

Descriptions of Ecological Systems for Modeling of LANDFIRE Biophysical Settings

Ecological Systems of location MRLC Map Zones 45, 46, 47, 48, 53, 54, 55, 56, 57, 58, 59, 60 OR 61; Including Aggregates

06 October 2007

Descriptions provided to TNC and LANDFIRE by NatureServe

About this document

This document contains brief definitions of the NatureServe terrestrial ecological systems currently identified as occurring in location MRLC Map Zones 45, 46, 47, 48, 53, 54, 55, 56, 57, 58, 59, 60 OR 61; Including Aggregates. Terrestrial ecological systems concepts form the basis for three map products from the inter-agency Landfire effort. First, they define the map legend for mapping Existing Vegetation Type (EVT); i.e., the current location of vegetative components of each terrestrial ecological system are mapped in that layer. Second, Environmental Site Potential (ESP) is a spatial model of environments that constrain the possible locations where a given ecological system could occur, without including natural disturbance regime as a factor. Third, Biophysical Settings (BpS) provide another spatial model depicting the probable location of each ecological system type, assuming the inclusion of natural disturbance regimes as a factor.

This ecological systems classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Most of the following types will be further described, quantitatively modeled, and mapped for LANDFIRE. Comments and suggestions regarding the contents of this subset may be directed to Mary J. Russo, Central Ecology Data Manager, Durham, NC, <mary_russo@natureserve.org>.



SAVING THE LAST GREAT PLACES ON EARTH

NatureServe is a non-profit organization dedicated to providing the scientific knowledge that forms the basis for effective conservation.

Citation:

The following citation should be used to reference this document and in any published materials which reference ecological system and/or International Vegetation Classification (IVC) and association data:

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA, U.S.A. Data current as of 06 October 2007.

© NatureServe 2007

Restrictions on Use: Permission to use, copy and distribute these data is hereby granted under the following conditions:

1. The above copyright notice must appear in all documents and reports;
2. Any use must be for informational purposes only and in no instance for commercial purposes;
3. Some data may be altered in format for analytical purposes, however the data should still be referenced using the citation above.

Any rights not expressly granted herein are reserved by NatureServe. Except as expressly provided above, nothing contained herein shall be construed as conferring any license or right under any NatureServe copyright.

Information Warranty Disclaimer: All data are provided as is without warranty as to the currentness, completeness, or accuracy of any specific data. The absence of data in any particular geographic area does not necessarily mean that species or ecological communities of concern are not present. NatureServe hereby disclaims all warranties and conditions with regard to these data, including but not limited to all implied warranties and conditions of merchantability, fitness for a particular purpose, and non-infringement. In no event shall NatureServe be liable for any special, indirect, incidental, consequential damages, or for damages of any kind arising out of or in connection with the use of these data. Because the data in the NatureServe Central Databases are continually being updated, it is advisable to refresh data at least once a year after receipt.

NatureServe
1101 Wilson Blvd, 15th floor
Arlington, VA 22209
703-908-1800
www.natureserve.org

TABLE OF CONTENTS

FOREST AND WOODLAND.....	5
1317 Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)	5
1370 Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)	7
1375 Appalachian Serpentine Woodland (CES202.347)	10
1340 Appalachian Shale Barrens (CES202.598)	12
1335 Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (CES203.241)	14
1346 Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)	16
1343 Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)	19
1347 Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)	22
1320 Central and Southern Appalachian Montane Oak Forest (CES202.596)	25
1350 Central and Southern Appalachian Spruce-Fir Forest (CES202.028)	27
1369 Central Appalachian Dry Oak-Pine Forest (CES202.591)	29
1377 Central Appalachian Pine-Oak Rocky Woodland (CES202.600)	31
1361 Central Atlantic Coastal Plain Maritime Forest (CES203.261)	33
1363 Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692)	35
1372 East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)	37
1349 East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland (CES203.496)	40
1328 East Gulf Coastal Plain Limestone Forest (CES203.502)	43
1380 East Gulf Coastal Plain Maritime Forest (CES203.503)	45
1307 East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)	47
1327 East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481)	49
1306 East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)	51
1325 East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477)	53
1329 East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)	55
1356 Florida Longleaf Pine Sandhill (CES203.284)	57
1387 Florida Peninsula Inland Scrub (CES203.057)	59
Lower Mississippi River Dune Pond (CES203.189)	61
1381 Lower Mississippi River Dune Woodland and Forest (CES203.531)	63
1509 Mississippi River Alluvial Plain Dry-Mesic Loess Slope Forest (CES203.071)	65
1313 North-Central Interior Beech-Maple Forest (CES202.693)	67
1311 North-Central Interior Dry Oak Forest and Woodland (CES202.047)	68
1310 North-Central Interior Dry-Mesic Oak Forest and Woodland (CES202.046)	70
1303 Northeastern Interior Dry-Mesic Oak Forest (CES202.592)	72
1324 Northern Atlantic Coastal Plain Hardwood Forest (CES203.475)	74
1379 Northern Atlantic Coastal Plain Maritime Forest (CES203.302)	76
1355 Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269)	78
1510 Northern Crowley's Ridge Sand Forest (CES203.072)	80
1342 Piedmont Hardpan Woodland and Forest (CES202.268)	82
1333 South Florida Hardwood Hammock (CES411.287)	84
1360 South Florida Pine Rockland (CES411.367)	86
1326 South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479)	88
1321 South-Central Interior Mesophytic Forest (CES202.887)	90
1337 Southeast Florida Coastal Strand and Maritime Hammock (CES411.369)	92
1351 Southeastern Interior Longleaf Pine Woodland (CES202.319)	93
1318 Southern and Central Appalachian Cove Forest (CES202.373)	95
1353 Southern Appalachian Low-Elevation Pine Forest (CES202.332)	98
1352 Southern Appalachian Montane Pine Forest and Woodland (CES202.331)	101
1309 Southern Appalachian Northern Hardwood Forest (CES202.029)	103
1315 Southern Appalachian Oak Forest (CES202.886)	106
1382 Southern Atlantic Coastal Plain Maritime Forest (CES203.537)	109
1330 Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560)	111
1357 Southern Coastal Plain Mesic Slope Forest (CES203.476)	113
Southern Coastal Plain Oak Dome and Hammock (CES203.494)	116
1322 Southern Crowley's Ridge Mesic Loess Slope Forest (CES203.079)	118
1305 Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)	120
1368 Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)	123
1316 Southern Piedmont Mesic Forest (CES202.342)	126

1376 Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457)	128
1336 Southwest Florida Coastal Strand and Maritime Hammock (CES411.368)	130
SAVANNA AND SHRUB-STEPPE.....	131
1408 Alabama Ketona Glade and Woodland (CES202.338)	131
1400 Central Appalachian Alkaline Glade and Woodland (CES202.602)	133
1401 Central Interior Highlands Calcareous Glade and Barrens (CES202.691)	135
1398 Cumberland Sandstone Glade and Barrens (CES202.337)	138
1397 Nashville Basin Limestone Glade and Woodland (CES202.334)	140
Panhandle Florida Limestone Glade (CES203.534)	142
South-Central Saline Glade (CES203.291)	143
Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)	145
Southern Piedmont Glade and Barrens (CES202.328)	147
Southern Ridge and Valley Calcareous Glade and Woodland (CES202.024)	149
UPLAND GRASSLAND AND HERBACEOUS.....	151
1413 Bluegrass Savanna and Woodland (CES202.888)	151
Cumberland Wet-Mesic Meadow and Savanna (CES202.053)	153
1430 East Gulf Coastal Plain Black Belt Calcareous Prairie and Woodland (CES203.478)	155
1427 East Gulf Coastal Plain Jackson Plain Prairie and Barrens (CES203.353)	157
1433 East Gulf Coastal Plain Jackson Prairie and Woodland (CES203.555)	159
1417 Eastern Highland Rim Prairie and Barrens (CES202.354)	161
1425 Florida Dry Prairie (CES203.380)	163
1432 Lower Mississippi Alluvial Plain Grand Prairie (CES203.549)	165
1418 Pennyroyal Karst Plain Prairie and Barrens (CES202.355)	167
1414 Southern Appalachian Grass and Shrub Bald (CES202.294)	169
1426 Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)	171
1419 Southern Ridge and Valley Patch Prairie (CES202.453)	174
1431 Southwest Florida Dune and Coastal Grassland (CES203.539)	175
1416 Western Highland Rim Prairie and Barrens (CES202.352)	176
WOODY WETLANDS AND RIPARIAN.....	178
Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)	178
Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)	181
1459 Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)	183
Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)	185
Atlantic Coastal Plain Northern Bog (CES203.893)	188
1452 Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)	189
Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)	192
Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)	194
1468 Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)	197
1470 Caribbean Coastal Wetland Systems (CES411.626)	199
1478 Caribbean Swamp Systems (CES411.634)	200
1501 Central Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)	201
1449 Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)	204
1479 Central Interior and Appalachian Swamp Systems (CES202.635)	207
Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018)	209
Cumberland Riverscour (CES202.036)	212
Cumberland Seepage Forest (CES202.361)	214
East Gulf Coastal Plain Interior Shrub Bog (CES203.385)	215
East Gulf Coastal Plain Large River Floodplain Forest (CES203.489)	217
East Gulf Coastal Plain Northern Seepage Swamp (CES203.554)	220
East Gulf Coastal Plain Small Stream and River Floodplain Forest (CES203.559)	222
1455 East Gulf Coastal Plain Southern Loblolly-Hardwood Flatwoods (CES203.557)	225
East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299)	227
1473 Gulf and Atlantic Coastal Plain Floodplain Systems (CES203.629)	229
1474 Gulf and Atlantic Coastal Plain Small Stream Riparian Systems (CES203.630)	231
1480 Gulf and Atlantic Coastal Plain Swamp Systems (CES203.636)	233
High Allegheny Wetland (CES202.069)	234
1513 Lower Mississippi River Flatwoods (CES203.193)	237
Mississippi River Bottomland Depression (CES203.490)	239
Mississippi River High Floodplain (Bottomland) Forest (CES203.196)	241
Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)	243
Mississippi River Riparian Forest (CES203.190)	245

North-Central Appalachian Acidic Swamp (CES202.604)	247
North-Central Interior and Appalachian Acidic Peatland (CES202.606)	249
North-Central Interior and Appalachian Rich Swamp (CES202.605)	251
1518 North-Central Interior Wet Flatwoods (CES202.700)	252
Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522)	254
Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest (CES203.520)	255
1456 Northern Atlantic Coastal Plain Pitch Pine Lowland (CES203.374)	256
Northern Atlantic Coastal Plain Tidal Swamp (CES203.282)	257
Piedmont Seepage Wetland (CES202.298)	258
Piedmont Upland Depression Swamp (CES202.336)	260
South Florida Bayhead Swamp (CES411.366)	262
1447 South Florida Cypress Dome (CES411.365)	264
1445 South Florida Dwarf Cypress Savanna (CES411.290)	265
South Florida Hydric Hammock (CES411.273)	266
South Florida Mangrove Swamp (CES411.289)	267
South Florida Pond-apple/Popash Slough (CES411.486)	269
1457 South-Central Interior / Upper Coastal Plain Wet Flatwoods (CES203.480)	270
Southeastern Coastal Plain Natural Lakeshore (CES203.044)	272
Southern and Central Appalachian Bog and Fen (CES202.300)	274
Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)	277
Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)	280
1450 Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536)	282
Southern Coastal Plain Blackwater River Floodplain Forest (CES203.493)	284
Southern Coastal Plain Hydric Hammock (CES203.501)	286
Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)	288
1460 Southern Coastal Plain Nonriverine Cypress Dome (CES203.251)	290
1461 Southern Coastal Plain Seepage Swamp and Baygall (CES203.505)	292
Southern Piedmont Large Floodplain Forest (CES202.324)	294
Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)	296
Southwest Florida Perched Barriers Tidal Swamp and Lagoon (CES203.540)	299
1506 West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)	300

HERBACEOUS WETLAND..... 302

Atlantic Coastal Plain Embayed Region Seagrass Bed (CES203.243)	302
Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (CES203.259)	304
Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)	306
Atlantic Coastal Plain Indian River Lagoon Seagrass Bed (CES203.256)	308
Atlantic Coastal Plain Indian River Lagoon Tidal Marsh (CES203.257)	310
1516 Atlantic Coastal Plain Sandhill Seep (CES203.253)	311
Central Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.376)	313
Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)	314
1514 Central Florida Herbaceous Pondshore (CES203.890)	316
Central Florida Wet Prairie and Herbaceous Seep (CES203.491)	318
1493 Central Interior and Appalachian Herbaceous Wetland Systems (CES202.641)	319
East Gulf Coastal Plain Depression Pondshore (CES203.558)	321
East Gulf Coastal Plain Florida Big Bend Seagrass Bed (CES203.244)	324
East Gulf Coastal Plain Sandhill Lakeshore Depression (CES203.292)	326
1485 East Gulf Coastal Plain Savanna and Wet Prairie (CES203.192)	328
Florida Big Bend Fresh and Oligohaline Tidal Marsh (CES203.507)	330
Florida Big Bend Salt and Brackish Tidal Marsh (CES203.508)	331
Florida Keys Seagrass Bed (CES411.285)	332
Florida River Floodplain Marsh (CES203.055)	333
1489 Floridian Highlands Freshwater Marsh (CES203.077)	335
1490 Gulf and Atlantic Coastal Plain Tidal Marsh Systems (CES203.638)	337
Interior Low Plateau Seepage Fen (CES202.346)	339
Laurentian-Acadian Freshwater Marsh (CES201.594)	341
Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)	343
Mississippi Sound Salt and Brackish Tidal Marsh (CES203.303)	345
North-Central Appalachian Seepage Fen (CES202.607)	347
Northern Atlantic Coastal Plain Brackish Tidal Marsh (CES203.894)	349
Northern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.516)	350
Northern Atlantic Coastal Plain Pondshore (CES203.518)	352
Northern Atlantic Coastal Plain Seagrass Bed (CES203.246)	354

Northern Atlantic Coastal Plain Subtidal Aquatic Bed (CES203.521)	355
Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519)	356
Northern Gulf of Mexico Seagrass Bed (CES203.263)	358
South Florida Depression Pondshore (CES411.054)	360
1483 South Florida Everglades Sawgrass Marsh (CES411.286)	362
South Florida Slough, Gator Hole, and Willow Head (CES411.485)	364
1484 South Florida Wet Marl Prairie (CES411.370)	366
Southeastern Coastal Plain Interdunal Wetland (CES203.258)	367
Southern Appalachian Seepage Wetland (CES202.317)	369
1515 Southern Coastal Plain Herbaceous Seep and Bog (CES203.078)	371
Southern Coastal Plain Spring-run Stream Aquatic Vegetation (CES203.275)	373
Southwest Florida Seagrass Bed (CES203.274)	374
MIXED UPLAND AND WETLAND.....	376
Central Appalachian River Floodplain (CES202.608)	376
Central Appalachian Stream and Riparian (CES202.609)	379
1453 Central Florida Pine Flatwoods (CES203.382)	381
1471 Central Interior and Appalachian Floodplain Systems (CES202.627)	383
1472 Central Interior and Appalachian Riparian Systems (CES202.628)	385
1435 East Gulf Coastal Plain Dune and Coastal Grassland (CES203.500)	387
1454 East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)	388
Northern Atlantic Coastal Plain Calcareous Ravine (CES203.069)	390
1436 Northern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.264)	392
Northern Atlantic Coastal Plain Stream and River (CES203.070)	395
1446 South Florida Pine Flatwoods (CES411.381)	397
South-Central Interior Large Floodplain (CES202.705)	398
South-Central Interior Small Stream and Riparian (CES202.706)	401
SPARSELY VEGETATED.....	404
Atlantic Coastal Plain Sea Island Beach (CES203.383)	404
1388 Atlantic Coastal Plain Xeric River Dune (CES203.497)	405
1496 Caribbean Coastal Beach Systems (CES411.644)	406
Central Atlantic Coastal Plain Sandy Beach (CES203.064)	407
Central Interior Acidic Cliff and Talus (CES202.689)	408
1497 Central Interior and Appalachian Sparsely Vegetated Systems (CES202.645)	410
Central Interior Calcareous Cliff and Talus (CES202.690)	411
Cumberland Acidic Cliff and Rockhouse (CES202.309)	413
East Gulf Coastal Plain Dry Chalk Bluff (CES203.492)	415
Florida Panhandle Beach Vegetation (CES203.266)	416
1498 Gulf and Atlantic Coastal Plain Sparsely Vegetated Systems (CES203.646)	417
North-Central Appalachian Acidic Cliff and Talus (CES202.601)	419
North-Central Appalachian Circumneutral Cliff and Talus (CES202.603)	421
Northern Atlantic Coastal Plain Sandy Beach (CES203.301)	423
South Florida Shell Hash Beach (CES411.271)	424
Southeast Florida Beach (CES411.272)	425
Southern Appalachian Granitic Dome (CES202.297)	426
Southern Appalachian Montane Cliff and Talus (CES202.330)	428
Southern Appalachian Rocky Summit (CES202.327)	430
Southern Appalachian Spray Cliff (CES202.288)	432
Southern Atlantic Coastal Plain Beach (CES203.535)	434
Southern Coastal Plain Sinkhole (CES203.495)	435
Southern Interior Calcareous Cliff (CES202.356)	436
Southern Interior Sinkhole Wall (CES202.357)	438
Southern Piedmont Cliff (CES202.386)	439
Southern Piedmont Granite Flatrock and Outcrop (CES202.329)	441
Southwest Florida Beach (CES411.276)	443

FOREST AND WOODLAND

1317 ALLEGHENY-CUMBERLAND DRY OAK FOREST AND WOODLAND (CES202.359)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Acidic Soil; Broad-Leaved Tree

Non-Diagnostic Classifiers: Lowland; Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2317; ESLF 4123; ESP 1317

CONCEPT

Summary: This system encompasses dry hardwood forests on predominately acidic substrates in the Allegheny and Cumberland plateaus, and ridges in the Ridge and Valley. This system can also be found as small isolated patches in the Southern Blue Ridge. Its range is more or less consistent with the "Mixed Mesophytic Forest Region" of Braun (1950) and Greller (1988), although it is not a mesic forest type. These forests are typically dominated by *Quercus alba*, *Quercus falcata*, *Quercus prinus*, *Quercus coccinea*, with lesser amounts of *Acer rubrum*, *Carya glabra*, and *Carya alba*. Small inclusions of *Pinus echinata* and/or *Pinus virginiana* may occur, particularly adjacent to escarpments or following fire. In addition, *Pinus strobus* may be prominent in some stands in the absence of fire. It occurs in a variety of situations, including on nutrient-poor or acidic soils. Sprouts of *Castanea dentata* can often be found where it was formerly a common tree.

Classification Comments: Related forests on more base-rich substrates may be classified as examples of Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457), where this distinction may be made.

Similar Ecological Systems:

- Central Appalachian Dry Oak-Pine Forest (CES202.591)--occurs to the east of this system's range.
- Northeastern Interior Dry-Mesic Oak Forest (CES202.592)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Oak Forest (CES202.886)--is a related broader and overlapping concept (conceptually and geographically).
- Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457)--is found in some similar landscapes but on more base-rich substrates, which usually correspond to different landform positions.

Related Concepts:

- Xeric Acidic Forest (Evans 1991) Broader

DESCRIPTION

Environment: This system is most likely found on predominantly nutrient-poor or acidic substrates in the Allegheny and Cumberland plateaus, and ridges in the eastern Ridge and Valley.

Vegetation: These forests are typically dominated by *Quercus alba*, *Quercus falcata*, *Quercus prinus*, *Quercus coccinea*, *Acer rubrum*, *Carya glabra*, and *Carya alba*. These occur in a variety of situations, most likely on nutrient-poor or acidic soils and, to a much lesser extent, on circumneutral soils. Sprouts of *Castanea dentata* can often be found where it was formerly a common tree. Small inclusions of *Pinus echinata* and/or *Pinus virginiana* may occur, particularly adjacent to escarpments or following fire. In addition, *Pinus strobus* may be prominent in some stands in the absence of fire.

MEMBERSHIP

Associations:

- *Liriodendron tulipifera* - *Quercus* spp. Forest (CEGL007221, GNA)
- *Pinus strobus* - *Quercus (coccinea, prinus)* / (*Gaylussacia ursina*, *Vaccinium stamineum*) Forest (CEGL007519, G4)
- *Pinus strobus* - *Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest (CEGL007517, G3G4)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Quercus alba* - (*Quercus prinus*) / (*Hydrangea quercifolia*) - *Viburnum acerifolium* / *Carex picta* - *Piptochaetium avenaceum* Forest (CEGL008430, G3G4)
- *Quercus alba* - *Carya alba* - (*Quercus velutina*) / *Desmodium nudiflorum* - (*Carex picta*) Forest (CEGL007795, G4)
- *Quercus alba* - *Quercus (coccinea, velutina, prinus)* / *Gaylussacia baccata* Forest (CEGL008521, G5)
- *Quercus alba* - *Quercus falcata* / *Vaccinium (arboresum, hirsutum, pallidum)* Forest (CEGL008567, G3G4)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* var. *virginiana* Forest (CEGL007240, G4)
- *Quercus alba* - *Quercus stellata* / *Ostrya virginiana* - *Acer barbatum* / *Chasmanthium sessiliflorum* Forest (CEGL008443, G3G4)
- *Quercus alba* - *Quercus velutina* - *Carya (ovata, alba, glabra)* - *Pinus* sp. Forest (CEGL007231, G4G5)
- *Quercus falcata* - *Quercus (coccinea, stellata)* / *Vaccinium (pallidum, stamineum)* Forest (CEGL007247, G4)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboresum* / *Vaccinium stamineum* Forest (CEGL007244, G4G5)

- *Quercus prinus* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum* Forest (CEGL008431, G4G5)
- *Quercus prinus* - *Carya* (*alba*, *glabra*, *ovata*) / *Juniperus virginiana* var. *virginiana* Forest (CEGL004786, G2G3)
- *Quercus prinus* - *Carya* spp. - *Quercus velutina* / *Vaccinium arboreum* / *Iris verna* var. *smalliana* Forest (CEGL007261, G3G4)
- *Quercus prinus* - *Quercus* (*alba*, *coccinea*, *velutina*) / *Viburnum acerifolium* - (*Kalmia latifolia*) Forest (CEGL005023, G4?)
- *Quercus prinus* - *Quercus rubra* - *Carya* (*ovata*, *glabra*) - *Pinus virginiana* Forest (CEGL007269, G4?)
- *Quercus prinus* - *Quercus* spp. / *Vaccinium arboreum* - (*Kalmia latifolia*, *Styrax grandifolius*) Forest (CEGL007700, G4)
- *Quercus stellata* - *Pinus virginiana* / (*Schizachyrium scoparium*, *Piptochaetium avenaceum*) Woodland (CEGL008406, G2?)

Alliances:

- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Pinus strobus* - *Quercus* (*alba*, *rubra*, *velutina*) Forest Alliance (A.401)
- *Pinus strobus* - *Quercus* (*coccinea*, *prinus*) Forest Alliance (A.402)
- *Pinus virginiana* Forest Alliance (A.131)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus* (*falcata*, *stellata*) Forest Alliance (A.241)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248)
- *Quercus prinus* - *Quercus* (*alba*, *falcata*, *rubra*, *velutina*) Forest Alliance (A.249)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South-Central Interior Mesophytic Forest (CES202.887)

Adjacent Ecological System Comments: The somewhat more mesic and/or more base-rich forests of the lower slopes of the Cumberlands and the lower slopes and valleys in the Ridge and Valley are covered by South-Central Interior Mesophytic Forest (CES202.887).

DISTRIBUTION

Range: This system is centered on the Allegheny and Cumberland plateaus from northern Alabama north to Ohio, West Virginia, and western Pennsylvania.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, OH, PA, TN, VA, WV

Map Zones: 48:C, 53:C, 57:C, 61:C, 62:C

USFS Ecomap Regions: 221E:CC, 221H:CC, 221J:CC, 231C:CC, 231D:CC, M221A:CC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Be:CCC, M221C:CC

TNC Ecoregions: 49:C, 50:C

SOURCES

References: Braun 1950, Comer et al. 2003, Greller 1988

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723154#references

Description Author: R. Evans, M. Pyne, C. Nordman, mod. J. Teague and S. Gawler

Version: 23 Jul 2007

Concept Author: R. Evans, M. Pyne, C. Nordman

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

1370 APPALACHIAN (HEMLOCK)-NORTHERN HARDWOOD FOREST (CES202.593)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Mesotrophic Soil; Needle-Leaved Tree; Broad-Leaved Deciduous Tree; *Pinus* spp. - *Tsuga canadensis*

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Lowland; Forest and Woodland (Treed); Sideslope;

Toeslope/Valley Bottom; Temperate; Acidic Soil; Shallow Soil; Deep Soil; Mineral: W/ A-Horizon >10 cm; Ustic; Long Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2370; ESLF 4313; ESP 1370

CONCEPT

Summary: This forested system of the northeastern U.S. ranges from central New England west to Lake Erie and south to Virginia. It is one of the matrix forest types in the northern part of the Central Interior and Appalachian Division. Northern hardwoods such as *Acer saccharum*, *Betula alleghaniensis*, and *Fagus grandifolia* are characteristic, either forming a deciduous canopy or mixed with *Tsuga canadensis* (or in some cases *Pinus strobus*). Other common and sometimes dominant trees include *Quercus* spp. (most commonly *Quercus rubra*), *Liriodendron tulipifera*, *Prunus serotina*, and *Betula lenta*. It is of more limited extent and more ecologically constrained in the southern part of its range, in northern parts of Virginia and West Virginia.

Classification Comments: Northward this system is replaced by Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563) and Laurentian-Acadian Northern Hardwoods Forest (CES201.564), but the limits of both are not yet clear in western New York (Allegheny Plateau) and central New England. USFS ecological province lines provide an apparently appropriate delimiter, with areas in Provinces 212 and M212 (as well as the Great Lakes part of 221 in NY and OH) falling into the Laurentian-Acadian systems, and areas in Provinces 221 and M221 falling into this Appalachian system.

Similar Ecological Systems:

- Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563)--found to the north and northeast of this system.
- North-Central Interior Beech-Maple Forest (CES202.693)
- South-Central Interior Mesophytic Forest (CES202.887)
- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

Related Concepts:

- Acidic Cove Forests (Fleming et al. 2005) Intersecting
- Central Appalachian Northern Hardwood Forests (Fleming et al. 2005) Intersecting
- Eastern Hemlock - Hardwood Forests (Fleming et al. 2005) Intersecting

DESCRIPTION

Environment: This system occurs on somewhat protected low and midslopes and valley bottoms. In the central Appalachian center of its range, its ecological amplitude is somewhat broader, and it approaches matrix forest in some areas. It is considered a system of intermediate moisture regime.

Vegetation: The canopy is characterized and often usually dominated by northern hardwoods (e.g., *Fagus grandifolia* and *Acer saccharum*), often with *Tsuga canadensis*, but may also contain large amounts of *Pinus strobus* and *Quercus* spp. The understory varies quite a bit, in some places dominated by evergreen shrubs and in others by herbs.

Dynamics: This system is currently being devastated in large parts of its range by the hemlock woolly adelgid (*Adelges tsugae*). This sucking insect is continuing to cause close to 100% mortality as it spreads from the north into the southern United States. The insect will most likely cause canopy hemlocks to be replaced by other canopy trees. Historically, this system was probably only subject to occasional fires. Fires that did occur may have been catastrophic and may have lead to even-aged stands of pine and hemlock.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014, GNR)
- *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (CEGL006132, GNR)
- *Acer saccharum* - *Betula alleghaniensis* - *Fagus grandifolia* / *Viburnum lantanoides* Forest (CEGL006252, G5)
- *Acer saccharum* - *Betula alleghaniensis* - *Prunus serotina* Forest (CEGL006045, G4)
- *Acer saccharum* - *Pinus strobus* / *Acer pensylvanicum* Forest (CEGL005005, GNR)
- *Acer saccharum* - *Quercus rubra* / *Hepatica nobilis* var. *obtusa* Forest (CEGL006046, GNR)
- *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861, G3G4Q)
- *Betula lenta* - *Acer rubrum* / *Lycopodium annotinum* - *Dennstaedtia punctilobula* Forest (CEGL008503, GNA)
- *Carex scabrata* - *Viola cucullata* / *Plagiomnium ciliare* Herbaceous Vegetation (CEGL006597, G3)
- *Chrysosplenium americanum* Herbaceous Vegetation (CEGL006193, G3G5)

- *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Forest (CEGL007220, GNA)
- *Picea rubens* - *Betula alleghaniensis* - *Prunus serotina* Forest (CEGL006029, GNR)
- *Pinus strobus* - *Tsuga canadensis* / *Acer pensylvanicum* / *Polystichum acrostichoides* Forest (CEGL006019, G4?)
- *Pinus strobus* - *Tsuga canadensis* Lower New England / Northern Piedmont Forest (CEGL006328, G5)
- *Pinus strobus* Successional Forest (CEGL007944, GNA)
- *Quercus bicolor* / *Vaccinium corymbosum* / *Carex stipata* Forest (CEGL006241, GNR)
- *Quercus rubra* - *Acer saccharum* - *Fagus grandifolia* / *Viburnum acerifolium* Forest (CEGL006173, G4G5)
- *Quercus rubra* - *Acer saccharum* - *Liriodendron tulipifera* Forest (CEGL006125, G4?)
- *Quercus rubra* - *Tsuga canadensis* - *Liriodendron tulipifera* / *Hamamelis virginiana* Forest (CEGL006566, G4?)
- *Rhododendron maximum* Upland Shrubland (CEGL003819, G3?Q)
- *Thuja occidentalis* - *Pinus strobus* - *Tsuga canadensis* / *Carex eburnea* Woodland (CEGL008426, G1G2)
- *Tsuga canadensis* - (*Betula alleghaniensis*, *Quercus rubra*) / *Ilex montana* / *Rhododendron catawbiense* Forest (CEGL008513, G1?)
- *Tsuga canadensis* - *Betula alleghaniensis* - *Acer saccharum* / *Dryopteris intermedia* Forest (CEGL006109, G4?)
- *Tsuga canadensis* - *Betula alleghaniensis* - *Prunus serotina* / *Rhododendron maximum* Forest (CEGL006206, G4?)
- *Tsuga canadensis* - *Betula alleghaniensis* / *Veratrum viride* - *Carex scabrata* - *Oclemena acuminata* Forest (CEGL008533, G2)
- *Tsuga canadensis* - *Fagus grandifolia* - *Acer saccharum* / (*Hamamelis virginiana*, *Kalmia latifolia*) Forest (CEGL005043, G3?)
- *Tsuga canadensis* - *Fagus grandifolia* - *Quercus rubra* Forest (CEGL006088, G4G5)
- *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136, G3G4)
- *Tsuga caroliniana* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest (CEGL007138, G1G2)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Acer saccharum* - *Betula alleghaniensis* - (*Fagus grandifolia*) Forest Alliance (A.216)
- *Chrysosplenium americanum* Saturated Herbaceous Alliance (A.1685)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Picea rubens* - *Betula alleghaniensis* Forest Alliance (A.384)
- *Pinus strobus* - *Acer saccharum* Forest Alliance (A.3012)
- *Pinus strobus* - *Tsuga canadensis* Forest Alliance (A.127)
- *Pinus strobus* Forest Alliance (A.128)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus* spp. Forest Alliance (A.237)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Rhododendron maximum* Shrubland Alliance (A.745)
- *Thuja occidentalis* Woodland Alliance (A.544)
- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)
- *Tsuga canadensis* - *Betula alleghaniensis* Forest Alliance (A.412)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413)
- *Tsuga caroliniana* Forest Alliance (A.144)

SPATIAL CHARACTERISTICS

Spatial Summary: Matrix in the northern portion of its range to large patch on the southern end of its range in Virginia and West Virginia.

Size: Some examples may be more than 1000 acres, but smaller in the southern part of the range.

Adjacent Ecological Systems:

- High Allegheny Wetland (CES202.069)

Adjacent Ecological System Comments: The concept of this system was revised in April 2007 to remove areas south and west of Virginia and West Virginia from its range; hemlock and mixed coves in that southern range are now within Southern and Central Appalachian Cove Forest (CES202.373), and small areas of non-cove hemlock are to be considered patches within the surrounding forest matrix system. The Region 8 National Forests and other Federal lands, as well as Ecoregions and Mapzones related to this area were also removed.

DISTRIBUTION

Range: This system is found from central New England south to Virginia and West Virginia.

Divisions: 202:C

Nations: US

Subnations: CT, MA, MD, ME?, NH, NJ, NY, OH?, PA, VA, VT, WV

Map Zones: 53:C, 60:C, 61:C, 62:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211E:CC, 211Fc:CCC, 211Fd:CCC, 211G:CC, 221Aa:CCC, 221B:CC, 221D:CC, 221E:CC, 221F:CC, 222I:CC, M221A:CC, M221B:CC, M221C:CC, M221D:CC

TNC Ecoregions: 48:C, 49:C, 52:?, 59:C, 60:P, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723013#references

Description Author: S.C. Gawler, R. White, R. Evans, M. Pyne

Version: 23 Jul 2007

Concept Author: S.C. Gawler, R. White, R. Evans, M. Pyne

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

1375 APPALACHIAN SERPENTINE WOODLAND (CES202.347)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Rock Outcrops/Barrens/Glades; Serpentine; Unglaciated; Ultramafic with low Ca:Mg ratio

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2375; ESLF 4318; ESP 1375

CONCEPT

Summary: This system consists of distinct vegetation associated with ultramafic rock substrates in the Piedmont and Blue Ridge of the eastern United States. Most examples are open woodlands with *Pinus rigida*, *Pinus virginiana*, and/or *Quercus alba*, *Quercus marilandica*, and *Quercus stellata* in the often stunted canopy. Extreme edaphic conditions lead to locally xerophytic growing conditions that contribute to relatively open canopies and a ground cover dominated by prairie grasses and a variety of forbs. Disjunct species from drier regions and some endemic plant taxa are often present. The unusual and extreme soil chemistry determines the underlying floristics and distinctive flora of the type, but that fire frequency determines the physiognomy of particular examples over time.

Classification Comments: While details of flora vary widely among the scattered examples of this system, all associations have in common a composition that is distinct from communities on other substrates and that is more xeric in aspect. Serpentine substrates support distinctive barren vegetation in most places where they occur. This system is distinguished from serpentine barrens in other regions because of the distinctive flora, as well as the climate, lack of glaciation, and other factors distinct to this region. A closely related Piedmont system, Piedmont Hardpan Woodland and Forest (CES202.268), may be only incompletely distinguished from this system. In this Appalachian system *Pinus rigida* / *Schizachyrium scoparium* - *Packera plattensis* Wooded Herbaceous Vegetation (CEGL006084) occurs in both the Appalachians and in the Piedmont.

Ultramafic rock substrate is apparently not sufficient to create this system. Some Piedmont areas with ultramafic rock outcrops on the most mesic sites support mesic forest vegetation not distinguishable from that on other substrates. It may be that these outcrops have less extreme chemistry, or that sufficient moisture levels or a long period without natural disturbance in the form of fire will override the effects of chemistry. The presence of unusually xerophytic or barren vegetation should be the defining characteristic of this system.

DESCRIPTION

Environment: This system occurs in a variety of topographic settings, perhaps excluding only alluvial sites. The bedrock is serpentinite, dunite, or other ultramafic rocks. The soil has unusual and extreme chemical composition that includes strongly skewed calcium-to-magnesium ratios and often high levels of heavy metals such as chromium. Owing to a high level of toxic metals and a deficiency in nutrients, serpentine outcrops are ecologically unique and provide habitat for many plant species that grow nowhere else. The soil may be shallow and rocky, or deep, and is usually very clayey. Seepage may be present locally.

Vegetation: Vegetation is generally an open woodland of pines or xerophytic hardwoods. The dominant vegetation is more xerophytic and more open than the topographic setting, soil moisture, and climate would suggest, and contrasts strongly with adjacent vegetation on other kinds of rock. *Pinus rigida* and *Pinus virginiana* are frequent canopy dominants, but *Quercus marilandica*, *Quercus alba*, and *Quercus stellata* dominate some examples. There is generally not a well-developed understory. Shrubs may be sparse to dense. The herb layer is usually dense; grasses, including prairie elements such as *Schizachyrium scoparium*, *Andropogon gerardii*, and/or *Sorghastrum nutans*, usually dominate, but a number of forbs may be present. In the northern portion of this system's range in Pennsylvania and Maryland, *Phlox subulata* and the endemic *Symphotrichum depauperatum* are characteristic; in the southern Appalachian portion of its range, *Packera plattensis*, *Hexastylis arifolia* var. *ruthii*, and *Thalictrum macrostylum* are characteristic. Often, paradoxical mixtures of xerophytic and mesophytic species are present, though the overall plant composition is characteristic of a drier setting. Disjunct species from drier regions and some endemic plant taxa are often present.

Dynamics: Although the unique soil chemistry is the crucial determining factor for this system, fire is generally a crucial process influencing species composition and vegetation structure. Without fire, vegetation can sometimes become dense enough to suppress or eliminate the distinctive herbaceous layer, as well as turning a distinctive savanna or woodland structure into dense forest. Southern pine beetles are an important factor in examples dominated by pines.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Pinus virginiana* - *Pinus rigida* / *Microstegium vimineum* - *Smilax* spp. Serpentine Forest (CEGL006439, G1G2)
- *Acer rubrum* - *Quercus* spp. / *Smilax* spp. Serpentine Forest (CEGL006438, G1G2)
- *Deschampsia caespitosa* - *Vernonia noveboracensis* Herbaceous Vegetation (CEGL006316, GNR)
- *Juniperus virginiana* - *Pinus virginiana* / *Smilax rotundifolia* Serpentine Forest (CEGL006440, G1G2)
- *Pinus rigida* - *Quercus alba* / *Sporobolus heterolepis* - *Andropogon gerardii* Woodland (CEGL003768, G1)

- *Pinus rigida* - *Quercus stellata* / *Andropogon gerardii* - *Packera paupercula* Woodland (CEGL004968, G1)
- *Pinus rigida* / *Schizachyrium scoparium* - *Packera plattensis* Wooded Herbaceous Vegetation (CEGL006084, G1)
- *Pinus virginiana* - *Pinus rigida* - *Quercus stellata* / *Ceanothus americanus* - *Kalmia latifolia* / *Thalictrum revolutum* Woodland (CEGL007721, G1)
- *Pinus virginiana* / *Quercus marilandica* Serpentine Forest (CEGL006266, GNA)
- *Quercus alba* / *Physocarpus opulifolius* / *Packera plattensis* - *Hexastylis arifolia* var. *ruthii* Forest (CEGL007296, G1)
- *Schizachyrium scoparium* - *Sporobolus heterolepis* Serpentine Herbaceous Vegetation (CEGL006442, G1G2)
- *Sorghastrum nutans* - *Schizachyrium scoparium* Serpentine Herbaceous Vegetation (CEGL006441, G1G2)

Alliances:

- (*Pinus rigida*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1921)
- *Deschampsia caespitosa* Saturated Herbaceous Alliance (A.1456)
- *Pinus rigida* - *Quercus* (*alba*, *stellata*) Woodland Alliance (A.681)
- *Pinus virginiana* Forest Alliance (A.131)
- *Quercus alba* - *Quercus* (*falcata*, *stellata*) Forest Alliance (A.241)
- *Quercus alba* Montane Forest Alliance (A.271)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)
- *Sporobolus heterolepis* - (*Deschampsia caespitosa*, *Schizachyrium scoparium*) Herbaceous Alliance (A.1402)

SPATIAL CHARACTERISTICS

Spatial Summary: Small- to large-patch system, most examples covering a few dozen acres at most. The largest, in Maryland, is 2000 acres.

Size: Most examples naturally cover a few to perhaps several dozen acres. A few in Pennsylvania and Maryland are 100-200 acres, with one Maryland site covering 2000 acres.

Adjacent Ecological System Comments: May be bordered by any other system appropriate for the region, often with abrupt boundaries at geologic contacts. Ultramafic rocks are often associated with mafic rocks such as amphibolite, so systems with basic soils are likely to be associated.

DISTRIBUTION

Range: This system is widely scattered throughout the southern and central Appalachians and Piedmont, from Pennsylvania to North Carolina.

Divisions: 202:C

Nations: US

Subnations: MD, NC, PA, VA

Map Zones: 57:C, 59:C, 60:C, 61:C

USFS Ecomap Regions: 221An:CCC, 221Da:CCC, 221Db:CCC, 231Ib:CCC, 232Hd:CCC, M221Db:CCC, M221Dc:CCC, M221Dd:CCC

TNC Ecoregions: 51:C, 52:C, 61:C

SOURCES

References: Arabas 2000, Barton and Wallenstein 1997, Comer et al. 2003, Harshberger 1903, Latham 1993, Mansberg and Wentworth 1984, Pennell 1910, Pennell 1912, Pennell 1929, Radford 1948, Wherry 1963

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723163#references

Description Author: M. Schafale, R. Evans, S.C. Gawler, M. Pyne

Version: 23 Jul 2007

Concept Author: M. Schafale, R. Evans, S.C. Gawler

Stakeholders: East, Southeast

ClassifResp: Southeast

1340 APPALACHIAN SHALE BARRENS (CES202.598)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Sideslope; Talus (Substrate); Unglaciaded; Unconsolidated

Non-Diagnostic Classifiers: Lowland; Ridge/Summit/Upper Slope; Temperate; Acidic Soil; Very Shallow Soil; Ustic; Landslide

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2340; ESLF 4147; ESP 1340

CONCEPT

Summary: This system encompasses the distinctive shale barrens of the central and southern Appalachians at low to mid elevations. The exposure and lack of soil create extreme conditions for plant growth. Vegetation is mostly classified as woodland, overall, but may include large open areas of sparse vegetation. Dominant trees are primarily *Quercus prinus* and *Pinus virginiana*, although on higher-pH substrates the common trees include *Juniperus virginiana* and *Fraxinus americana*. The substrate includes areas of solid rock as well as unstable areas of shale scree, usually steeply sloped. The fully exposed areas are extremely dry. These barrens are high in endemic species.

Classification Comments: Examples of related barrens in the "Knobs" region of Kentucky are included in Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692), not here. The southern range limit is not completely clear. "Central Appalachian Shale Barrens" (sensu VDNH) are the "core" concept. The bluestone shale barrens of West Virginia are placed in this system even though many of the endemics are not present there; the same is true at the northern periphery of this system in Pennsylvania.

Similar Ecological Systems:

- Central Appalachian Pine-Oak Rocky Woodland (CES202.600)
- Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692)
- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Montane Cliff and Talus (CES202.330)

Related Concepts:

- Central Appalachian Shale Barrens (Fleming et al. 2004) Finer

DESCRIPTION

Environment: This system is found at low to mid elevations in the central and southern Appalachians. Most shale barrens occur between 305 and 610 m (1000-2000 feet) elevation and have a generally southern exposure. Slopes are steep and often undercut by a stream at the base. Soils are thin, with a layer weathered rock fragments covering the surface. The exposure and lack of soil create extreme conditions for plant growth. The chemistry and pH vary somewhat from site to site, and this variability may be reflected in the vegetation. The substrate includes areas of solid rock as well as unstable areas of shale scree, usually steeply sloped.

Vegetation: Although stunted trees of several species such as *Quercus prinus*, *Pinus virginiana*, and *Carya glabra* are common, Central Appalachian Shale Barrens are strongly characterized by their open physiognomy and by a suite of uncommon and rare plants found almost exclusively in these habitats (Fleming et al. 2004). Endemic or near-endemic shale barren species include shale-barren rock-cress (*Arabis serotina*), white-haired leatherflower (*Clematis albicoma*), Millboro leatherflower (*Clematis viticaulis*; also endemic to Virginia), shale-barren wild buckwheat (*Eriogonum allenii*), shale-barren evening-primrose (*Oenothera argillicola*), shale-barren ragwort (*Packera antennariifolia*), and Kate's Mountain clover (*Trifolium virginicum*). Other more-or-less widespread and characteristic herbaceous species of Virginia shale barrens include Pennsylvania sedge (*Carex pennsylvanica*), little bluestem (*Schizachyrium scoparium*), poverty oatgrass (*Danthonia spicata*), wavy hairgrass (*Deschampsia flexuosa* var. *flexuosa*), moss phlox (*Phlox subulata*), mountain nailwort (*Paronychia montana*), rock spike-moss (*Selaginella rupestris*), shale-barren pussytoes (*Antennaria virginica*), Canada cinquefoil (*Potentilla canadensis*), smooth sunflower (*Helianthus laevigatus*), false boneset (*Brickellia eupatorioides* var. *eupatorioides*), hairy woodmint (*Blephilia ciliata*), and western wallflower (*Erysimum capitatum* var. *capitatum*; Bath and Alleghany counties).

MEMBERSHIP

Associations:

- (*Pinus virginiana*, *Juniperus virginiana*) / *Schizachyrium scoparium* - *Eriogonum allenii* Wooded Herbaceous Vegetation (CEGL008530, G2)
- *Carya glabra* - *Fraxinus americana* - *Quercus prinus* / *Ostrya virginiana* / *Philadelphus hirsutus* Woodland (CEGL004995, G2)
- *Juniperus virginiana* - *Fraxinus americana* / *Carex pennsylvanica* - *Cheilanthes lanosa* Wooded Herbaceous Vegetation (CEGL006037, G2)
- *Paulownia tomentosa* Woodland (CEGL003687, GNA)
- *Pinus virginiana* - *Juniperus virginiana* - *Quercus rubra* / *Solidago arguta* var. *harrisii* - *Opuntia humifusa* Woodland (CEGL006288, G3)
- *Pinus virginiana* - *Quercus prinus* / *Packera antennariifolia* - *Phlox subulata* Woodland (CEGL006562, G3G4)

- *Pinus virginiana* - *Quercus prinus* / *Quercus ilicifolia* / (*Hieracium greenii*, *Viola pedata*) Woodland (CEGL008525, G3)
- *Pinus virginiana* / *Vaccinium pallidum* / *Schizachyrium scoparium* - *Carex pensylvanica* Woodland (CEGL003624, G2)
- *Quercus prinus* - *Juniperus virginiana* - (*Pinus virginiana*) / *Philadelphus hirsutus* - *Celtis occidentalis* Woodland (CEGL007720, G2)
- *Quercus prinus* / *Quercus ilicifolia* / *Danthonia spicata* Woodland [Provisional] (CEGL008526, G3?)

Alliances:

- (*Fraxinus americana*, *Juniperus virginiana*) / *Carex pensylvanica* - *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.3014)
- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Paulownia tomentosa* Woodland Alliance (A.609)
- *Pinus (rigida, pungens, virginiana)* - *Quercus prinus* Woodland Alliance (A.677)
- *Quercus prinus* - *Quercus coccinea* Woodland Alliance (A.622)

DISTRIBUTION

Range: This system is found from southern Pennsylvania south to Virginia and extreme eastern Tennessee. Application of the concept south of Virginia is uncertain. It is not attributed to Kentucky.

Divisions: 202:C

Nations: US

Subnations: MD, NC?, PA, TN, VA, WV

Map Zones: 57:C, 61:C

USFS Ecomap Regions: M221Ac:CCC, M221Be:CCC

TNC Ecoregions: 50:P, 51:P, 59:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2004, Keener 1970, Platt 1951

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723010#references

Description Author: S.C. Gawler, mod. M. Pyne

Version: 23 Jul 2007

Concept Author: S.C. Gawler

Stakeholders: East, Southeast

ClassifResp: East

1335 ATLANTIC COASTAL PLAIN DRY AND DRY-MESIC OAK FOREST (CES203.241)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Long Disturbance Interval; Broad-Leaved Tree

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2335; ESLF 4141; ESP 1335

CONCEPT

Summary: This system encompasses oak-dominated forests of somewhat fire-sheltered dry to dry-mesic sites in the Mid-Atlantic and South Atlantic coastal plains from southeastern Virginia to Georgia. Sites where this system occurs are somewhat protected from most natural fires by some combination of steeper topography, isolation from the spread of fire, and limited flammability of the vegetation. If fires were more frequent, the vegetation would likely be replaced by more fire-tolerant southern pines, especially *Pinus palustris*.

Classification Comments: There remains some uncertainty how this system and other dry and dry-mesic hardwood systems should be divided. There is a broad gradient in climate and species composition from north to south and west. The boundaries at the north edge of the Mid-Atlantic Coastal Plain ecoregion and at the break between the South Atlantic Coastal Plain and East Gulf Coastal Plain ecoregions are boundaries of convenience to create breaks in this broad gradient. Better boundaries may be possible. Differences from comparable systems in the Piedmont are sometimes fairly subtle, and species that differentiate them in one part of the range may not work in other parts. In particular, some species that are excluded from the Coastal Plain farther south are common components farther north. The boundary with Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242) and with adjacent *Pinus palustris*-dominated systems may be blurred by fire suppression.

Related Concepts:

- Dry Oak-Hickory Forest (Schafale and Weakley 1990) Broader
- Dry-Mesic Oak-Hickory Forest (Schafale and Weakley 1990) Broader. The Schafale and Weakley (1990) types (Dry and Dry-Mesic Oak-Hickory Forest) include both their Coastal Plain and Piedmont manifestations.

DESCRIPTION

Environment: This system occurs in dry-mesic to dry but not xeric sites, generally on upper to midslopes in bluff systems, but occasionally it occurs on broader uplands or on the highest parts of non-flooded river terraces. Soils are generally acidic, though calcareous soils occur occasionally (as in *Carya glabra* - *Tilia americana* var. *caroliniana* - *Acer barbatum* / *Trillium maculatum* Forest (CEGL004747)). Soils are loamy to clayey and well-drained but not excessively drained. Similar sites with coarse sandy soils tend to support other ecological systems, in part due to the influence of more frequent fire. Sites are somewhat protected from most natural fires by steep topography and by limited flammability of the vegetation. Fires that penetrate them are generally low in intensity and have fairly limited ecological effect.

Vegetation: Vegetation consists of forests dominated by combinations of upland oaks, particularly *Quercus alba*, *Quercus falcata*, and *Quercus stellata*. In the northern part of the range, *Quercus rubra* may be a component, while in the southern part, evergreen species such as *Quercus nigra* or *Quercus hemisphaerica* become more prominent. Hickories (*Carya* spp.) are also prominent, including *Carya alba*, *Carya glabra*, and *Carya pallida*. Other woody plants may include *Tilia americana* var. *caroliniana*, *Acer barbatum*, *Aesculus pavia*, *Osmanthus americanus* var. *americanus*, *Ilex glabra*, *Ilex opaca*, *Vaccinium arboreum*, *Vaccinium elliotii*, and *Clethra alnifolia*. Some typical herbs are *Trillium maculatum* and *Chasmanthium sessiliflorum*. There is some variation in composition with aspect and degree of exposure to fire. *Pinus echinata* may be present in some stands, particularly on drier south- and west-facing slopes but is typically not dominant. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past cutting. More mesophytic species such as *Fagus grandifolia* and *Magnolia grandiflora* are absent or are confined to the understory. Analogous systems on the Gulf Coastal Plain have pine as a natural component, and this may be true for some examples of this system as well, where occasional fires may allow them to regenerate. A well-developed shrub layer may be present, with *Vaccinium* spp. and *Gaylussacia* spp. most typical. The herb layer is generally sparse, and species richness tends to be low. In examples where fires have occurred, the understory is open and savanna-like and dominated by grasses and forbs rather than shrubs.

Dynamics: Fire is naturally infrequent in this system, which is the important factor separating it from adjacent *Pinus palustris*-dominated systems. If fire does penetrate, it is likely to be low in intensity and have limited ecological effects. However, there is some evidence that this system has expanded into areas once occupied by longleaf pine as fire has been suppressed. There may have been a shifting boundary between these systems, driven by variation in fire frequency. These forests probably generally exist naturally as old-growth forests, with canopy dynamics dominated by gap-phase regeneration. However, exposure to occasional fires and hurricanes may create more frequent and larger canopy disturbances than analogous systems inland.

MEMBERSHIP

Associations:

- *Carya glabra* - *Tilia americana* var. *caroliniana* - *Acer barbatum* / *Trillium maculatum* Forest (CEGL004747, G2G3)
- *Quercus alba* - *Carya alba* / *Vaccinium elliotii* Forest [Provisional] (CEGL007224, G5?)
- *Quercus alba* - *Carya glabra* - *Carya alba* / *Aesculus pavia* Forest (CEGL007225, G4?)
- *Quercus alba* - *Carya glabra* / Mixed Herbs Coastal Plain Forest (CEGL007226, G4?)
- *Quercus alba* - *Quercus nigra* - *Quercus falcata* / *Ilex opaca* / *Clethra alnifolia* - *Arundinaria gigantea* ssp. *tecta* Forest (CEGL007862, G4?)
- *Quercus falcata* - *Quercus stellata* - *Carya alba* / *Vaccinium* spp. Coastal Plain Forest (CEGL007246, G4?)
- *Quercus hemisphaerica* - *Magnolia grandiflora* - *Carya (glabra, pallida)* / *Vaccinium arboreum* / *Chasmanthium sessiliflorum* Forest (CEGL004788, G3G4)
- *Quercus hemisphaerica* - *Pinus taeda* - (*Quercus nigra*) / *Osmanthus americanus* var. *americanus* / *Ilex glabra* Forest (CEGL007022, G2G3)
- *Quercus nigra* Forest (CEGL004638, GNA)

Alliances:

- *Acer barbatum* - *Fraxinus americana* - (*Juglans nigra*) Forest Alliance (A.214)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus hemisphaerica* - *Carya glabra* Forest Alliance (A.372)
- *Quercus hemisphaerica* Forest Alliance (A.53)
- *Quercus nigra* Forest Alliance (A.247)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, occurring in mosaics with other small-patch systems, or as small isolated patches surrounded by wetlands.

Size: Generally occurs as small to medium patches, of a few to dozens of acres. Mosaics may contain up to several hundred acres in close proximity.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)

Adjacent Ecological System Comments: Most commonly associated with Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242). Naturally grades to adjacent *Pinus palustris*-dominated systems on drier or flatter sites, but virtually no examples remain with this association intact.

DISTRIBUTION

Range: This system ranges from southeastern Virginia (south of the James River) south to southeastern Georgia in the Atlantic Coastal Plain.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

USFS Ecomap Regions: 232C:CC, 232H:CC, 232I:CC, 232J:CC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723244#references

Description Author: R. Evans and M. Schafale, mod. M. Pyne

Version: 11 Dec 2006

Concept Author: R. Evans and M. Schafale

Stakeholders: East, Southeast

ClassifResp: Southeast

1346 ATLANTIC COASTAL PLAIN FALL-LINE SANDHILLS LONGLEAF PINE WOODLAND (CES203.254)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Very Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2346; ESLF 4249; ESP 1346

CONCEPT

Summary: This system occurs in the Fall-line Sandhills region of central North Carolina extending into central Georgia. It is the predominant system in its range, covering most of the natural landscape of the region. It occurs on upland sites ranging from gently rolling, broad ridgetops to steeper sideslopes, as well as locally in mesic swales and terraces. Most soils are well- to excessively drained. The vegetation is naturally dominated by longleaf pine (*Pinus palustris*). Most associations have an understory of scrub oaks (*Quercus laevis*, *Quercus marilandica*, *Quercus incana*, and *Quercus margarettiae*). The herb layer is generally well-developed and dominated by grasses. Wiregrass (*Aristida stricta* in the north, *Aristida beyrichiana* in the south) dominates in most of the range, but other grasses dominate where it is absent. Forbs, including many legumes, are also abundant. Frequent, low-intensity fire is the dominant natural ecological force.

Classification Comments: This system is distinguished from Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281) based on differences in landscape patterns, prevailing associations, and some floristic differences. Dissected topography with much higher relief, predominance of interbedded sands and clays, and interspersed with seepage wetlands all characterize the Fall-line Sandhills, in contrast to the low relief, pure sands or loams, and mosaics containing other wetland types in the rest of the Coastal Plain. Some matrix associations in the Fall-line Sandhills, such as *Pinus palustris* / *Quercus marilandica* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003595) are nearly absent in the rest of the Coastal Plain. The abundance of legumes in most Sandhills region associations and their scarcity in most Outer Coastal Plain associations is striking, and is probably related to the differences in prevailing soil texture. This system does not have a biogeographic break in southern South Carolina, as the Outer Coastal Plain systems do. It includes areas with both *Aristida stricta* and *Aristida beyrichiana*. Gopher tortoises (*Gopherus polyphemus*), used as a break in the Outer Coastal Plain systems because of their keystone species role, are not present in the Fall-line Sandhills. This system is distinguished from Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265) because of the ecological role of saturated wetland conditions in the latter.

Similar Ecological Systems:

- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)

Related Concepts:

- Pine / Scrub Oak Sandhill (Schafale and Weakley 1990) Finer. in major part.

DESCRIPTION

Environment: This system occurs on upland sites in the Fall-line Sandhills region (Ecoregion 65c of EPA (2004); 232Bq of Keys et al. (1995)). It covers the gently rolling, ancient eolian sands and the steeper side slopes in older formations that make up most of the dissected landscape in this region. Shallow swales, drier stream terraces, and rock outcrops also may support this system. Substrates include interbedded sands and clays, deep sands, and occasional loamy sediments. Soils are generally well- to excessively drained and infertile, though local richer, mesic sites occur. Non-wetland conditions and frequent fire unify this system within the Fall-line Sandhills region. Soil texture appears to be the most important driver of differences among associations within the system, with biogeography also important.

Vegetation: Vegetation is a set of associations naturally dominated by longleaf pine (*Pinus palustris*). Scrub oaks (*Quercus laevis*, *Quercus marilandica*, *Quercus incana*, and *Quercus margarettiae*) form an understory in most associations, all but the mesic ones. Low shrubs, most ericaceous, may be abundant. In most of the range, wiregrass (*Aristida stricta* or in the south *Aristida beyrichiana*) is the dominant herb. In central South Carolina both species are absent and various other grass species dominate. Most associations have abundant legumes, as well as composites and other forbs. The abundance of legumes distinguishes this system from Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281), where most associations have few legumes. Many associations have moderate to high species richness, with most of the species in the herb layer. Some mesic associations have among the highest species richness values measured at the 1/10-hectare scale. Associations on deep, coarse sands may have low species richness but have a distinct set of xerophytic herbs and dwarf-shrubs.

Dynamics: Frequent fire is the predominant natural force in this system. Component communities naturally burned every few years, many averaging as often as every 3 years. Fires are naturally low to moderate in intensity. They burn above-ground parts of herbs and shrubs, but have little effect on the fire-tolerant trees. Vegetation recovers very quickly from fires, with live herbaceous biomass often restored in just a few weeks. Many plants have their flowering triggered by burning. Fire is important in creating the structure of the vegetation. In the absence of fire, less fire-tolerant species increase and others invade the system. The scrub oaks and shrubs, kept to

low density and mostly reduced to shrub size, become tall and dense and can suppress tree regeneration. Herb layer density and diversity decline. Only on the most excessively drained coarse sands does the vegetation not undergo substantial structural alteration and reduction in species richness after just a few years without burning.

Canopies are believed to naturally be many-aged, consisting of a fine mosaic of small even-aged groves driven by gap-phase regeneration. Longleaf pine is shade-intolerant and slow to reach reproductive age, but is very long-lived. Most plants in these systems appear to be conservative, living a long time and only rarely sexually reproducing or colonizing new sites. Similar conservatism is shown by some of the vertebrates, such as *Picoides borealis*. Different dynamics occur in insect populations, whose individuals are not resilient to fire. Insect populations must recolonize burned areas from nearby unburned patches.

MEMBERSHIP

Associations:

- *Crataegus flava* - *Quercus (incana, laevis)* Woodland (CEGL007883, GNA)
- *Pinus palustris* - (*Pinus taeda*) / *Schizachyrium scoparium* - *Rhynchosia reniformis* Woodland (CEGL007738, G1)
- *Pinus palustris* - *Pinus (echinata, taeda)* - *Quercus (incana, margarettiae, falcata, laevis)* Woodland (CEGL007511, G4)
- *Pinus palustris* / *Aristida stricta* - *Sorghastrum nutans* - *Anthraenantia villosa* Woodland (CEGL003570, G2G3)
- *Pinus palustris* / *Quercus incana* - *Quercus marilandica* / *Aristida beyrichiana* - *Nolina georgiana* Woodland (CEGL007842, G2G3)
- *Pinus palustris* / *Quercus incana* / *Aristida stricta* - *Sorghastrum nutans* - *Anthraenantia villosa* Woodland (CEGL003578, G2G3)
- *Pinus palustris* / *Quercus laevis* - (*Quercus incana*) / *Vaccinium tenellum* / *Schizachyrium scoparium* - *Eriogonum tomentosum* Woodland (CEGL003593, G2)
- *Pinus palustris* / *Quercus laevis* - *Quercus (incana, margarettiae)* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003591, G3?)
- *Pinus palustris* / *Quercus laevis* - *Quercus incana* / *Aristida beyrichiana* - *Baptisia perfoliata* Woodland (CEGL007844, G2G3)
- *Pinus palustris* / *Quercus laevis* / *Aristida purpurascens* - *Stipulicida setacea* - (*Rhynchospora megalocarpa*, *Selaginella acanthonota*) Woodland (CEGL003590, G2)
- *Pinus palustris* / *Quercus laevis* / *Aristida stricta* / *Cladonia* spp. Woodland (CEGL003584, G2G3)
- *Pinus palustris* / *Quercus laevis* / *Gaylussacia dumosa* / *Aristida beyrichiana* - *Helianthus atrorubens* Woodland (CEGL004488, G2G3)
- *Pinus palustris* / *Quercus laevis* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003586, G3?)
- *Pinus palustris* / *Quercus laevis* / *Leiophyllum buxifolium* - *Cyrilla racemiflora* - *Clethra alnifolia* Woodland (CEGL007767, G1)
- *Pinus palustris* / *Quercus marilandica* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003595, G2G3)
- *Pinus palustris* / *Quercus marilandica* / *Vaccinium crassifolium* / *Aristida stricta* Woodland (CEGL003599, G2?)
- *Pinus palustris* / *Vaccinium elliottii* - *Clethra alnifolia* / *Aristida stricta* - *Panicum virgatum* Woodland (CEGL003573, G1)
- *Pinus palustris* Planted Forest (CEGL007176, GNA)
- *Pinus taeda* / *Schizachyrium scoparium* Woodland (CEGL003620, GNA)
- *Quercus (margarettiae, stellata)* - *Quercus marilandica* / *Crataegus flava* / *Schizachyrium scoparium* Woodland (CEGL008479, GNA)
- *Quercus laevis* / (*Andropogon virginicus*, *Aristida* spp., *Schizachyrium scoparium*) Woodland (CEGL004689, GNA)

Alliances:

- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Pinus palustris* Planted Forest Alliance (A.96)
- *Pinus palustris* Woodland Alliance (A.520)
- *Pinus taeda* Woodland Alliance (A.526)
- *Quercus laevis* Woodland Alliance (A.617)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)

SPATIAL CHARACTERISTICS

Spatial Summary: This system is naturally a matrix system, covering most of the landscape in its range. Most occurrences now are artificially bounded remnants or naturally small islands. Extensive occurrences usually have embedded wetland systems, especially Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252).

Size: Natural patches once would have been contiguous over hundreds of square miles, covering most of the landscape in the region and broken only by river systems. Most occurrences are now artificially bounded remnants of small to fairly large size. A few landscape matrix areas of thousands of acres remain.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Sandhill Seep (CES203.253)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)

Adjacent Ecological System Comments: Streamhead pocosins are the most frequently associated system, with Sandhill seeps and Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249) also frequent associates.

DISTRIBUTION

Range: This system ranges from central North Carolina to central Georgia, in the Fall-line Sandhills region (Ecoregion 65c of EPA (2004); 232Bq of Keys et al. (1995)).

Divisions: 203:C
Nations: US
Subnations: GA, NC, SC
Map Zones: 55:C, 58:C
TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, EPA 2004, Keys et al. 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723231#references

Description Author: M. Schafale and R. Evans

Version: 17 Jan 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1343 ATLANTIC COASTAL PLAIN MESIC HARDWOOD FOREST (CES203.242)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2343; ESLF 4150; ESP 1343

CONCEPT

Summary: This upland system of the Atlantic Coastal Plain ranges from southern New Jersey south to Georgia in a variety of moist but non-wetland sites that are naturally sheltered from frequent fire. Such sites include lower slopes and bluffs along streams and rivers in dissected terrain, mesic flats between drier pine-dominated uplands and floodplains, and local topographic high areas within bottomland terraces or nonriverine wet flats. Soil textures are variable in both texture and pH. The vegetation consists of forests dominated by combinations of trees that include a significant component of mesophytic deciduous hardwood species, such as *Fagus grandifolia* or *Acer barbatum*. Its southern limit is generally exclusive of the natural range of *Pinus glabra* as mapped by Kossuth and Michael (1990) and *Magnolia grandiflora* as mapped by Outcalt (1990). Upland and bottomland oaks at the mid range of moisture tolerance are usually also present, particularly *Quercus alba*, but sometimes also *Quercus pagoda*, *Quercus falcata*, *Quercus michauxii*, *Quercus shumardii*, or *Quercus nigra*. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past cutting. Analogous systems on the Gulf Coastal Plain have pine as a natural component, and this may be true for some examples of this system. Understories are usually well-developed. Shrub and herb layers may be sparse or moderately dense. Within its range, *Sabal minor* may be a prominent shrub. Species richness may be fairly high in basic sites but is fairly low otherwise.

Classification Comments: There remains some uncertainty how this system and other mesic hardwood systems should be divided. There is a broad gradient in climate and species composition from north to south and west. The boundaries at the northern edge of its range (the Chesapeake Bay Lowlands TNC ecoregion) and at the break between the South Atlantic Coastal Plain and East Gulf Coastal Plain ecoregions are boundaries of convenience to create breaks in this broad gradient. At the southern end, the boundary has been better determined (April 2006) to exclude areas within the combined ranges of *Pinus glabra* and *Magnolia grandiflora*, making this system deciduous rather than mixed evergreen-deciduous. Differences from mesic forests of the Piedmont are sometimes fairly subtle, and species that differentiate them in one part of the range many not work in other parts. In particular, some species that are excluded from the Coastal Plain farther south are common components farther north. Besides the variation across the range of this system, there are two sets of distinctions within it that may be worthy of consideration for defining separate systems. Acidic and basic substrates have substantial floristic differences. Variants on upland slopes, nonriverine swamp islands, and high ridges in bottomlands could be recognized as separate systems, or the latter two could be treated as part of the systems that surround them. However, the difference between ecological processes in uplands and wetlands separates those surrounded by wetland systems from the surrounding systems. This is especially true in the case of floodplains, which have flood-carried nutrient input as well as wetness as a difference. Floristic differences may exist between these variants, but they are subtle and do not appear to be definitive.

Similar Ecological Systems:

- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)
- Northern Atlantic Coastal Plain Hardwood Forest (CES203.475)
- Southern Coastal Plain Mesic Slope Forest (CES203.476)
- Southern Piedmont Mesic Forest (CES202.342)

DESCRIPTION

Environment: This system occurs in a variety of moist non-wetland sites that are naturally sheltered from frequent fire. Most common are lower slope and bluff examples along streams and rivers in dissected terrain, but some examples occur on mesic flats between drier pine-dominated uplands and floodplains or on local high areas within bottomland terraces or nonriverine wet flats. Soils cover the full range of mineral soil textures, except the coarsest sands. Soils are not saturated for any significant time during the growing season and seldom, if ever, are extremely dry. Soils developed from calcareous materials or rich alluvium may be basic; others are strongly acidic. Sites are protected from most natural fires by steep topography or by surrounding extensive areas of non-flammable vegetation.

Vegetation: Common trees include *Betula nigra*, *Platanus occidentalis*, and *Acer negundo*. Where somewhat more stable, linear forests develop; typical trees include *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Acer rubrum*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Quercus michauxii*, and *Quercus pagoda*. Some common shrubs, occurring as forest/woodland understory or as non-forested shrublands, include *Alnus serrulata*, *Cephalanthus occidentalis*, *Cornus amomum*, *Lindera benzoin*, *Salix caroliniana* and other *Salix* spp., *Toxicodendron radicans*, and, over parts of the range, *Fothergilla major*, *Hypericum densiflorum*, *Itea virginica*, and *Rhododendron arborescens*. More southern examples may contain *Hydrangea quercifolia*, *Hypericum densiflorum*, and *Morella cerifera* (= *Myrica cerifera* var. *cerifera*); *Hamamelis vernalis* is characteristic in the Ozark/Ouachita region. Open, flood-scoured

rivershore prairies feature *Andropogon gerardii*, *Sorghastrum nutans*, *Schizachyrium scoparium*, *Chasmanthium latifolium*, *Tripsacum dactyloides*, and/or *Panicum virgatum*. *Carex torta* is typical of wetter areas near the channel. Forbs are diverse and variable from occurrence to occurrence. Some characteristic forbs are *Baptisia australis*, *Conoclinium coelestinum* (= *Eupatorium coelestinum*), *Coreopsis pubescens*, *Coreopsis tripteris*, *Elephantopus carolinianus*, *Helenium autumnale*, *Hydrocotyle* sp., *Ludwigia leptocarpa*, *Lycopus* spp., *Orontium aquaticum*, *Osmunda regalis* var. *spectabilis*, *Oxypolis rigidior*, *Phlox carolina*, *Pityopsis graminifolia* var. *latifolia*, *Rudbeckia laciniata*, and *Vernonia gigantea*. Distinctive shoals with *Hymenocallis coronaria* and/or *Justicia americana* may be present as well.

Dynamics: Fire is naturally infrequent to absent in this system. If fire does penetrate, it is likely to be low in intensity but may have significant ecological effects. These forests probably generally exist naturally as old-growth forests, with canopy dynamics dominated by gap-phase regeneration. However, exposure to occasional fires and hurricanes may create more frequent and larger canopy disturbances than analogous systems inland.

MEMBERSHIP

Associations:

- *Celtis laevigata* - *Tilia americana* var. *caroliniana* / *Aesculus pavia* Forest (CEGL007282, G1G2)
- *Fagus grandifolia* - *Acer barbatum* - *Quercus muehlenbergii* / *Sanguinaria canadensis* Forest (CEGL007181, G2?)
- *Fagus grandifolia* - *Liriodendron tulipifera* - *Carya cordiformis* / *Lindera benzoin* / *Podophyllum peltatum* Forest (CEGL006055, G4?)
- *Fagus grandifolia* - *Quercus* (*alba*, *rubra*) - *Liriodendron tulipifera* / (*Ilex opaca* var. *opaca*) / *Polystichum acrostichoides* Forest (CEGL006075, G5)
- *Fagus grandifolia* - *Quercus alba* - (*Acer barbatum*) / Mixed Herbs Forest (CEGL007206, G4)
- *Fagus grandifolia* - *Quercus alba* - *Quercus laurifolia* / *Galax urceolata* Forest (CEGL007863, G4?)
- *Fagus grandifolia* - *Quercus nigra* Forest (CEGL007211, G3)
- *Fagus grandifolia* - *Quercus rubra* / *Cornus florida* / *Polystichum acrostichoides* - *Hexastylis virginica* Forest (CEGL008465, G3G4)
- *Liquidambar styraciflua* - *Acer rubrum* - (*Nyssa biflora*) / *Woodwardia virginica* Forest (CEGL007848, G2G3)
- *Quercus alba* - *Carya glabra* - *Carya alba* / *Aesculus pavia* Forest (CEGL007225, G4?)
- *Quercus alba* - *Quercus* (*michauxii*, *nigra*) / *Ilex opaca* / *Chasmanthium laxum* Forest (CEGL007845, G3G4)
- *Quercus alba* - *Quercus velutina* - *Carya alba* / *Cornus florida* / *Chimaphila maculata* Forest (CEGL007278, G3G4)
- *Quercus falcata* - *Quercus phellos* / *Ilex opaca* Forest (CEGL006390, GNR)
- *Quercus falcata* - *Tilia americana* var. *caroliniana* - *Magnolia grandiflora* / *Ilex vomitoria* Forest (CEGL007470, G2G3)
- *Quercus muehlenbergii* / *Cercis canadensis* / *Dichanthelium boscii* - *Bromus pubescens* - *Erigeron pulchellus* var. *pulchellus* - *Aquilegia canadensis* Forest (CEGL007748, G1)
- *Quercus pagoda* - *Carya cordiformis* / *Chasmanthium sessiliflorum* - *Verbesina virginica* Forest (CEGL004092, G2?)

Alliances:

- *Carya glabra* - *Tilia americana* var. *caroliniana* - *Celtis laevigata* Forest Alliance (A.223)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system, occurring in mosaics with other small-patch systems, or as small isolated patches surrounded by wetlands.

Size: Generally occurs as small to large patches, of a few to dozens of acres. Mosaics may contain up to several hundred acres in close proximity.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (CES203.241)
- Central Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)

Adjacent Ecological System Comments: Most commonly associated with Atlantic Coastal Plain Dry and Dry-Mesic Oak Forest (CES203.241) and various floodplain systems. Less commonly associated with Central Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304). Floodplain systems often occur below this system.

DISTRIBUTION

Range: This system ranges from Delaware south to central Georgia in the Atlantic Coastal Plain.

Divisions: 203:C

Nations: US

Subnations: DE, GA, MD, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

USFS Ecomap Regions: 232B:CC, 232C:CC, 232H:CC, 232I:CC

TNC Ecoregions: 56:C, 57:C, 58:C, 62:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723243#references

Description Author: R. Evans, mod. M. Pyne

Version: 31 May 2007

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1347 ATLANTIC COASTAL PLAIN UPLAND LONGLEAF PINE WOODLAND (CES203.281)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Very Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2347; ESLF 4250; ESP 1347

CONCEPT

Summary: This system of upland *Pinus palustris*-dominated vegetation ranges from southern Virginia (beginning approximately at the James River) to northeastern Florida (excluding longleaf pine of the Fall-Line Sandhills, accommodated by another ecological system), where it was once perhaps the most extensive system in the Outer Coastal Plain within its range. Examples and associations share the common feature of upland (non-wetland) moisture regimes and natural exposure to frequent fire. They occur on a variety of well- to excessively drained soils, and on the higher parts of upland-wetland mosaics. The vegetation is naturally dominated by *Pinus palustris*. Most associations have an understory of scrub oaks. The herb layer is generally well-developed and dominated by grasses. *Aristida stricta* primarily dominates in the northern part of its range, and *Aristida beyrichiana* in the southern part. Frequent, low-intensity fire is the dominant natural ecological force.

Classification Comments: This system is distinguished from Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265) because of the ecological role of saturated wetland conditions in the latter. The two systems have much in common, including frequent fire and the same primary dominant tree and herb species. They often occur in the same landscapes. However, floristic differences are well marked, and no associations are shared. This system is distinguished from the Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254) based on the differences in landscape patterns and prevailing associations in the two regions. Dissected topography with much higher relief, predominance of interbedded sands and clays, and interspersed with seepage wetlands all characterize the Fall-line Sandhills, in contrast to the low relief, pure sands or loams, and mosaics containing other wetland types in the rest of the Coastal Plain. Some matrix associations in the Fall-line Sandhills, such as *Pinus palustris* / *Quercus marilandica* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003595) are nearly absent in the rest of the Coastal Plain, and there are systematic floristic differences. If this were to be split into a northern and southern component, the distinction would be justified based on differences in climate, flora, and some differences in ecological dynamics. Gopher tortoises (*Gopherus polyphemus*) are an important keystone species in the southern portion of the range. The dominant grass also changes at this approximate point, with *Aristida beyrichiana* dominating herb layers to the south.

Similar Ecological Systems:

- Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)

Related Concepts:

- Coastal Fringe Sandhill (Schafale and Weakley 1990) Finer
- Mesic Pine Flatwoods (Schafale and Weakley 1990) Finer
- Pine / Scrub Oak Sandhill (Schafale and Weakley 1990) Finer. in minor part.
- Sandhill (FNAI 1990) Intersecting

DESCRIPTION

Environment: This system occurs on upland sites of the Middle to Outer Atlantic Coastal Plain, on landforms that include loamy to sandy flats, relict beach system deposits, eolian sand deposits, Carolina bay rims, and occasional low rolling hills. Soils range from mesic to xeric and from sandy to loamy or occasionally clayey. Most natural remnants are on coarse sands, but most examples probably once occurred on loamy soils. Soils are largely acidic and infertile, and the coarsest sands are excessively drained and sterile. The unifying feature of this system is non-wetland sites that naturally supported frequent fire. As such, it once covered much of the landscape of the Coastal Plain. Variations in soil texture and drainage appear to be a primary driver of differences between associations within the system, with biogeography also important.

Vegetation: Vegetation is a set of associations that are most naturally woodlands or savannas dominated by *Pinus palustris* and having a well-developed grassy herb layer. A few associations have sparse herb layers due to excessively drained soils, and a few are dominated by scrub oaks. Other pine species may sometimes be present. Scrub oaks (*Quercus laevis*, *Quercus incana*, *Quercus margarettae*, *Quercus hemisphaerica*, and others) form an understory in most associations, all but the mesic ones. Low shrubs, most ericaceous, are often an important component. In most of the range, *Aristida stricta* is the dominant herb. In the southern and northern parts of the range, it is absent, and various other grass species dominate. Forbs, especially composites, are usually also an important herb component, and lichens are abundant in some associations. Many associations have moderate species richness, with most of the species in the herb layer. Some mesic associations have very high species richness, among the highest values ever measured at the 1/10-hectare scale. Associations on deep, coarse sands may have low species richness but have a distinct set of xerophytic herbs and dwarf-shrubs.

Dynamics: Frequent fire is the predominant natural force in this system. Component communities naturally burned every few years, many averaging as often as every 3 years. Fires are naturally low to moderate in intensity. They burn above-ground parts of herbs and shrubs but have little effect on the fire-tolerant trees. Vegetation recovers very quickly from fire, with live herbaceous biomass often restored in just a few weeks. Many plants have their flowering triggered by burning. In the absence of fire, less fire-tolerant species increase and others invade the system. The scrub oaks and shrubs, kept to low density and mostly reduced to shrub size by fire, become tall and dense and can suppress tree regeneration. Herb layer density and diversity decline. Only on the most excessively drained coarse sands does the vegetation not undergo substantial structural alteration and reduction in species richness after just a few years without burning.

Canopies are believed to naturally be many-aged, consisting of a fine mosaic of small even-aged groves driven by gap-phase regeneration. Longleaf pine is shade-intolerant and slow to reach reproductive age but is very long-lived. Most plants in these systems appear to be conservative, living a long time and only rarely sexually reproducing or colonizing new sites. Similar conservatism is shown by some of the vertebrates, such as *Picoides borealis* (red-cockaded woodpecker). Different dynamics occur in insect populations, whose individuals are not resilient to fire. Insect populations must recolonize burned areas from nearby unburned patches.

MEMBERSHIP

Associations:

- *Pinus palustris* - (*Pinus taeda*) / *Schizachyrium scoparium* - *Rhynchosia reniformis* Woodland (CEGL007738, G1)
- *Pinus palustris* - *Pinus* (*echinata*, *taeda*) - *Quercus* (*incana*, *margarettae*, *falcata*, *laevis*) Woodland (CEGL007511, G4)
- *Pinus palustris* - *Pinus taeda* - *Pinus serotina* / *Quercus marilandica* / (*Quercus pumila*) / *Aristida stricta* Woodland (CEGL003664, G1)
- *Pinus palustris* - *Pinus taeda* / *Quercus geminata* - *Quercus hemisphaerica* - *Osmanthus americanus* var. *americanus* / *Aristida stricta* Woodland (CEGL003577, G2)
- *Pinus palustris* / *Amorpha herbacea* var. *herbacea* / *Aristida stricta* - *Sorghastrum nutans* Woodland (CEGL003569, G2G3)
- *Pinus palustris* / *Aristida stricta* - *Sorghastrum nutans* - *Anthaenantia villosa* Woodland (CEGL003570, G2G3)
- *Pinus palustris* / *Quercus incana* - *Quercus marilandica* / *Aristida beyrichiana* - *Nolina georgiana* Woodland (CEGL007842, G2G3)
- *Pinus palustris* / *Quercus incana* - *Quercus stellata* / *Aristida beyrichiana* - *Sporobolus junceus* - *Nolina georgiana* Woodland (CEGL004487, G2G3)
- *Pinus palustris* / *Quercus incana* / *Aristida stricta* - *Sorghastrum nutans* - *Anthaenantia villosa* Woodland (CEGL003578, G2G3)
- *Pinus palustris* / *Quercus laevis* - (*Quercus incana*) / *Vaccinium tenellum* / *Schizachyrium scoparium* - *Eriogonum tomentosum* Woodland (CEGL003593, G2)
- *Pinus palustris* / *Quercus laevis* - *Quercus* (*incana*, *margarettae*) / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003591, G3?)
- *Pinus palustris* / *Quercus laevis* - *Quercus geminata* / *Vaccinium tenellum* / *Aristida stricta* Woodland (CEGL003589, G2?)
- *Pinus palustris* / *Quercus laevis* - *Quercus incana* - *Quercus margarettae* / *Licania michauxii* / *Aristida beyrichiana* Woodland (CEGL004492, G3)
- *Pinus palustris* / *Quercus laevis* - *Quercus incana* / *Aristida beyrichiana* - *Baptisia perfoliata* Woodland (CEGL007844, G2G3)
- *Pinus palustris* / *Quercus laevis* - *Quercus incana* / *Gaylussacia dumosa* - *Gaylussacia* (*baccata*, *frondosa*) Woodland (CEGL003592, G1)
- *Pinus palustris* / *Quercus laevis* / *Aristida purpurascens* - *Stipulicida setacea* - (*Rhynchospora megalocarpa*, *Selaginella acanthonota*) Woodland (CEGL003590, G2)
- *Pinus palustris* / *Quercus laevis* / *Aristida stricta* / *Cladonia* spp. Woodland (CEGL003584, G2G3)
- *Pinus palustris* / *Quercus laevis* / *Gaylussacia dumosa* / *Aristida beyrichiana* - *Helianthus atrorubens* Woodland (CEGL004488, G2G3)
- *Pinus palustris* / *Quercus laevis* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003586, G3?)
- *Pinus palustris* / *Quercus laevis* / *Serenoa repens* - *Vaccinium stamineum* / *Aristida beyrichiana* Woodland (CEGL004490, G2G3)
- *Pinus palustris* / *Quercus marilandica* / *Gaylussacia dumosa* / *Aristida stricta* Woodland (CEGL003595, G2G3)
- *Pinus palustris* Planted Forest (CEGL007176, GNA)
- *Quercus laevis* / (*Andropogon virginicus*, *Aristida* spp., *Schizachyrium scoparium*) Woodland (CEGL004689, GNA)

Alliances:

- *Pinus palustris* - *Pinus* (*elliottii*, *serotina*) Saturated Woodland Alliance (A.578)
- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Pinus palustris* Planted Forest Alliance (A.96)
- *Pinus palustris* Woodland Alliance (A.520)
- *Quercus laevis* Woodland Alliance (A.617)

SPATIAL CHARACTERISTICS

Spatial Summary: This system is naturally a matrix system, probably once the most extensive system in its range. Most occurrences now are artificially bounded remnants or naturally small islands. Occurrences often form mosaics with Atlantic Coastal Plain Northern Wet Longleaf Pine Savanna and Flatwoods (CES203.265) or Atlantic Coastal Plain Peatland Pocosin (CES203.267) and may have small-patch systems embedded in them.

Size: Once the most abundant system over large parts of the Coastal Plain, forming the matrix in which most other systems occurred, most occurrences are now naturally small islands or are artificially bounded remnants of small to fairly large size. A few landscape

matrix areas of several thousand acres remain.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)

Adjacent Ecological System Comments: Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265) or Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267) are the most commonly associated systems, often forming mosaics. Southern Atlantic Coastal Plain Depression Pondshore (CES203.262) and small floodplain systems may be embedded in matrices of this system.

DISTRIBUTION

Range: This system is found in the Atlantic Coastal Plain (exclusive of the Fall-line Sandhills) from southern Virginia to northeastern Florida.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, Schafale pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723206#references

Description Author: R.E. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1320 CENTRAL AND SOUTHERN APPALACHIAN MONTANE OAK FOREST (CES202.596)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Unglaciated; Broad-Leaved Deciduous Tree; *Quercus* - *Carya*

Non-Diagnostic Classifiers: Temperate; Oligotrophic Soil; Acidic Soil; Shallow Soil; Mineral: W/ A-Horizon <10 cm; Ustic; Consolidated; W-Landscape/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2320; ESLF 4126; ESP 1320

CONCEPT

Summary: This system is found in the central and southern Appalachian Mountains. These high-elevation deciduous forests occur on exposed sites mostly between 915 and 1372 m (3000-4500 feet) elevation. The weathered soils are thin, nutrient-poor, low in organic matter, and acidic. The forests are dominated by *Quercus* spp. (most commonly *Quercus rubra* and *Quercus alba*), with the individuals often stunted or wind-flagged. *Castanea dentata* sprouts are also common, but the importance of chestnut in these forests has been dramatically altered by chestnut blight. *Ilex montana* and *Rhododendron prinophyllum* are characteristic shrubs.

Classification Comments: Above 1372 m (4500 feet) elevation and below spruce-fir communities, this system tends to be replaced by the Southern Appalachian Northern Hardwood Forest (CES202.029).

Similar Ecological Systems:

- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Northern Hardwood Forest (CES202.029)--generally occurs above 1372 m (4500 feet) elevation.
- Southern Appalachian Oak Forest (CES202.886)--occurs at lower elevations.

Related Concepts:

- Cumberlands Highlands Forest (Evans 1991) Finer

DESCRIPTION

Environment: This system includes high ridgelines and exposed upper slopes at elevations above 915 m (3000 feet). It generally occurs as a transition between Southern Appalachian Oak Forest (CES202.886) and the more mesic Southern Appalachian Northern Hardwood Forest (CES202.029) that occurs on less-exposed ridgetops and protected upper slopes. At high elevations (e.g., above 1372 m [4500 feet]), this system is generally less common than Southern Appalachian Northern Hardwood Forest (CES202.029) since the habitat on most slopes at this elevation tends to favor those species adapted to a more mesic environment.

Vegetation: This system is dominated by *Quercus rubra* and, more rarely, *Quercus alba*. Often the trees are stunted or at least not as tall as they would be in other systems farther downslope. Species richness is low to moderate. Tree associates include *Prunus serotina*, *Betula lenta*, and *Betula alleghaniensis*. Typical small trees and shrubs include *Ilex montana*, *Hamamelis virginiana*, *Acer pensylvanicum*, *Menziesia pilosa*, *Rhododendron prinophyllum*, *Vaccinium pallidum*, *Corylus cornuta* var. *cornuta*, and sprouts of *Castanea dentata* <javascript:()%20blank()>. The understory is usually dominated by ericaceous shrubs, but some communities are dominated by graminoid species or ferns. *Dennstaedtia punctilobula*, *Carex pensylvanica*, and *Deschampsia flexuosa* are common. Only rarely are the communities dominated by other herbs.

Dynamics: The communities of this system inhabit some of the most inhospitable parts of the Appalachians. Their occurrence on exposed high ridges means they are subject to frequent ice and wind storms in the summer and high winds throughout the year. This probably explains the forests' stunted appearance. In addition, lightning-caused fires may create ground fires that change the understory composition and inhibit some ericaceous shrub species in some areas. Presettlement forests are likely to have experienced lightning-caused fires every 40-60 years (Fleming et al. 2005). In some locations, fire exclusion and competing understory vegetation are a factor in poor oak regeneration, with replacement by more mesophytic species such as *Acer saccharum* (Fleming et al. 2005). Despite the high elevation, chestnut had been a fairly substantial component of this system and can still be seen as rotting stumps in the forest. In the northern Blue Ridge, gypsy moth infestations have caused widespread tree mortality and pose a threat to these systems (Fleming et al. 2005).

MEMBERSHIP

Associations:

- *Betula alleghaniensis* - *Quercus rubra* / *Acer (pensylvanicum, spicatum)* / *Dryopteris intermedia* - *Oclemena acuminata* Forest (CEGL008502, G3G4)
- *Betula alleghaniensis* / *Sorbus americana* - *Acer spicatum* / *Polypodium appalachianum* Forest (CEGL008504, G2)
- *Caltha palustris* - *Impatiens capensis* - *Viola cucullata* Herbaceous Vegetation [Provisional] (CEGL006258, GNR)
- *Quercus alba* - *Quercus (rubra, prinus)* / *Rhododendron calendulaceum* - *Kalmia latifolia* - (*Gaylussacia ursina*) Forest (CEGL007230, G5)
- *Quercus alba* / *Kalmia latifolia* Forest (CEGL007295, G2Q)

- *Quercus rubra* - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134, G3G5)
- *Quercus rubra* - *Carya ovalis* / *Collinsonia canadensis* - *Impatiens pallida* Forest (CEGL008519, G3)
- *Quercus rubra* - *Carya ovata* / *Dennstaedtia punctilobula* - *Eupatorium purpureum* - (*Stachys nuttallii*) Forest (CEGL008520, G2)
- *Quercus rubra* - *Quercus alba* - *Fraxinus americana* - *Carya (ovata, ovalis)* / *Actaea racemosa* Forest (CEGL008518, G3)
- *Quercus rubra* - *Quercus alba* / *Ilex montana* / *Dennstaedtia punctilobula* - *Carex pensylvanica* - *Deschampsia flexuosa* Forest (CEGL008506, G3?)
- *Quercus rubra* - *Quercus prinus* / *Deschampsia flexuosa* - *Danthonia compressa* - *Calamagrostis porteri* Woodland [Provisional] (CEGL004714, GNR)
- *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299, G4)
- *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300, G4)
- *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (CEGL007298, G2)
- *Quercus rubra* / *Ilex montana* - *Menziesia pilosa* / *Dennstaedtia punctilobula* Forest (CEGL008505, G3?)
- *Tilia americana* - *Fraxinus americana* / *Acer pensylvanicum* - *Ostrya virginiana* / *Parthenocissus quinquefolia* - *Impatiens pallida* Woodland (CEGL008528, G3)
- *Tsuga canadensis* - *Betula alleghaniensis* / *Veratrum viride* - *Carex scabrata* - *Oclemena acuminata* Forest (CEGL008533, G2)

Alliances:

- *Acer saccharum* - *Betula alleghaniensis* - (*Fagus grandifolia*) Forest Alliance (A.216)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* Montane Forest Alliance (A.271)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)
- *Quercus rubra* Montane Forest Alliance (A.272)
- *Symplocarpus foetidus* - *Caltha palustris* Saturated Herbaceous Alliance (A.1694)
- *Tilia americana* - *Fraxinus americana* - (*Acer saccharum*) Woodland Alliance (A.628)
- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)

SPATIAL CHARACTERISTICS

Spatial Summary: Large patch that is often surrounded on three sides by Southern Appalachian Northern Hardwood Forest (CES202.029) and on one side by Southern Appalachian Oak Forest (CES202.886).

Size: Usually smaller than 10 acres but can be larger if the slope is broadly convex on the upper exposed slopes.

Adjacent Ecological Systems:

- Southern Appalachian Northern Hardwood Forest (CES202.029)
- Southern Appalachian Oak Forest (CES202.886)

Adjacent Ecological System Comments: This system often grades into Southern Appalachian Northern Hardwood Forest (CES202.029) as one proceeds upslope or around slope to less exposed areas. Below 915-1220 m (3000-4000 feet) this system can grade into Southern Appalachian Oak Forest (CES202.886).

DISTRIBUTION

Range: This system is found at higher elevations of the central and southern Appalachian Mountains, Virginia and West Virginia to Georgia. In Kentucky, this system is restricted to the Cumberland Mountains in the extreme southeastern corner of that state. In West Virginia, this is found in the Ridge and Valley.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, SC, TN, VA, WV

Map Zones: 53:P, 57:C, 61:C

USFS Ecomap Regions: M221A:CC, M221B:CP, M221C:CC, M221D:CC

TNC Ecoregions: 50:C, 51:C, 59:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2005, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723012#references

Description Author: R. White, M. Pyne, R. Evans, M. Schafale, S.C. Gawler

Version: 23 Jul 2007

Concept Author: R. White, M. Pyne, R. Evans, M. Schafale, S.C. Gawler

Stakeholders: East, Southeast

ClassifResp: Southeast

1350 CENTRAL AND SOUTHERN APPALACHIAN SPRUCE-FIR FOREST (CES202.028)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Forest and Woodland (Treed); Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2350; ESLF 4253; ESP 1350

CONCEPT

Summary: This system consists of forests in the highest elevation zone of the Blue Ridge and parts of the Central Appalachians, generally dominated by *Picea rubens*, *Abies fraseri*, or by a mixture of spruce and fir. *Abies fraseri* is the constituent fir from Mount Rogers in Virginia southward. Examples occur above 1676 m (5500 feet) in the Southern Blue Ridge, but as low as 975 m (3200 feet) at the northern range in West Virginia, and may range up to the highest peaks. Elevation and orographic effects make the climate cool and wet, with heavy moisture input from fog as well as high rainfall. Strong winds, extreme cold, rime ice, and other extreme weather are periodically important.

Classification Comments: The border of this system with adjacent systems is often gradational. The non-forested systems that occur in the same elevational zone may have transition zones of open woody vegetation, though some have sharp borders. The transition to Southern Appalachian Northern Hardwood Forest (CES202.029) or other systems that adjoin at lower elevations is marked by a gradual shift in canopy dominance from conifers to hardwoods. In relatively undisturbed stands, the canopy composition and structure are the best way to determine the boundary of this system.

This system is similar to the spruce-fir systems of the northern Appalachians and the boreal forests but differs in having less frequent natural fire, having southern seasonal dynamics (shorter winters, less extreme cold temperatures, lack of long summer days), lacking a history of glaciation, and in a flora and fauna that has southern Appalachian endemics and lacks some characteristic northern species. High-elevation spruce-fir in West Virginia is placed in this system because its location well below the glacial boundary and presence of species of more southern affinity (e.g., *Rhododendron maximum* and *Vaccinium erythrocarpum*) differentiate it from the northern Appalachian system.

Similar Ecological Systems:

- Acadian-Appalachian Montane Spruce-Fir Forest (CES201.566)--occurs on the higher elevations of the northern Appalachians, mostly from New York northward but with a few disjunct patches in Pennsylvania.

DESCRIPTION

Environment: This system occurs at elevations typically above 1300 m (4300 feet), up to the highest peaks. It occurs on most of the landforms that are present in this elevational range; most sites are strongly exposed and convex in shape. Elevation and orographic effects make the climate cool and wet, with heavy moisture input from fog as well as high rainfall. Strong winds, extreme cold, rime ice, and other extreme weather are periodically important. Concentration of air pollutants has been implicated as an important anthropogenic stress in recent years. Soils are generally very rocky, with the matrix ranging from well-weathered parent material to organic deposits over boulders. Soils may be saturated for long periods from a combination of precipitation and seepage. Any kind of bedrock may be present, but most sites have erosion-resistant felsic igneous or metamorphic rocks.

Vegetation: Vegetation consists primarily of forests dominated by *Picea rubens*, *Abies fraseri*, or occasionally by *Sorbus americana*. *Betula alleghaniensis*, *Tsuga canadensis*, and *Quercus rubra* are the only other locally common canopy species. *Acer rubrum*, *Betula lenta*, *Magnolia acuminata*, and *Magnolia fraseri* may occur. Lower strata are most typically dominated by mosses, ferns or forbs, but a few associations have dense shrub layers of *Rhododendron catawbiense*, *Rhododendron maximum*, or *Vaccinium erythrocarpum*.

Dynamics: This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration on a fine scale. Despite the extreme climate, *Picea rubens* is long-lived (300-400 years). Both *Picea* and *Abies* seedlings are shade-tolerant, and advanced regeneration is important in stand dynamics. Natural disturbances include lightning fire, debris avalanches, wind events, and ice storms (White and Pickett 1985, Nicholas and Zedaker 1989). Occasional extreme wind events disturb larger patches on the most exposed slopes. There are hints of fir wave activity in the uncommon forests strongly dominated by *Abies fraseri*, but this is not well-developed. Fire is a very rare event under natural conditions, due to the wetness and limited flammability of the undergrowth, and return intervals have been estimated between 500-1000 years. If fires occur, they are likely to be catastrophic, because few of the species are at all fire-tolerant. Anthropogenic disturbances and stresses, beyond the effects of logging, have had major effects on dynamics in these systems in recent decades. An introduced insect, the balsam woolly adelgid (*Adelges piceae*), has killed almost all of the mature *Abies fraseri*. Saplings are not susceptible, resulting in many dense stands of young trees. It is unclear if these stands will establish seedlings before they too are killed. Stress caused by concentrated air pollutants on the mountain tops has been suggested as a cause of observed growth declines in *Picea rubens*. Earlier, unnatural fires fueled by logging slash turned large expanses of this system into grass-shrub-hardwood scrub (e.g., Dolly Sods) that has not recovered to conifer dominance after 90 years but that in places has recovered to northern hardwoods forests. Climatic changes may affect this systems severely. Global warming can be expected to raise the lower elevational limit and greatly reduce the land area available to this system.

MEMBERSHIP

Associations:

- *Abies fraseri* / (*Rhododendron catawbiense*, *Rhododendron carolinianum*) Forest (CEGL006308, G1)
- *Abies fraseri* / *Viburnum lantanoides* / *Dryopteris campyloptera* - *Oxalis montana* / *Hylocomium splendens* Forest (CEGL006049, G1)
- *Carex scabrata* - *Viola cucullata* / *Plagiomnium ciliare* Herbaceous Vegetation (CEGL006597, G3)
- *Chrysosplenium americanum* Herbaceous Vegetation (CEGL006193, G3G5)
- *Picea rubens* - (*Abies fraseri*) / (*Rhododendron catawbiense*, *Rhododendron maximum*) Forest (CEGL007130, G1)
- *Picea rubens* - (*Abies fraseri*) / *Vaccinium erythrocarpum* / *Oxalis montana* - *Dryopteris campyloptera* / *Hylocomium splendens* Forest (CEGL007131, G2)
- *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Rhododendron (maximum, catawbiense)* Forest (CEGL004983, G1?)
- *Picea rubens* - (*Betula alleghaniensis*, *Aesculus flava*) / *Viburnum lantanoides* / *Oxalis montana* - *Solidago glomerata* Forest (CEGL006256, G2)
- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Forest (CEGL006152, G2G3)
- *Picea rubens* / *Acer rubrum* / *Maianthemum canadense* - (*Lycopodium clavatum*, *Lycopodium dendroideum*) Forest (CEGL008501, G2)
- *Picea rubens* / *Ribes glandulosum* Forest (CEGL007128, G1)
- *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland (CEGL003893, GNA)

Alliances:

- *Abies fraseri* - *Picea rubens* Forest Alliance (A.136)
- *Chrysosplenium americanum* Saturated Herbaceous Alliance (A.1685)
- *Picea rubens* - *Betula alleghaniensis* Forest Alliance (A.384)
- *Picea rubens* Forest Alliance (A.138)
- *Rubus allegheniensis* - *Rubus canadensis* Shrubland Alliance (A.930)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch to matrix system, dominating the highest mountain areas. Small patches may occur especially due to logging of the matrix/large-patch forest. Small-patch systems may be embedded.

Size: Generally covers most of the landscape in the limited areas at the tops of the highest mountain ranges. Natural patches range from hundreds to thousands of acres. A couple remnant patches of thousands of acres remain, while other intact patches are dozens of acres embedded in landscapes of degraded spruce-fir systems.

Adjacent Ecological Systems:

- High Allegheny Wetland (CES202.069)
- Southern Appalachian Grass and Shrub Bald (CES202.294)
- Southern Appalachian Northern Hardwood Forest (CES202.029)
- Southern Appalachian Rocky Summit (CES202.327)

Adjacent Ecological System Comments: Bordered by Southern Appalachian Northern Hardwood Forest (CES202.029) or Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) at lower elevation. It may contain embedded small patches of Southern Appalachian Rocky Summit (CES202.327) and Southern Appalachian Grass and Shrub Bald (CES202.294). In addition, high-elevation wetlands may be present.

DISTRIBUTION

Range: This system ranges from the Balsam Mountains and Great Smoky Mountains of North Carolina and Tennessee northward to the mountains of western Virginia and eastern West Virginia.

Divisions: 202:C

Nations: US

Subnations: NC, TN, VA, WV

Map Zones: 57:C, 61:C

USFS Ecomap Regions: M221A:CC, M221B:CC

TNC Ecoregions: 51:C, 59:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2005, Lohman and Watson 1943, Nicholas and Zedaker 1989, White and Pickett 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722677#references

Description Author: M. Schafale and R. Evans, mod. S.C. Gawler and M. Pyne

Version: 23 Jul 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast
ClassifResp: Southeast

1369 CENTRAL APPALACHIAN DRY OAK-PINE FOREST (CES202.591)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Acidic Soil; Pinus (strobis, rigida, echinata, virginiana) - Quercus prinus

Non-Diagnostic Classifiers: Lowland; Sideslope; Oligotrophic Soil; Mineral: W/ A-Horizon <10 cm; Loam Soil Texture; Sand Soil Texture; Ustic; F-Patch/Medium Intensity; W-Patch/Low Intensity; Needle-Leaved Tree; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2369; ESLF 4312; ESP 1369

CONCEPT

Summary: These oak and oak-pine forests cover large areas in the low- to mid-elevation central Appalachians and middle Piedmont. The topography and landscape position range from rolling hills to steep slopes, with occasional occurrences on more level, ancient alluvial fans. The soils are coarse and infertile; they may be deep (on glacial deposits in the northern part of the system's range), or more commonly shallow, on rocky slopes of acidic rock (shale, sandstone, other acidic igneous or metamorphic rock). The well-drained soils and exposure create dry conditions. The forest is mostly closed-canopy but can include patches of more open woodlands. It is dominated by a variable mixture of dry-site oak and pine species, most typically *Quercus prinus*, *Pinus virginiana*, and *Pinus strobus*, but sometimes *Quercus alba* and/or *Quercus coccinea*. The system may include areas of oak forest, pine forest (usually small), and mixed oak-pine forest. Heath shrubs such as *Vaccinium pallidum*, *Gaylussacia baccata*, and *Kalmia latifolia* are common in the understory and often form a dense layer. Embedded submesic ravines and concave landforms support slightly more diverse forests characterized by mixtures of oaks, several hickories, *Cornus florida*, and sometimes *Liriodendron tulipifera*. Small hillslope pockets with impeded drainage may support small isolated wetlands with *Acer rubrum* and *Nyssa sylvatica* characteristic. Disturbance agents include fire, windthrow, and ice damage. Increased site disturbance generally leads to secondary forest vegetation with a greater proportion of *Pinus virginiana* and weedy hardwoods such as *Acer rubrum*.

Classification Comments: This system occurs in drier settings than the other matrix oak forest system of the division, i.e., Northeastern Interior Dry-Mesic Oak Forest (CES202.592). It includes the system formerly segregated as Southern Piedmont Dry Oak-Heath Forest (CES202.023). Its analog from central Virginia south is Southern Piedmont Dry Oak-(Pine) Forest (CES202.339), which has somewhat more southern floristics, for example, the typical presence of *Pinus taeda*.

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)--occurs to the west of this system (e.g., Allegheny Plateau), with the Allegheny Front as the dividing line.
- Central Appalachian Pine-Oak Rocky Woodland (CES202.600)
- Northeastern Interior Dry-Mesic Oak Forest (CES202.592)--more mesic.
- Southern Appalachian Oak Forest (CES202.886)--found south of Roanoke River in central Virginia (Blue Ridge/southern Appalachians only).
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)--occurs to the south; its northern limit overlaps slightly with the southern limit of this system but is farther out on the Coastal Plain.

DESCRIPTION

Environment: These oak and oak-pine forests cover large areas in the low- to mid-elevation central Appalachians and middle Piedmont. The topography and landscape position range from rolling hills to steep slopes, with occasional occurrences on more level, ancient alluvial fans. The soils are coarse and infertile; they may be deep (on glacial deposits in the northern part of the system's range), or more commonly shallow, on rocky slopes of acidic rock (shale, sandstone, other acidic igneous or metamorphic rock). The well-drained soils and exposure create dry conditions.

Vegetation: Stands of this forest system are mostly closed-canopied but can include more open woodlands. They are dominated by a variable mixture of dry-site oak and pine species, including *Quercus prinus*, *Pinus virginiana*, and *Pinus strobus*. The system may include areas of pine forest and mixed oak-pine forest. Heath shrubs such as *Vaccinium pallidum*, *Gaylussacia baccata*, and *Kalmia latifolia* are common in the understory. Within these forests, hillslope pockets with impeded drainage may support small isolated wetlands with *Acer rubrum* and *Nyssa sylvatica* characteristic.

Dynamics: Disturbance agents include fire, windthrow, and ice damage.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (CEGL006132, GNR)
- *Castanea dentata* - *Quercus prinus* Forest (CEGL007196, GH)
- *Pinus rigida* - *Quercus (velutina, prinus)* Forest (CEGL006290, GNR)
- *Pinus rigida* - *Quercus coccinea* / *Vaccinium angustifolium* Woodland (CEGL006557, GNR)

- *Pinus strobus* - *Pinus resinosa* - *Pinus rigida* Forest (CEGL006259, G4G5)
- *Pinus strobus* - *Quercus (rubra, velutina)* - *Fagus grandifolia* Forest (CEGL006293, G5)
- *Pinus strobus* - *Quercus alba* - *Quercus prinus* / *Vaccinium stamineum* Forest (CEGL008539, G4)
- *Pinus strobus* / *Vaccinium pallidum* Forest (CEGL007099, GNR)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Pinus virginiana* Successional Forest (CEGL002591, GNA)
- *Prunus serotina* - *Liriodendron tulipifera* - *Acer rubrum* - *Fraxinus americana* Forest (CEGL006599, GNA)
- *Quercus (velutina, alba)* / *Vaccinium pallidum* High Allegheny Plateau, Western Allegheny Plateau Forest (CEGL006018, GNR)
- *Quercus alba* - *Quercus (coccinea, velutina, prinus)* / *Gaylussacia baccata* Forest (CEGL008521, G5)
- *Quercus alba* - *Quercus prinus* - *Carya glabra* / *Cornus florida* / *Vaccinium pallidum* / *Carex pensylvanica* Forest (CEGL008515, G4)
- *Quercus ilicifolia* - *Prunus pumila* Shrubland (CEGL006121, GNR)
- *Quercus prinus* - (*Quercus coccinea, Quercus rubra*) / *Kalmia latifolia* / *Vaccinium pallidum* Forest (CEGL006299, G5)
- *Quercus prinus* - *Quercus (alba, coccinea, velutina)* / *Viburnum acerifolium* - (*Kalmia latifolia*) Forest (CEGL005023, G4?)
- *Quercus prinus* - *Quercus (rubra, velutina)* / *Vaccinium angustifolium* Forest (CEGL006282, G5)
- *Quercus prinus* - *Quercus rubra* / *Hamamelis virginiana* Forest (CEGL006057, G5)
- *Quercus prinus* - *Quercus rubra* / *Vaccinium pallidum* - (*Rhododendron periclymenoides*) Forest (CEGL008523, G3G4)
- *Quercus prinus* / *Rhododendron catawbiense* - *Kalmia latifolia* Forest (CEGL008524, G3?)
- *Quercus rubra* - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134, G3G5)
- *Quercus rubra* - *Quercus prinus* / *Deschampsia flexuosa* - *Danthonia compressa* - *Calamagrostis porteri* Woodland [Provisional] (CEGL004714, GNR)
- *Robinia pseudoacacia* Forest (CEGL007279, GNA)
- *Tsuga canadensis* - *Quercus prinus* - *Betula lenta* Forest (CEGL006923, G3)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Castanea dentata* - *Quercus prinus* Forest Alliance (A.224)
- *Pinus rigida* Woodland Alliance (A.524)
- *Pinus strobus* - *Quercus (alba, rubra, velutina)* Forest Alliance (A.401)
- *Pinus strobus* - *Quercus (coccinea, prinus)* Forest Alliance (A.402)
- *Pinus strobus* Forest Alliance (A.128)
- *Pinus virginiana* Forest Alliance (A.131)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus* spp. Forest Alliance (A.237)
- *Quercus ilicifolia* Shrubland Alliance (A.906)
- *Quercus prinus* - (*Quercus coccinea, Quercus velutina*) Forest Alliance (A.248)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus prinus* - *Quercus rubra* Forest Alliance (A.250)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)
- *Robinia pseudoacacia* Forest Alliance (A.256)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch (at outer range) to matrix (in center of range) system that may cover extensive hillslopes and low ridges.

DISTRIBUTION

Range: This system is found from central New England through Pennsylvania and south to the Roanoke River in southern Virginia. It is primarily Appalachian but overlaps slightly into the upper Piedmont in Virginia.

Divisions: 202:C

Nations: US

Subnations: CT, MA, MD, ME, NH, NJ, NY, PA, RI, VA, VT, WV

Map Zones: 57:P, 60:C, 61:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211E:CC, 211F:CC, 211G:CC, 211I:CC, 221A:CC, 221B:CC, 221D:CC, M221A:CC, M221Ba:CCC, M221Bb:CCC, M221Bd:CCC, M221Bf:CCC, M221Da:CCC

TNC Ecoregions: 52:C, 59:C, 60:C, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723015#references

Description Author: S.C. Gawler

Version: 20 Aug 2007

Concept Author: S.C. Gawler

Stakeholders: East, Southeast

ClassifResp: East

1377 CENTRAL APPALACHIAN PINE-OAK ROCKY WOODLAND (CES202.600)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Woody-Herbaceous; Ridge/Summit/Upper Slope; Acidic Soil; *Pinus* (*strobus*, *rigida*, *echinata*, *virginiana*) - *Quercus prinus*

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Lowland; Temperate; Oligotrophic Soil; Shallow Soil; Ustic; Consolidated; F-Patch/Medium Intensity; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2377; ESLF 4320; ESP 1377

CONCEPT

Summary: This system of the Central Appalachians encompasses open or sparsely wooded hilltops and outcrops or rocky slopes, mostly at lower elevations, but occasionally up to 1220 m (4000 feet) in West Virginia. The substrate rock is granitic or of other acidic lithology, including traprock in New England. The vegetation is patchy, with woodland as well as open portions. *Pinus* spp. are diagnostic and often are mixed with xerophytic *Quercus* spp. Some areas have a fairly well-developed heath shrub layer, others a graminoid layer. Conditions are dry and nutrient-poor, and many, if not most, sites have a history of fire.

Classification Comments: The northern extent of this system in central New England may overlap with Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571), which has *Picea* spp. prominent. The southern extent overlaps with Southern Appalachian Montane Pine Forest and Woodland (CES202.331), which is characterized by *Pinus pungens*. This type is differentiated from the similar Central Appalachian Dry Oak-Pine Forest (CES202.591) by its mosaic nature of wooded and open patches, as opposed to being merely a "thin forest."

Similar Ecological Systems:

- Appalachian Shale Barrens (CES202.598)
- Central Appalachian Dry Oak-Pine Forest (CES202.591)
- Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)--is a restricted type characterized by the dominance (not just incidental occurrence) of *Pinus pungens*.

Related Concepts:

- Low-Elevation Acidic Outcrop Barrens (Fleming et al. 2005) Finer. This system in the southern portion of its range appears similar to Virginia's Low-Elevation Acidic Outcrop Barrens, which are noted to occur in the western Piedmont, Blue Ridge, Cumberland Mountains, and Ridge and Valley.

MEMBERSHIP

Associations:

- (*Pinus strobus*, *Quercus rubra*) / *Danthonia spicata* Acid Bedrock Wooded Herbaceous Vegetation (CEGL005101, G3G4)
- *Juniperus virginiana* - *Fraxinus americana* / *Danthonia spicata* - *Poa compressa* Woodland (CEGL006002, G2G3)
- *Paulownia tomentosa* Woodland (CEGL003687, GNA)
- *Penstemon hirsutus* Sparse Vegetation (CEGL006535, GNR)
- *Photinia melanocarpa* - *Gaylussacia baccata* / *Carex pensylvanica* Shrubland (CEGL008508, G1?)
- *Pinus resinosa* - *Quercus rubra* / *Sibbaldiopsis tridentata* / *Danthonia compressa* - *Antennaria virginica* / *Rhytidium rugosum* Woodland (CEGL003766, G1)
- *Pinus resinosa* / *Menziesia pilosa* / *Polypodium appalachianum* Forest (CEGL006108, G1)
- *Pinus rigida* / (*Quercus ilicifolia*) / *Photinia melanocarpa* / *Deschampsia flexuosa* Woodland (CEGL006116, GNR)
- *Pinus rigida* / *Corema conradii* Woodland (CEGL006154, G2)
- *Quercus ilicifolia* - *Prunus pumila* Shrubland (CEGL006121, GNR)
- *Quercus ilicifolia* Shrubland [Placeholder] (CEGL003883, GNR)
- *Quercus prinus* - *Pinus virginiana* - (*Pinus pungens*) / *Schizachyrium scoparium* - *Dichanthelium depauperatum* Woodland (CEGL008540, G2?)
- *Quercus prinus* / *Quercus ilicifolia* / *Danthonia spicata* Woodland [Provisional] (CEGL008526, G3?)
- *Quercus rubra* - (*Quercus prinus*) / *Vaccinium* spp. / *Deschampsia flexuosa* Woodland (CEGL006134, G3G5)
- *Quercus rubra* - *Quercus prinus* - *Pinus strobus* / *Penstemon hirsutus* Woodland (CEGL006074, G3G5)
- *Schizachyrium scoparium* - *Danthonia spicata* - *Carex pensylvanica* / *Cladonia* spp. Herbaceous Vegetation (CEGL006544, GNR)
- *Vaccinium (angustifolium, myrtilloides, pallidum)* Central Appalachian Dwarf-shrubland (CEGL003958, G4G5)
- *Vaccinium angustifolium* - *Sorbus americana* / *Sibbaldiopsis tridentata* Dwarf-shrubland (CEGL005094, GNR)

Alliances:

- *Danthonia spicata* Herbaceous Alliance (A.1281)

- *Juniperus virginiana* Woodland Alliance (A.545)
- *Kalmia latifolia* - *Gaylussacia baccata* Shrubland Alliance (A.1050)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- *Paulownia tomentosa* Woodland Alliance (A.609)
- *Pinus (rigida, pungens, virginiana)* - *Quercus prinus* Woodland Alliance (A.677)
- *Pinus resinosa* - *Quercus rubra* Woodland Alliance (A.670)
- *Pinus resinosa* Forest Alliance (A.126)
- *Pinus rigida* Woodland Alliance (A.524)
- *Quercus ilicifolia* Shrubland Alliance (A.906)
- *Quercus prinus* - *Quercus coccinea* Woodland Alliance (A.622)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)
- *Schizachyrium scoparium* - (*Sporobolus cryptandrus*) Herbaceous Alliance (A.1224)
- *Vaccinium (angustifolium, myrtilloides, pallidum)* Dwarf-shrubland Alliance (A.1113)

DISTRIBUTION

Range: This system occurs from central New England south to Virginia and West Virginia, with peripheral occurrences in southeastern Ohio and easternmost Kentucky.

Divisions: 202:C

Nations: US

Subnations: CT, KY, MA, MD?, ME, NH, NJ, NY, OH, PA, VA, VT, WV

Map Zones: 53:C, 57:P, 60:C, 61:C, 62:C, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 211E:CC, 211F:CC, 221A:CC, 221B:CC, M211Bb:CCC, M211Bd:CCC, M211C:CC, M221A:CC, M221B:CP

TNC Ecoregions: 49:C, 50:C, 52:C, 59:C, 60:C, 61:C, 64:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723009#references

Description Author: S.C. Gawler

Version: 20 Aug 2007

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast
ClassifResp: East

1361 CENTRAL ATLANTIC COASTAL PLAIN MARITIME FOREST (CES203.261)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2361; ESLF 4264; ESP 1361

CONCEPT

Summary: This system encompasses most woody vegetation of Atlantic Coast barrier islands and similar coastal strands, from Virginia Beach to central South Carolina (approximately the Cooper River where the true Sea Islands begin). It includes forests and shrublands whose structure and composition are influenced by salt spray, extreme disturbance events, and the distinctive climate of the immediate coast. Many examples of this system will include a component of live oak (*Quercus virginiana*) or wax-myrtle (*Morella cerifera*). Also included are embedded freshwater depressional wetlands dominated by shrubs or small trees, such as *Cornus foemina*, *Persea palustris*, or *Salix caroliniana*.

Classification Comments: Southern Atlantic Coastal Plain Maritime Forest (CES203.537) occurs south of this system where barrier islands give way to sea islands (central South Carolina, approximately the Cooper River). Sea islands are wider and more extensive and their size may contribute to a greater ecological influence of fire resulting in a greater component of *Pinus elliotii* and *Pinus palustris* in maritime forests occurring there.

Northern Atlantic Coastal Plain Maritime Forest (CES203.302) occurs north of this system where deciduous trees come to prevail in the maritime forests [see Bellis (1992)] at approximately 37 degrees North latitude. There is a zone where both evergreen and deciduous forests occur (from approximately Nags Head, North Carolina, to Virginia Beach, Virginia), making the geographic boundary between the two systems somewhat unclear. The boundary of cold and warm offshore waters near Cape Hatteras may be an important climatic influence. This system is separated from Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273) by the dominance of woody vegetation, which corresponds to increased shelter from salt spray and increased stability of landforms.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Maritime Forest (CES203.302)--occurs to north.
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)
- Southern Atlantic Coastal Plain Maritime Forest (CES203.537)--occurs to south.

Related Concepts:

- Estuarine Fringe Loblolly Pine Forest (Schafale and Weakley 1990) Finer

DESCRIPTION

Environment: This system occurs on barrier islands, and on coastal strands where barrier islands are lacking, but seldom or never more than 2 or 3 miles from the ocean. Chronic salt spray is an important influence on vegetation structure and composition. However, the extent to which plant communities found in this system are shaped by salt spray varies. Examples closest to the coast are most likely to exhibit classic streamlined canopy shape due to spray sculpting and are less likely to support salt-intolerant plant species. Heavier salt spray often determines the boundary of this system with Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273). It requires some shelter from the ocean, in the form of high dunes or extensive sand flats, to develop. This system may occur from the top of interior dunes to wet swales. Soils are sandy, except for mucks in the wettest swamps. Soils range from excessively drained to permanently saturated. They are presumably low in nutrient-holding capacity, but input of nutrients in salt spray probably makes this system fairly fertile. Topography and apparent moisture may vary widely with little change in vegetation. The ocean's moderation of climate may be a significant factor in the character of this system. A number of plant species extend much farther north in the maritime forests than they do even a few miles inland.

Vegetation: Vegetation includes shrublands and forests. Shrubland dominated by salt-tolerant shrubs such as *Morella cerifera* and *Ilex vomitoria* or by stunted trees often occurs on the seaward edge where salt spray is heavier. Forests are typically dominated by a small set of salt-tolerant evergreen trees, mainly *Quercus virginiana*, *Quercus hemisphaerica*, *Pinus taeda*, and in the southern portions, *Sabal palmetto*. Rare forested wetlands are dominated by a variety of wetland tree species, including *Acer rubrum*, *Nyssa biflora*, and *Taxodium distichum*. A few of the most sheltered areas near the northern end of the range have forests with deciduous species such as *Fagus grandifolia* and *Quercus falcata*. Also included are embedded freshwater depressional wetlands dominated by shrubs or small trees, such as *Cornus foemina*, *Persea palustris*, or *Salix caroliniana*. Communities tend to be low in species richness, with all strata limited to a set of salt-tolerant species.

Dynamics: Maritime Forests occur in the most stable portions of barrier islands, but the maritime environment is still extremely dynamic. Geologic processes such as destruction of dunes by storms or slow movement of dunes may quickly or slowly destroy the environment this system needs. Sand movement may also create new sites for this system to occupy. Extreme salt spray or saltwater flooding in storms can severely disturb vegetation, though it recovers if the landforms have not been altered. Fire may have naturally

occurred infrequently in this system, but probably was not an important factor.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Nyssa biflora* - (*Liquidambar styraciflua*, *Fraxinus* sp.) Maritime Swamp Forest (CEGL004082, G2)
- *Cornus foemina* / *Berchemia scandens* Forest (CEGL007384, G1)
- *Morella cerifera* - *Prunus caroliniana* - *Zanthoxylum clava-herculis* Shrubland (CEGL004784, G2?)
- *Morella cerifera* / *Spartina patens* Shrubland (CEGL003839, G3G4)
- *Persea palustris* / *Morella cerifera* Maritime Forest (CEGL004635, G1)
- *Pinus taeda* / *Morella cerifera* / *Osmunda regalis* var. *spectabilis* Forest (CEGL006137, G3)
- *Quercus virginiana* - (*Ilex vomitoria*) Shrubland (CEGL003833, G3)
- *Quercus virginiana* - (*Pinus elliottii* var. *elliottii*, *Sabal palmetto*) / *Persea borbonia* - *Callicarpa americana* Forest (CEGL007032, G2)
- *Quercus virginiana* - *Quercus hemisphaerica* - *Pinus taeda* - *Quercus falcata* / *Persea palustris* Forest (CEGL007026, G2)
- *Quercus virginiana* - *Quercus hemisphaerica* - *Pinus taeda* / *Persea (borbonia, palustris)* - *Ilex vomitoria* Forest (CEGL007027, G2)
- *Quercus virginiana* - *Quercus incana* Woodland (CEGL003750, G1)
- *Salix caroliniana* / *Sacciolepis striata* - *Boehmeria cylindrica* Woodland (CEGL004222, G2?)
- *Taxodium distichum* / *Boehmeria cylindrica* - *Ceratophyllum muricatum* Maritime Swamp Forest (CEGL004079, G1)

Alliances:

- *Cornus foemina* Seasonally Flooded Forest Alliance (A.319)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Magnolia virginiana* - *Persea palustris* Saturated Forest Alliance (A.60)
- *Morella cerifera* Saturated Shrubland Alliance (A.1906)
- *Pinus taeda* Saturated Forest Alliance (A.3009)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Quercus virginiana* - *Ilex vomitoria* - (*Morella cerifera*) Shrubland Alliance (A.785)
- *Quercus virginiana* - *Juniperus virginiana* - (*Sabal palmetto*) Woodland Alliance (A.479)
- *Salix caroliniana* Seasonally Flooded Woodland Alliance (A.1914)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)

SPATIAL CHARACTERISTICS

Size: Occurs as medium to large patches. Patch size varies naturally with the character of barrier islands. South-facing islands tend to have more extensive dunes that provide shelter for extensive, contiguous maritime forests. East-facing islands tend to naturally have discontinuous dunes and only small patches sheltered enough to support maritime forests. Presettlement vegetation had a few occurrences of several thousand acres, but only a couple as large as 1000 acres remain. Most occurrences now are artificially bounded remnants or naturally small patches of tens to hundreds of acres.

Adjacent Ecological Systems:

- Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)
- Southeastern Coastal Plain Interdunal Wetland (CES203.258)
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Adjacent Ecological System Comments: Always bordered by Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273) on the seaward side, and sometimes surrounded by them. May border tidal salt marshes on the back of barrier islands.

DISTRIBUTION

Range: This system is found from southernmost Virginia to central South Carolina (Cooper River).

Divisions: 203:C

Nations: US

Subnations: DE, MD, NC, NJ, SC, VA

Map Zones: 58:C, 60:C

USFS Ecomap Regions: 232C:CC, 232Ib:CPP

TNC Ecoregions: 57:C

SOURCES

References: Bellis 1992, Comer et al. 2003, Schafale pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723225#references

Description Author: R. Evans

Version: 01 Feb 2007

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1363 CENTRAL INTERIOR HIGHLANDS DRY ACIDIC GLADE AND BARRENS (CES202.692)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Woody-Herbaceous; Sedimentary Rock; Igneous Rock; Acidic Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2363; ESLF 4305; ESP 1363

CONCEPT

Summary: This system is primarily found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions with small occurrences in northern Missouri. It occurs on flatrock outcrops and along moderate to steep slopes or valley walls of rivers along most aspects. Parent material includes chert, igneous and/or sandstone bedrock with well- to excessively well-drained, shallow soils interspersed with rock and boulders. These soils are typically dry during the summer and autumn, becoming saturated during the spring and winter. Grasses such as *Schizachyrium scoparium* and *Sorghastrum nutans* dominate this system with stunted oak species (*Quercus stellata*, *Quercus marilandica*) and shrub species such as *Vaccinium* spp. occurring on variable depth soils. *Juniperus virginiana* can be present and often increases in the absence of fire. In Kentucky, this system includes both sandstone glades found in the Shawnee Hills (EPA Ecoregions 71a, 72h of Woods et al. (2002)), as well as shale glades found in the Knobs region (EPA Ecoregions 70d, 71c of Woods et al. (2002)), both in the Kentucky Interior Low Plateau. It also includes dry *Quercus stellata*-dominated barrens on Cretaceous-aged gravel substrates on the northern fringes of the Upper East Gulf Coastal Plain Ecoregion in southern Illinois and western Kentucky. This system is influenced by drought and infrequent to occasional fires. Prescribed fires help manage this system by maintaining an open glade structure.

Classification Comments: The occurrence of this system in TNC Ecoregion 43 is apparently confined to southern Illinois and/or Kentucky but does not include any portions of states to the south. Not all examples are acidic. Sometimes a layer of limestone or neutral shale occurs in these and thus are not acidic.

Similar Ecological Systems:

- Appalachian Shale Barrens (CES202.598)
- Cumberland Sandstone Glade and Barrens (CES202.337)

Related Concepts:

- Sandstone Prairie (Evans 1991) Finer
- Shale Barrens (Evans 1991) Finer
- Shawnee Hills Sandstone Glade (Evans 1991) Finer
- Xeric Acidic Forest (Evans 1991) Finer

DESCRIPTION

Environment: This system occurs on flat outcrops of sandstone rock and along moderate to steep slopes or valley walls of rivers along most aspects. Parent material includes chert, shale, igneous and/or sandstone bedrock with well- to excessively well-drained, shallow soils interspersed with rock and boulders. These soils are typically dry during the summer and autumn, becoming saturated during the spring and winter.

Vegetation: Grasses such as *Schizachyrium scoparium* and *Sorghastrum nutans* dominate this system with stunted oak species (*Quercus stellata*, *Quercus marilandica*) and shrub species such as *Vaccinium* spp. occurring on variable depth soils. In the Shawnee Hills (EPA Ecoregions 71a, 72h of Woods et al. (2002)) of the Kentucky Interior Low Plateau, *Quercus marilandica*, *Quercus stellata*, and *Juniperus virginiana* are the dominant trees. Scattered shrubs, such as *Vaccinium arboreum* and *Chionanthus virginicus*, occur on the margins in patches of deeper soil. *Quercus prinus* may be present in the eastern part of the range. Some other plants that may be associated with these glades include *Andropogon ternarius*, *Danthonia spicata*, *Symphytotrichum patens* var. *patentissimum*, *Silene rotundifolia*, *Pityopsis graminifolia* var. *latifolia*, *Coreopsis grandiflora*, *Silene regia*, *Coreopsis lanceolata*, *Croton willdenowii*, *Sedum nuttallianum*, *Selaginella rupestris*, and *Portulaca pilosa*.

Dynamics: This system is influenced by drought and infrequent to occasional fires. Prescribed fires help manage this system by maintaining an open glade structure.

MEMBERSHIP

Associations:

- (*Quercus stellata*, *Ulmus alata*) / *Schizachyrium scoparium* - *Symphytotrichum patens* var. *patentissimum* Wooded Herbaceous Vegetation (CEGL007824, G2?)
- *Asplenium montanum* - *Heuchera parviflora* var. *parviflora* - *Silene rotundifolia* Sparse Vegetation (CEGL004392, G3G4)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Quercus marilandica* - *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* - *Hypericum gentianoides* Wooded Herbaceous Vegetation (CEGL004062, G3?)
- *Quercus marilandica* / *Vaccinium arboreum* / *Danthonia spicata* Scrub Woodland (CEGL002425, G3G4)

- *Quercus prinus* / *Cornus florida* - *Amelanchier arborea* / *Pityopsis graminifolia* var. *latifolia* Woodland (CEGL003706, G2?)
- *Quercus prinus* / *Danthonia spicata* - *Silene caroliniana* Woodland (CEGL004439, G2?)
- *Quercus stellata* - (*Pinus echinata*) / *Vaccinium arboreum* / *Andropogon gerardii* - *Symphytotrichum patens* var. *patentissimum* Wooded Herbaceous Vegetation (CEGL007814, G2?)
- *Quercus stellata* - *Quercus marilandica* - *Quercus velutina* - *Carya texana* / *Schizachyrium scoparium* Woodland (CEGL002149, G2G3)
- *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* - *Silphium terebinthinaceum* Wooded Herbaceous Vegetation (CEGL005134, G1)
- *Schizachyrium scoparium* - *Aristida dichotoma* - *Croton willdenowii* / Lichens Wooded Herbaceous Vegetation (CEGL002242, G3)
- *Schizachyrium scoparium* - *Sedum nuttallianum* - *Selaginella rupestris* - *Portulaca pilosa* / Lichens Wooded Herbaceous Vegetation (CEGL002244, G1G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Andropogon ternarius* - *Coreopsis grandiflora* Sandstone - Shale Herbaceous Vegetation (CEGL002212, G3)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Coreopsis lanceolata* - *Croton willdenowii* Wooded Herbaceous Vegetation (CEGL002243, G4?)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Danthonia spicata* - *Silene regia* Chert Herbaceous Vegetation (CEGL002211, G3)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Asplenium montanum* Sparsely Vegetated Alliance (A.1831)
- *Pinus virginiana* Forest Alliance (A.131)
- *Quercus prinus* - *Quercus coccinea* Woodland Alliance (A.622)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions, with rare and limited occurrences in the Upper East Gulf Coastal Plain of Kentucky and Illinois.

Divisions: 202:C; 203:C

Nations: US

Subnations: AR, IL, IN, KY, MO, OK, TN?

Map Zones: 43:P, 44:C, 47:C, 48:C, 49:C, 53:C

TNC Ecoregions: 36:C, 38:C, 39:C, 43:C, 44:C

SOURCES

References: Comer et al. 2003, Evans 1991, Heikens and Robertson 1995, Nelson 1985, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722967#references

Description Author: S. Menard and T. Nigh, mod. M. Pyne

Version: 30 May 2007

Concept Author: S. Menard and T. Nigh

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1372 EAST GULF COASTAL PLAIN INTERIOR SHORTLEAF PINE-OAK FOREST (CES203.506)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Short Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2372; ESLF 4315; ESP 1372

CONCEPT

Summary: This forested system of the East Gulf Coastal Plain occurs most extensively on generally rolling uplands north of the range of *Pinus palustris*. It was the historical matrix in large areas of the region in Alabama and Mississippi, particularly between about 32 degrees 30 minutes N latitude (the approximate local northern limit of the historic range of *Pinus palustris*), and about 35 degrees N latitude (the approximate limit where relatively extensive examples of *Pinus echinata* are replaced by predominantly hardwood-dominated systems, although isolated examples of this system may occur both north and south of these boundaries in limited areas. Stands tend to occur on generally well-drained sandy or clayey soils with dry to dry-mesic moisture regimes. *Pinus echinata* is the dominant pine species of the generalized "dry and dry-mesic oak-pine" forest type in the Gulf Coastal Plain (White and Lloyd 1998) and is the most characteristic floristic component of this system. The actual amount of *Pinus echinata* present varies based on a number of factors, but intact examples of this system often include stands that are dominated by *Pinus echinata* grading into stands with a mixture of upland hardwoods. Locally, on mid to lower slopes, *Pinus taeda* may be a component, extending further upslope in the absence of fire. Fire is possibly the most important natural process affecting the floristic composition and vegetation structure of this system, although fire-return intervals are lower than those associated with the East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland (CES203.496). *Pinus echinata* may have difficulty replacing itself in the absence of fire, particularly on sites other than the driest ones (Eyre 1980). Landers (1989) inferred a fire-return interval of 10 times per century for *Pinus echinata*. Local topographic conditions affecting natural fire compartment size generally lend themselves to this fire frequency, although some examples may have more frequent fires and some less than this generalized value. Where fire is most frequent the system may develop a relatively pure canopy of *Pinus echinata* typified by a very open woodland structure with scattered overstory trees and an herbaceous-dominated understory; such examples are rare on the modern landscape. More typical are areas in which *Quercus* spp., *Carya* spp., *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Acer* spp., and *Nyssa sylvatica* have become prominent in the midstory and even overstory and in which herbaceous patches are rare. Although the general distributional boundaries described above indicate where this system formed an historical landscape matrix, smaller patches of the system may also be present in limited areas both north and south of these boundaries. Although Lawson (1990) maps the native range of shortleaf throughout a relatively large area of western Tennessee, the actual distribution of the species appears to be much more confined and almost absent from the Coastal Plain (Chester 1990); when present, it occurs in only small stands on dry southwestern aspects (C. Nordman pers comm.).

Classification Comments: The range of this system overlaps with East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483) in the Fall Line Hills ecoregion (65i) of Alabama and in the Southern Hilly Gulf Coastal Plain ecoregion (65d) of Mississippi and may overlap to some degree with Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560) as well. In parts of the overlapping range (including the Oakmulgee Ranger District of the Talladega National Forest), these types occur in a mosaic which is difficult to interpret environmentally and ecologically (A. Schotz pers. comm.). East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482) replaces this system along the northern and northwestern boundary in Tennessee.

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland (CES203.496)
- East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)
- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)
- Ozark-Ouachita Shortleaf Pine-Bluestem Woodland (CES202.325)
- Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)

DESCRIPTION

Environment: The core distribution of this system lies between about 32 degrees 30 minutes N latitude and about 35 degrees N latitude; more localized occurrences may be found as small patches both north and south of these boundaries embedded in other systems. The belted character of this region, in the form of inner lowlands and cuestas and other low-ridge landforms (Bowman 1911, Fenneman 1938), the associated diversity of soil types, and differences in settlement history appear to account for the importance of shortleaf pine in the Gulf Coast region when compared to the Atlantic Coastal Plain (White and Lloyd 1998). Cuestas and other hills create strong environmental gradients which, coupled with soil characteristics, promote a variety of mixed pine and pine-hardwood vegetation in this region; local differences in topography, parent material, and exposure influence site characteristics, resulting in numerous different plant communities. This system primarily occupies the dry and dry-mesic portion of regional moisture gradients. Wide variation in vegetation composition across this gradient is also strongly related to fire frequency and intensity (White and Lloyd 1998). Generally to the south and southeast it grades into longleaf pine-dominated system(s), and to the north into

hardwood-dominated ones.

Vegetation: This system is primarily composed of forest or woodland vegetation dominated by trees generally up to about 33 m (100 feet) in height. Individual patches or stands may be predominantly evergreen, predominantly deciduous, or mixed. The canopy will be primarily relatively closed (greater than 60%), but some areas may exhibit lower canopy closures, either as a result of repeated surface fires, timber removal, or other disturbances. This system includes the Shortleaf Pine-Oak Cover Type (Eyre 1980) as expressed in the Upper East Gulf Coastal Plain. In contrast to most of the Atlantic Coastal Plain, *Pinus echinata* is a much more ecologically and economically important species across much of the Gulf Coastal Plain, both presently and historically (Mohr 1901, Harper 1920, 1943). The actual vegetation composition depends greatly upon local site conditions, ongoing management, and disturbance history of an area. Locally, the species that comprise the system are strongly influenced by soil, slope, and aspect (Eyre 1980). Examples may be composed of various mixtures of pines and hardwoods. Although the actual amount of *Pinus echinata* present varies based on a number of factors, intact examples of this system often include stands that are dominated by *Pinus echinata* grading into stands with a mixture of upland hardwoods. Where fire is most frequent the system may develop a relatively pure canopy of shortleaf typified by a very open woodland structure with scattered overstory trees and an herbaceous-dominated understory; such examples are rare on the modern landscape. More typical are areas in which *Pinus echinata* trees occur in mixture with *Quercus* spp. and *Carya* spp. Many such areas also support *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Acer* spp., and *Nyssa sylvatica*, and even *Pinus taeda*. When these species are prominent in the overstory and midstory it is generally thought to be indicative of fire suppression. *Quercus alba* and *Quercus stellata* are common hardwood components, particularly in later-seral or higher-quality stands, typically combined with *Carya alba*, *Carya pallida*, *Carya glabra*, and other *Carya* spp. Higher-quality areas may exhibit somewhat open canopies. Other tree species indicative of recent disturbance and/or fire suppression are *Quercus nigra*, *Quercus hemisphaerica*, *Quercus falcata*, and *Quercus velutina*. Subcanopies will typically contain *Cornus florida*, *Oxydendrum arboreum*, *Nyssa sylvatica*, and *Liquidambar styraciflua*. The patchy shrub layer includes *Vaccinium arboreum*, *Vaccinium elliotii*, *Asimina parviflora*, *Aesculus pavia*, *Hamamelis virginiana*, *Callicarpa americana*, *Hypericum hypericoides*, *Gelsemium sempervirens*, *Vitis rotundifolia*, and *Arundinaria gigantea*. Herbs, which may be few and sparse, include *Cnidocolus stimulosus*, *Indigofera caroliniana*, *Aristolochia serpentaria*, *Piptochaetium avenaceum*, *Chasmanthium sessiliflorum*, *Elephantopus tomentosus*, *Hexastylis arifolia*, *Iris verna*, *Rudbeckia fulgida*, *Solidago juncea*, *Euphorbia pubentissima*, *Mitchella repens*, and *Desmodium* spp. (NatureServe Ecology unpubl. data 2003). Other associates may include *Smilax* spp., *Symphytotrichum* spp., *Coreopsis* spp., *Lespedeza* spp., *Viola pedata*, *Mimosa microphylla*, *Antennaria* spp., *Clitoria mariana*, *Senna* spp., *Chasmanthium latifolium*, *Dichantherium* spp., *Andropogon* spp., *Schizachyrium scoparium*, and *Carex* spp. (Lawson 1990).

Dynamics: The frequent presence of surface fire is important in order to support the reproduction of *Pinus echinata*, which is a critical species characteristic to the system. *Pinus echinata* is a shade-intolerant species and does not survive or grow well when fire-suppressed. Outbreaks of *Dendroctonus frontalis* (Southern Pine Beetle) also play an important role in shaping the dynamics of this system and the balance of pine versus hardwood dominance over time. Young shortleaf pines are generally slower growing and slower to dominate a site than *Pinus taeda* or many hardwood competitors, but they usually will endure competition longer than the common associate, *Pinus taeda*. *Pinus echinata* can maintain dominance on most sites after it overtops competing vegetation, but in general hardwoods cannot be eliminated from pine sites. On very good sites (i.e., with high site index), however, it may not outgrow competing species such as sweetgum and red maple (Lawson 1990).

MEMBERSHIP

Associations:

- *Juniperus virginiana* var. *virginiana* - (*Quercus* spp.) Forest (CEGL007124, GNA)
- *Pinus echinata* - *Pinus taeda* - *Quercus* (*alba*, *stellata*) - *Carya alba* / *Oxydendrum arboreum* Forest (CEGL008493, G2G3)
- *Pinus echinata* - *Quercus alba* - *Carya alba* East Gulf Coastal Plain Forest (CEGL004050, G2G3)
- *Pinus echinata* - *Quercus falcata* East Gulf Coastal Plain Forest (CEGL004052, G2G3)
- *Pinus echinata* - *Quercus stellata* - (*Quercus marilandica*) Forest (CEGL004053, G1)
- *Pinus echinata* Early-Successional Forest (CEGL006327, GNA)
- *Pinus taeda* - *Liquidambar styraciflua* Semi-natural Forest (CEGL008462, GNA)

Alliances:

- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Pinus echinata* - *Quercus* (*alba*, *falcata*, *stellata*, *velutina*) Forest Alliance (A.394)
- *Pinus echinata* Forest Alliance (A.119)
- *Pinus taeda* Forest Alliance (A.130)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Limestone Forest (CES203.502)
- East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)
- East Gulf Coastal Plain Southern Loblolly-Hardwood Flatwoods (CES203.557)
- Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560)
- Western Highland Rim Prairie and Barrens (CES202.352)

Adjacent Ecological System Comments: East Gulf Coastal Plain Limestone Forest (CES203.502) occurs adjacent in parts of the region, especially the Black Belt.

DISTRIBUTION

Range: East Gulf Coastal Plain; it was the historical matrix in large areas of the region in Alabama and Mississippi, particularly

between about 32 degrees 30 minutes N latitude and about 35 degrees N latitude. In southwestern Mississippi, this system is apparently dominant on the landscape west of 91 degrees W longitude to the limits of the alluvial plain and northwest of a line running approximately from the intersection of 31 degrees N latitude and 91 degrees W longitude, northeastward to the city of Jackson, Mississippi, extending at least to about 34 degrees N latitude. This is consistent with the ranges of Oak-Pine vegetation (generally equivalent to this system) versus Longleaf-Loblolly-Slash Pines in Shantz and Zon (1924).

Divisions: 203:C

Nations: US

Subnations: AL, MS, TN?

Map Zones: 46:C, 47:?, 99:C

TNC Ecoregions: 43:C

SOURCES

References: Bowman 1911, Chester 1990, Comer et al. 2003, Eyre 1980, Fenneman 1938, Harper 1920b, Harper 1943, Landers 1989, Lawson 1990, Mohr 1901, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman pers. comm., Schotz pers. comm., Shantz and Zon 1924, White and Lloyd 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723082#references

Description Author: R. Evans and A. Schotz

Version: 25 Aug 2004

Concept Author: R. Evans and A. Schotz

Stakeholders: Southeast

ClassifResp: Southeast

1349 EAST GULF COASTAL PLAIN INTERIOR UPLAND LONGLEAF PINE WOODLAND (CES203.496)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); East Gulf Coastal Plain; Very Short Disturbance Interval

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2349; ESLF 4252; ESP 1349

CONCEPT

Summary: This system represents longleaf pine forests of rolling, dissected uplands of the East Gulf Coastal Plain. These stands occur primarily in Ecoregion 65 (EPA 2004). It is found inland of the coastal flatlands (*sensu* Peet and Allard (1993); Ecoregion 75a (EPA 2004)) and extends landward into the Upper East Gulf Coastal Plain Ecoregion (*sensu* TNC) by about 80 km (50 miles). It potentially occupies a much larger geographic area than the related longleaf pine woodlands of the outer coastal area. The characteristic species is *Pinus palustris*, although many stands may support only relictual individuals following a long history of exploitation, harvest, and stand conversion, primarily to *Pinus taeda*. This system includes stands with a range of soil and moisture conditions. Mesic stands on medium- to fine-textured soils are more typical of the system, although limited xeric areas on deep sands are also present. In natural condition, fire is believed to have been frequent enough to limit development of intolerant species of hardwoods and both *Pinus taeda* and *Pinus echinata*. Although such species may be present or even common in the most mesic stands, they generally do not share dominance in the overstory unless the system has been fire-suppressed.

Classification Comments: The dominance of *Pinus palustris* in examples of this ecological system may be lost through fire suppression, bark beetle infestations, forestry and agricultural land conversion, and mechanical disturbance. Loss of *Pinus palustris* dominance will fundamentally change the ecological function of the landscape occupied by the system, primarily by altering the fire regime. Without the appropriate fire regime, canopy closure will increase along with shrub dominance, and grasses, forbs and other finer-fuel components will decline, further altering the fire regime dynamics.

Systems dominated by *Pinus palustris* are subdivided by biogeography, from northeast to southwest across the coastal plains from Virginia to Texas. Longleaf pine-dominated stands in the rocky submontane areas of the Piedmont as well as the Ridge and Valley (from North Carolina to Alabama) are classified as a separate system, Southeastern Interior Longleaf Pine Woodland (CES202.319).

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)
- East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)
- Southeastern Interior Longleaf Pine Woodland (CES202.319)

Related Concepts:

- Mesic Flatwoods (FNAI 1990) Undetermined
- Sandhill (FNAI 1990) Broader
- Upland Pine Forest (FNAI 1990) Undetermined

DESCRIPTION

Environment: This system once occupied extensive areas of the East Gulf Coastal Plain from the northern range limits of *Pinus palustris* southward to the inland terminus of the Coastal Flatlands (*sensu* Peet and Allard (1993); Ecoregion 75a (EPA 2004)). In its natural condition, this system occupied a range of upland soils from clays and loams to deep sands. Although "sandhills" and "loamhills" are generally recognizable components of this system (due to locally distinctive understory, shrub and herbaceous vegetation associated with differing soil textures), within the range of this system, they are generally interspersed to such an extent that differentiating them as separate systems is not practical. Although the topography of this system is overall much more rolling than East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375) to the south, the largest and best developed examples are more likely to occupy landscapes with few impediments to the ignition and spread of natural fires. Localized soil characteristics determine the specific composition of the lower strata in various examples of this system. Ultisols are the dominant order and cover most of the range of the system. Ultisols most commonly associated with longleaf pine are the Typic Paleudults and Plinthic Paleudults. More limited areas are occupied by Psamments and other coarser-textured materials. Longleaf pine grows in warm, wet temperate climates characterized by hot summers and mild winters. Annual mean temperatures range from 16 to 23 degrees C (60-74 degrees F), and annual precipitation ranges from 1090 to 1750 mm (43-69 inches) (Boyer 1990). Fall is the driest season of the year, although periods of drought during the growing season are not unusual (Boyer 1990).

Vegetation: Occurrences of this system are typically more-or-less open-canopy stands (woodlands) dominated by the evergreen needle-leaved tree *Pinus palustris*. In parts of the range, and on more rolling topography, other pines may be present, including *Pinus echinata* and *Pinus taeda*. These may increase or become codominant with extended fire-return times. Unless fire suppression is extreme, deciduous trees generally do not share dominance in the canopy. More mesic stands (e.g., those on finer-textured soils) may contain oaks, such as *Quercus falcata*, *Quercus nigra*, or *Quercus pumila*, and occasionally species favoring more xeric conditions, such as *Quercus marilandica* or *Quercus stellata*, in combination with the more mesic oaks. Even more xeric stands (uncommon in

this system) may contain "scrub oaks" such as *Quercus incana*, *Quercus laevis*, *Quercus margarettiae*, or *Quercus arkansana*. In fire-suppressed areas, *Quercus falcata*, *Liquidambar styraciflua*, *Acer rubrum*, *Quercus nigra*, *Nyssa sylvatica*, *Cornus florida*, *Callicarpa americana*, and/or *Rhus copallinum* may invade or increase. Some typical mesic to dry-mesic herbaceous species include *Andropogon ternarius*, *Andropogon gyrans* var. *gyrans*, *Schizachyrium scoparium*, *Sorghastrum nutans*, and *Panicum virgatum*. *Aristida stricta* or *Aristida beyrichiana* are also dominant or at least present in the herbaceous layer of many more southern and coastward examples. Variation in floristic composition of this wide-ranging system is related to site conditions, fire-return interval, and local or regional floristics. The herbaceous layer typically becomes much less diverse with increased fire-return interval. The wiregrass *Aristida beyrichiana* is not present throughout the range of this system, and even within the range of this species, it tends to be dominant or more abundant in moister sites, particularly in the western part of the system's range (and also in examples of East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)).

MEMBERSHIP

Associations:

- *Liquidambar styraciflua* - *Quercus (nigra, phellos)* - *Pinus taeda* / *Vaccinium elliotii* - *Morella cerifera* Forest (CEGL007726, GNA)
- *Pinus palustris* - *Pinus (echinata, taeda)* / *Quercus (marilandica, laevis)* / *Schizachyrium scoparium* Woodland (CEGL008491, G3)
- *Pinus palustris* - *Pinus (echinata, taeda)* / *Schizachyrium tenerum* - *Vernonia angustifolia* Woodland (CEGL004774, G2G3)
- *Pinus palustris* / *Asimina angustifolia* / *Aristida beyrichiana* - *Schizachyrium scoparium* - *Dyschoriste oblongifolia* Woodland (CEGL004485, G3?)
- *Pinus palustris* / *Quercus falcata* / *Cornus florida* / *Aristida beyrichiana* Woodland (CEGL004945, G1G2)
- *Pinus palustris* / *Quercus falcata* / *Cornus florida* / *Schizachyrium scoparium* Woodland (CEGL003575, G3)
- *Pinus palustris* / *Quercus incana* / *Sporobolus clandestinus* Woodland (CEGL004957, G1G2)
- *Pinus palustris* / *Quercus laevis* / *Aristida beyrichiana* - *Pityopsis aspera* Woodland (CEGL003583, G3)
- *Pinus palustris* / *Quercus laevis* / *Schizachyrium scoparium* - *Rhynchosia cytisoides* Woodland (CEGL003587, G3)
- *Pinus palustris* / *Quercus laevis* / *Serenoa repens* - *Clinopodium coccineum* Woodland (CEGL003601, G2)
- *Pinus palustris* / *Quercus laevis* / *Serenoa repens* / *Aristida condensata* Woodland (CEGL003588, G2)
- *Pinus palustris* / *Quercus marilandica* / *Schizachyrium scoparium* - *Schizachyrium tenerum* - *Rhexia alifanus* Woodland (CEGL003598, G2G3)
- *Pinus palustris* / *Quercus pumila* / *Aristida beyrichiana* Woodland (CEGL007749, G2G3)
- *Pinus palustris* / *Schizachyrium scoparium* - *Coreopsis tripteris* - *Baptisia bracteata* var. *leucophaea* Woodland (CEGL004955, G2)
- *Pinus palustris* / *Schizachyrium scoparium* - *Verbesina aristata* Loamhill Woodland (CEGL008452, G2G3)
- *Pinus palustris* Planted Forest (CEGL007176, GNA)
- *Quercus (margarettiae, stellata)* - *Quercus marilandica* / *Crataegus flava* / *Schizachyrium scoparium* Woodland (CEGL008479, GNA)
- *Quercus laevis* - *Carya floridana* / *Cladonia* spp. Woodland (CEGL007254, GNA)
- *Quercus laevis* / (*Andropogon virginicus*, *Aristida* spp., *Schizachyrium scoparium*) Woodland (CEGL004689, GNA)
- *Quercus nigra* Forest (CEGL004638, GNA)

Alliances:

- *Liquidambar styraciflua* Forest Alliance (A.234)
- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Pinus palustris* Planted Forest Alliance (A.96)
- *Pinus palustris* Woodland Alliance (A.520)
- *Quercus laevis* Woodland Alliance (A.617)
- *Quercus nigra* Forest Alliance (A.247)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)

DISTRIBUTION

Range: This system formerly occupied an extensive range across the southern parts of Alabama, Florida, and Mississippi, and was also present in limited areas of Louisiana and Georgia. It has been greatly reduced in its extent, with much of its range now occupied by agriculture and/or forestry operations. In southwestern Mississippi, this system is apparently absent (or very rare and limited) west of 91 degrees W longitude to the limits of the alluvial plain and northwest of a line running approximately from the intersection of 31 degrees N latitude and 91 degrees W longitude, northeastward to the city of Jackson, Mississippi. This is consistent with the ranges of "Oak-Pine" vegetation versus "Longleaf-Loblolly-Slash Pines" (generally equivalent to this system) in Shantz and Zon (1924).

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS

Map Zones: 46:C, 55:C, 99:C

TNC Ecoregions: 43:C, 53:C

SOURCES

References: Boyer 1990, Comer et al. 2003, EPA 2004, Peet and Allard 1993, Shantz and Zon 1924

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723090#references

Description Author: R. Evans, A. Schotz, M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans, A. Schotz, M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1328 EAST GULF COASTAL PLAIN LIMESTONE FOREST (CES203.502)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Circumneutral Soil; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2328; ESLF 4134; ESP 1328

CONCEPT

Summary: This system represents deciduous forests of the East Gulf Coastal Plain where limestone or other calcareous substrates occur near enough to the surface to influence vegetation composition. Examples are most common in the Black Belt region of Alabama and Mississippi, but are also present in more isolated patches in other portions of the region, including western Alabama, eastern Georgia, and southwestern middle Tennessee. Generally, the vegetation consists of forests and woodlands on well-developed, deep soils. Related vegetation surrounding rock outcrops and calcareous prairies is accommodated within other ecological systems. **Classification Comments:** Is this sufficiently extensive in the Atlantic Coastal Plain (e.g., South Carolina) to be recognized? Placed inquiry to SC Heritage (Pittman/Boyle 11-2006) as they have a study ongoing related to these communities in SC.

DESCRIPTION

Environment: Stands typically occur on ridges and upper to middle slopes of the East Gulf Coastal Plain where limestone or other calcareous substrates occur near enough to the surface to influence vegetation composition.

Vegetation: Typical stands are dominated by oaks and hickories, particularly species which are indicative of finer-textured soils and/or a higher base status in the soil (e.g., *Carya carolinae-septentrionalis*, *Quercus muehlenbergii*, *Quercus pagoda*, *Quercus shumardii*, *Quercus stellata*). Other hardwood trees include *Fraxinus americana*, *Liquidambar styraciflua*, *Acer barbatum*, and *Aesculus glabra*. The rare *Carya myristiciformis* may also be found in some stands. Understory trees may include *Fraxinus americana* and *Juniperus virginiana* var. *virginiana*. Early-successional or fire-suppressed stands may exhibit greater dominance by *Juniperus virginiana*. More nutrient-rich or fire-sheltered stands may exhibit dominance or codominance by *Fraxinus americana*, *Tilia americana* (most commonly var. *caroliniana*, but var. *heterophylla* along the Chattahoochee River), and/or *Acer barbatum*. Understory trees may include smaller examples of canopy species in addition to *Aesculus pavia* var. *pavia*, *Cercis canadensis*, *Cornus florida*, *Ostrya virginiana*, and *Ulmus alata*. Shrubs and woody vines may include *Arundinaria gigantea*, *Berchemia scandens*, *Bignonia capreolata*, *Cocculus carolinus*, *Cornus drummondii*, *Crataegus* spp., *Euonymus americanus*, *Euonymus atropurpureus*, *Frangula caroliniana*, *Hydrangea quercifolia*, *Ilex decidua*, *Menispermum canadense*, *Parthenocissus quinquefolia*, *Ptelea trifoliata*, *Sideroxylon lycioides*, *Staphylea trifolia*, *Symphoricarpos orbiculatus*, *Toxicodendron radicans*, *Viburnum* spp., and *Vitis* spp. Some typical herbs include *Chasmanthium laxum*, *Chasmanthium sessiliflorum*, *Dichantheium boscii*, *Lithospermum tuberosum*, *Polystichum acrostichoides*, *Sanicula* spp., *Solidago auriculata*, *Spigelia marilandica*, *Trillium* spp., and *Verbesina virginica*. The ground layers of some stands may exhibit dominance by native warm-season grasses and other graminoids, including *Schizachyrium scoparium*, *Andropogon* spp., *Danthonia* spp., and *Carex cherokeensis*. In addition, *Tillandsia usneoides* may be present as an epiphyte.

MEMBERSHIP

Associations:

- *Acer barbatum* - *Aesculus glabra* - *Carya myristiciformis* - *Quercus shumardii* - *Quercus muehlenbergii* Forest (CEGL004671, G1G2)
- *Fraxinus americana* - *Juglans nigra* - *Ulmus rubra* / *Acer barbatum* - *Ostrya virginiana* / *Ptelea trifoliata* Forest (CEGL007180, G2)
- *Juniperus virginiana* var. *virginiana* - (*Quercus* spp.) Forest (CEGL007124, GNA)
- *Quercus muehlenbergii* - *Quercus shumardii* - *Carya* (*carolinae-septentrionalis*, *ovata*) Forest (CEGL007808, G3)
- *Quercus pagoda* - *Liquidambar styraciflua* / *Quercus shumardii* / *Verbesina virginica* - *Solidago auriculata* Forest (CEGL008585, G3G4)
- *Quercus shumardii* - *Fraxinus americana* - *Carya* spp. / *Juniperus virginiana* var. *virginiana* Forest (CEGL004685, G2?)
- *Quercus shumardii* - *Quercus pagoda* - *Fraxinus americana* / *Ostrya virginiana* - *Cornus florida* / *Trillium ludovicianum* Forest (CEGL007272, G1)
- *Tilia americana* (var. *caroliniana*, var. *heterophylla*) - *Acer barbatum* - *Fraxinus americana* / *Arundinaria gigantea* / *Tillandsia usneoides* Forest (CEGL008557, G2G3)

Alliances:

- *Acer barbatum* - *Fraxinus americana* - (*Juglans nigra*) Forest Alliance (A.214)
- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

DISTRIBUTION

Range: This system occurs in the East Gulf Coastal Plain, most commonly in the Black Belt region of Alabama and Mississippi. It is also present in more isolated patches in other portions of the region, including western Alabama, eastern Georgia, and marginally in southwestern middle Tennessee.

Divisions: 203:C

Nations: US

Subnations: AL, GA?, MS, TN

Map Zones: 46:C, 55:C, 99:C

TNC Ecoregions: 43:C, 53:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723086#references

Description Author: A. Schotz and R. Evans, mod. M. Pyne

Version: 29 Sep 2006

Concept Author: A. Schotz and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1380 EAST GULF COASTAL PLAIN MARITIME FOREST (CES203.503)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); East Gulf Coastal Plain; Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2380; ESLF 4323; ESP 1380

CONCEPT

Summary: This system encompasses a mosaic of woody vegetation present on barrier islands and near-coastal strands along the northern Gulf of Mexico, from the Florida panhandle to southern Mississippi. Examples may include forests and/or shrublands that are found in somewhat more protected environments than East Gulf Coastal Plain Dune and Coastal Grassland (CES203.500). Such areas include relatively stabilized coastal dunes, sometimes with a substantial shell component. Vegetation structure and composition are influenced by salt spray, extreme disturbance events, and the distinctive climate of the immediate coast. Stands may be dominated by a variety of needle-leaved and broad-leaved evergreen trees, including *Pinus clausa*, *Pinus elliottii* var. *elliottii*, *Pinus palustris*, *Quercus virginiana*, *Sabal palmetto*, *Carya glabra*, and *Carya pallida*. Wetland inclusions may be dominated by *Taxodium ascendens* and *Magnolia virginiana*. The most heavily salt-influenced examples may appear pruned or sculpted.

Similar Ecological Systems:

- East Gulf Coastal Plain Dune and Coastal Grassland (CES203.500)

Related Concepts:

- Maritime Hammock (FNAI 1990) Broader
- Shell Mound (FNAI 1990) Intersecting

DESCRIPTION

Vegetation: Stands may be dominated by a variety of needle-leaved and broad-leaved evergreen trees, including *Pinus clausa*, *Pinus elliottii* var. *elliottii*, *Pinus palustris*, *Quercus virginiana*, *Sabal palmetto*, *Carya glabra*, and *Carya pallida*. Wetland inclusions may be dominated by *Taxodium ascendens* and *Magnolia virginiana*. Understory trees and shrubs may include *Quercus geminata*, *Quercus myrtifolia*, *Ilex vomitoria*, *Serenoa repens*, *Morella cerifera*, *Ilex glabra*, *Vaccinium arboreum*, *Juniperus virginiana*, *Zanthoxylum clava-herculis*, *Sideroxylon lanuginosum*, *Persea borbonia*, *Conradina canescens*, and *Callicarpa americana*. Herbs may include *Spartina patens*, *Juncus roemerianus*, and *Panicum virgatum*. Wetland inclusions may contain *Cladium mariscus* ssp. *jamaicense*.

MEMBERSHIP

Associations:

- *Pinus clausa* / *Quercus geminata* - *Quercus myrtifolia* - *Conradina canescens* Woodland (CEGL003554, G2)
- *Pinus elliottii* var. *elliottii* - (*Pinus palustris*) / *Ilex vomitoria* - *Serenoa repens* - *Morella cerifera* Woodland (CEGL004658, G2G3)
- *Pinus elliottii* var. *elliottii* / *Serenoa repens* - *Ilex glabra* - *Morella cerifera* - *Ilex vomitoria* Woodland (CEGL004680, G3)
- *Pinus elliottii* var. *elliottii* / *Spartina patens* - *Juncus roemerianus* - (*Panicum virgatum*) Woodland (CEGL004958, G3?)
- *Quercus virginiana* - (*Juniperus virginiana*) - *Zanthoxylum clava-herculis* / *Sideroxylon lanuginosum* Woodland (CEGL003523, G2G3)
- *Quercus virginiana* - (*Pinus elliottii* var. *elliottii*, *Sabal palmetto*) / *Persea borbonia* - *Callicarpa americana* Forest (CEGL007032, G2)
- *Quercus virginiana* - *Pinus clausa* / *Carya (glabra, pallida)* / *Serenoa repens* Forest (CEGL004976, G2Q)
- *Quercus virginiana* / *Vaccinium arboreum* - *Ilex vomitoria* Forest (CEGL007028, G2G3)
- *Taxodium ascendens* / *Magnolia virginiana* / *Cladium mariscus* ssp. *jamaicense* Forest (CEGL004914, G1)

Alliances:

- *Pinus clausa* Woodland Alliance (A.511)
- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris* Woodland Alliance (A.520)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Quercus virginiana* - *Juniperus virginiana* - (*Sabal palmetto*) Woodland Alliance (A.479)
- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)

DISTRIBUTION

Range: This system is found along the northern Gulf of Mexico, from the Florida panhandle to southern Mississippi, restricted to the most coastward part of the "Gulf Coast Flatwoods" (Ecoregion 75a of EPA (2004)).

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C
TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, EPA 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723085#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Jun 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1307 EAST GULF COASTAL PLAIN NORTHERN DRY UPLAND HARDWOOD FOREST (CES203.483)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2307; ESLF 4113; ESP 1307

CONCEPT

Summary: This system represents dry, upland, predominantly hardwood forests of limited portions of the Coastal Plain of western Kentucky and Tennessee, northern Mississippi and Alabama. The core range of this type lies within the Northern Hilly Coastal Plain (Level IV Ecoregion 65e) of Omernik (EPA 2004), which includes the Northern Pontotoc Ridge (222Cf), Upper Loam Hills (222Cg), and Northern Loessal Hills (222Ce) subsections of Keys et al. (1995). These areas occupy the eastern margin of the upper Coastal Plain where elevation is greatest and influence of loess is less than adjacent areas to the west. The vegetation has been broadly considered distinct from other Coastal Plain forests (Bryant et al. 1993, Fralish and Franklin 2002) but has received almost no specific study. Although vastly forested when compared to the loess plains to the west (USGS 1992), most of the vegetation is recovering from one or more forms of severe disturbance (Franklin and Kupfer 2000). *Quercus alba* dominates the upland forests which have been studied in a limited portion of this area (Franklin and Kupfer 2000), but communities have not been described to the same detail as in other ecological systems.

Classification Comments: The range of this system overlaps with East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506) in the Fall Line Hills (Ecoregion 65i) of Alabama and in the Southern Hilly Gulf Coastal Plain (Ecoregion 65d) of Mississippi and may overlap to some degree with Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560) at its southern boundary as well. In parts of the overlapping range (including the Oakmulgee Ranger District of the Talladega National Forest), these types occur in a mosaic which is difficult to interpret environmentally and ecologically (A. Schotz pers. comm.). The vegetation of this system has received almost no specific study and is extremely poorly documented.

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

DESCRIPTION

Environment: The most northern examples (e.g., western Tennessee and Kentucky) occur along the eastern margin of the Coastal Plain where elevation is greatest and influence of loess is minimal, and where they occur as predominantly slope forests in relatively deep, dissected stream valleys. The vegetation in this region has been broadly considered distinct from other Coastal Plain forests (Bryant et al. 1993, Fralish and Franklin 2002) but has received almost no specific study (Franklin and Kupfer 2000). Although vastly forested when compared to the loess plains to the west (USGS 1992), most of the vegetation is recovering from one or more forms of severe disturbance (Franklin and Kupfer 2000). *Quercus alba* dominates the upland forests which have been studied in a limited portion of this area (Franklin and Kupfer 2000), but communities have not been described to the same detail as in other ecological systems.

Vegetation: Stands may contain *Aesculus pavia*, *Carya alba*, *Carya glabra*, *Carya pallida*, *Carya* spp., *Celtis laevigata*, *Iris verna* var. *smalliana*, *Kalmia latifolia*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Ostrya virginiana*, *Oxydendrum arboreum*, *Quercus alba*, *Quercus falcata*, *Quercus marilandica*, *Quercus muehlenbergii*, *Quercus pagoda*, *Quercus stellata*, *Quercus velutina*, *Styrax grandifolius*, *Vaccinium arboreum*, *Vaccinium* spp., and *Vaccinium stamineum*.

Dynamics: Fire suppression and the resulting greater understory density and resulting cooler conditions on the forest floor affect this system.

MEMBERSHIP

Associations:

- *Liquidambar styraciflua* - *Quercus* (*alba*, *falcata*) Forest (CEGL007217, GNA)
- *Liriodendron tulipifera* - *Quercus* spp. Forest (CEGL007221, GNA)
- *Quercus alba* - *Carya glabra* - *Carya alba* / *Aesculus pavia* Forest (CEGL007225, G4?)
- *Quercus alba* - *Carya glabra* / Mixed Herbs Coastal Plain Forest (CEGL007226, G4?)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244, G4G5)
- *Quercus falcata* - *Quercus stellata* - *Carya alba* / *Vaccinium* spp. Coastal Plain Forest (CEGL007246, G4?)
- *Quercus muehlenbergii* - *Carya* spp. / *Ostrya virginiana* Upper East Gulf Coastal Plain Forest (CEGL003903, G3)
- *Quercus pagoda* - (*Quercus falcata*) / *Ostrya virginiana* Forest (CEGL003871, G3?)
- *Quercus prinus* - *Carya* spp. - *Quercus velutina* / *Vaccinium arboreum* / *Iris verna* var. *smalliana* Forest (CEGL007261, G3G4)
- *Quercus prinus* - *Quercus* spp. / *Vaccinium arboreum* - (*Kalmia latifolia*, *Styrax grandifolius*) Forest (CEGL007700, G4)
- *Quercus stellata* - *Quercus marilandica* - *Carya* (*alba*, *pallida*) Upper East Gulf Coastal Plain Woodland (CEGL003952, G2G3)
- *Quercus velutina* - *Carya pallida* - *Tilia americana* var. *heterophylla* / *Celtis laevigata* / *Aesculus pavia* Forest (CEGL008565,

G3G4)

Alliances:

- *Liquidambar styraciflua* Forest Alliance (A.234)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)
- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)
- South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479)

Adjacent Ecological System Comments: To the west this system grades into East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482). The two types are similar and may be difficult to distinguish where they come together. The loess plain type is believed to be more mesic and richer floristically due to the influence of the loessal soils. However, it is also rare due to the fertility of the soils for agriculture. More work is needed to better quantify the differences between these types and their exact boundaries.

DISTRIBUTION

Range: This system is found in the Coastal Plain of western Kentucky and Tennessee, ranging south to northern Mississippi and Alabama.

Divisions: 203:C

Nations: US

Subnations: AL, KY, MS, TN

Map Zones: 46:C, 47:C

TNC Ecoregions: 43:C

SOURCES

References: Bryant et al. 1993, Comer et al. 2003, Fralish and Franklin 2002, Franklin and Kupfer 2000, Keys et al. 1995, Smalley et al. 1996, Springer and Elder 1980, USGS 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723103#references

Description Author: R. Evans and M. Pyne

Version: 05 Apr 2007

Concept Author: R. Evans and M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1327 EAST GULF COASTAL PLAIN NORTHERN LOESS BLUFF FOREST (CES203.481)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Loess deposit (undifferentiated); Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2327; ESLF 4133; ESP 1327

CONCEPT

Summary: This system is largely confined to steep bluffs bordering the northern portion of the eastern edge of the Mississippi River Alluvial Plain. The geology is typically mapped as the Jackson Formation. These bluffs extend up to 150 m (500 feet) in elevation and from 30 to 60 m (100-200 feet) above the adjacent plain. They consist of a belt of Pleistocene and Tertiary eolian deposits (Braun 1950) that are often deeply eroded and very steep, with fertile top soil and abundant moisture (Miller and Neiswender 1987). The vegetation is often richer than surrounding non-loessal areas, or those with only thin loess deposits. The forests found on these bluffs are intermediate in soil moisture for the region and may best be thought of as mesic. The vegetation may sometimes be referred to as western mesophytic forest and may share some superficial similarities with cove forests of the Interior Highlands. In many cases, these bluffs provide habitat for plant species that are rare or absent from other parts of the Coastal Plain. Braun (1950) noted that the composition of forest changes from north to south along the bluffs; more southerly examples are represented by the East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556), and these would contain *Magnolia grandiflora* as an important component. As currently defined this system ranges northward from about 32 degrees N latitude (where the Big Black River cuts through the bluffs), and occurs only in the westernmost portions of the Upper East Gulf Coastal Plain, including northern and central Mississippi, western Tennessee, and western Kentucky, being restricted to the northern part of the Loess Bluff Hills (Ecoregion 74a of EPA (2004)).

Classification Comments: Similar ecological systems include East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556) which occurs further southward in the East Gulf Coastal Plain and has greater dominance by broad-leaved and needle-leaved evergreen trees, Southern Coastal Plain Mesic Slope Forest (CES203.476), and East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477). There are other mixed deciduous mesic systems in the West Gulf Coastal Plain as well as other mesic forest systems to the east of this one, in areas other than the loess bluffs.

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477)
- East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)
- Southern Coastal Plain Mesic Slope Forest (CES203.476)

Related Concepts:

- Coastal Plain Mesophytic Cane Forest (Evans 1991) Finer

DESCRIPTION

Environment: This system is largely confined to steep bluffs east of the Mississippi River consisting of a belt of Pleistocene and Tertiary eolian deposits (Braun 1950) that are often deeply eroded and very steep, with fertile topsoil and abundant moisture (Miller and Neiswender 1987). The core of this is mapped as the Jackson Formation (Hardeman 1966) and corresponds more broadly with Ecoregion 74a (Bluff Hills) (EPA 2004). These bluffs border the eastern edge of the Mississippi River Alluvial Plain from about 32 degrees N latitude (where the Big Black River cuts through the bluffs) northward to western Tennessee and Kentucky. Examples may extend up to 150 m (500 feet) in elevation and from 30 to 60 m (100-200 feet) above the adjacent Mississippi Alluvial Plain. In Tennessee the loess soils may be 9-27.5 m (30-90 feet deep) (Springer and Elder 1980).

Vegetation: Examples of this system have deciduous canopies dominated by *Fagus grandifolia* or this species in combination with *Quercus alba*. The most mesic stands may lack codominance by *Quercus* spp. In addition, a variety of other hardwood species may also be found in the overstory, including *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Acer rubrum*, *Nyssa sylvatica*, *Fraxinus americana*, *Magnolia acuminata* (of local distribution), and *Pinus taeda* (in more southern stands). This system is defined as being north of the range of *Magnolia grandiflora*, which excludes the "Beech-Magnolia" forests of the southern loess bluffs. Some subcanopy components (in addition to canopy species) include *Carpinus caroliniana*, *Diospyros virginiana*, *Oxydendrum arboreum*, *Cornus florida*, *Acer barbatum*, *Magnolia macrophylla*, *Ostrya virginiana*, *Ulmus alata*, and *Ilex opaca*. Other shrubs and woody vines include *Decumaria barbara*, *Rhododendron canescens*, *Toxicodendron radicans*, *Vitis rotundifolia*, and *Smilax glauca*. Important herbs include *Polystichum acrostichoides*, *Woodwardia areolata*, *Osmunda cinnamomea*, *Mitchella repens*, and *Hexastylis arifolia*. In many cases, these bluffs provide habitat for plant species that are rare or absent from other parts of the Coastal Plain, such as *Magnolia acuminata*, *Aralia racemosa*, and *Hydrophyllum canadense* (Chester et al. 1997).

Dynamics: These are stable, generally fire-sheltered forests. There is presumably some natural disturbance from the effects of windstorms, which are relatively frequent in the range of this system.

MEMBERSHIP

Associations:

- *Liquidambar styraciflua* - *Carya illinoensis* - *Quercus nigra* Forest (CEGL004122, GNA)
- *Quercus alba* - *Quercus nigra* - *Carya pallida* - (*Quercus pagoda*) / *Magnolia (grandiflora, macrophylla)* Forest (CEGL004775, G3G4)
- *Quercus pagoda* - *Quercus nigra* Forest (CEGL004109, G3)

Alliances:

- *Liquidambar styraciflua* Forest Alliance (A.234)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

DISTRIBUTION

Range: This system is endemic to the loess bluffs ("Bluff Hills" [Ecoregion 74a] of EPA (2004)) along the eastern edge of the Mississippi River Alluvial Plain in Mississippi, Tennessee, and Kentucky.

Divisions: 203:C

Nations: US

Subnations: KY, MS, TN

Map Zones: 46:C, 47:C

TNC Ecoregions: 43:C

SOURCES

References: Braun 1950, Chester et al. 1997, Comer et al. 2003, EPA 2004, Hardeman 1966, Miller and Neiswender 1987, Springer and Elder 1980

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723105#references

Description Author: R. Evans and M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans and M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1306 EAST GULF COASTAL PLAIN NORTHERN LOESS PLAIN OAK-HICKORY UPLAND (CES203.482)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Loess deposit (undifferentiated); Forest and Woodland (Treed); Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2306; ESLF 4112; ESP 1306

CONCEPT

Summary: This is the former matrix hardwood system flanking the loess bluffs of the most northern portions of the Upper East Gulf Coastal Plain of western Tennessee, western Kentucky, possibly southern Illinois, and northern Mississippi. The core distribution of this system is mapped as the Loess Plains (Level IV Ecoregion 74b) of Omernik (EPA 2004). Extensive forests once covered this broad area of generally flat to rolling uplands. Most have been cleared for agriculture due to the rich, productive soils derived from relatively thick loess deposits. The areal extent of this forested system has been so heavily reduced, that the component community types remain undocumented and speculative at best.

Classification Comments: The southern boundary of this system has not been clearly delineated; Omernik (EPA 2004) Ecoregion 74b extends farther south than the presumed boundary of this system. For now, the boundary is assumed to occur in northern Mississippi at the latitude of the junction of Omernik (EPA 2004) Ecoregion 65e and Ecoregion 65d (ca. 34 degrees N). To the east, this system grades into East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483). The two types may be similar and difficult to distinguish where they come together, but the former is believed to be more mesic and richer floristically due to the influence of the loessal soils. However, it is also rare due the fertility of the soils for agriculture. More work is needed to better quantify the differences between these types and their exact boundaries.

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

Related Concepts:

- Acidic Subseric Forest (Evans 1991) Broader

DESCRIPTION

Environment: Soils included in this system in western Tennessee are silty and rich, derived from loess deposits. Most of the soils have fragipans and some are poorly drained (Springer and Elder 1980).

Vegetation: Typical stands would contain oaks and other hardwoods, with scattered successional stands dominated by *Juniperus virginiana* var. *virginiana*. Some typical canopy dominants include *Quercus falcata*, *Quercus alba*, *Carya alba*, *Quercus stellata*, *Quercus marilandica*, and *Quercus velutina*.

MEMBERSHIP

Associations:

- *Juniperus virginiana* var. *virginiana* - (*Quercus* spp.) Forest (CEGL007124, GNA)
- *Liquidambar styraciflua* - *Quercus* (*alba*, *falcata*) Forest (CEGL007217, GNA)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244, G4G5)
- *Quercus stellata* - *Quercus marilandica* - *Quercus velutina* - *Carya texana* / *Schizachyrium scoparium* Woodland (CEGL002149, G2G3)

Alliances:

- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Liquidambar styraciflua* Forest Alliance (A.234)
- *Quercus alba* - *Quercus* (*falcata*, *stellata*) Forest Alliance (A.241)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)

SPATIAL CHARACTERISTICS

Spatial Summary: Historically a matrix system which dominated the landscape; in current condition only exists in small isolated patches.

Adjacent Ecological Systems:

- East Gulf Coastal Plain Jackson Plain Prairie and Barrens (CES203.353)
- East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)
- East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477)
- South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479)
- South-Central Interior / Upper Coastal Plain Wet Flatwoods (CES203.480)

Adjacent Ecological System Comments: Included within this former matrix system were patches of other systems including East Gulf Coastal Plain Jackson Plain Prairie and Barrens (CES203.353), South-Central Interior / Upper Coastal Plain Wet Flatwoods

(CES203.480), and South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479). It is bordered on the west by East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477) and to the east by East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483).

DISTRIBUTION

Range: This system would have occupied the most northern portions of the Upper East Gulf Coastal Plain of western Tennessee, western Kentucky, possibly southern Illinois, and northern Mississippi. Today it is reduced to remnants in a largely agricultural landscape.

Divisions: 203:C

Nations: US

Subnations: IL?, KY, MS, TN

Map Zones: 46:C, 47:C, 49:?

TNC Ecoregions: 43:C

SOURCES

References: Comer et al. 2003, EPA 2004, Springer and Elder 1980

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723104#references

Description Author: R. Evans and M. Pyne

Version: 29 Jan 2003

Concept Author: R. Evans and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1325 EAST GULF COASTAL PLAIN NORTHERN MESIC HARDWOOD SLOPE FOREST (CES203.477)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Slope; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2325; ESLF 4131; ESP 1325

CONCEPT

Summary: This system includes mesic deciduous hardwood forests of inland portions of the East Gulf Coastal Plain, including Alabama, Mississippi, western Kentucky, and western Tennessee. This system covers parts of the more mesic forests in the coastal plain portion of the Western Mesophytic Forest Region of Braun (1950) referred to as mesophytic mixed hardwoods, as well as mesic forests in the adjacent "Oak-Pine-Hickory" region to the south (Greller 1988). Examples of this system occur on slopes and ravines between dry uplands and stream bottoms. Mesic forests of the loess bluffs are treated in separate ecological systems, being confined to that landform of steep bluffs and ravines on deep loess. The most characteristic feature of the vegetation in some examples may be *Fagus grandifolia*, but a variety of other hardwood species may also be found in the overstory, and *Fagus grandifolia* may not always be present. Some stands may be dominated by *Fagus grandifolia* and *Quercus alba*, others by *Quercus alba* or *Quercus pagoda* with other mesic hardwoods. In addition, *Pinus taeda* may be common in some examples in the southern portion of the range and, depending on previous disturbance and site conditions, may be locally dominant [see CEGLO04763]. To the south this system is replaced by Southern Coastal Plain Mesic Slope Forest (CES203.476), which is within the range of *Pinus glabra* and *Magnolia grandiflora*. Most of the vegetation is recovering from one or more forms of severe disturbance (Franklin and Kupfer 2000).

Classification Comments: Southern Coastal Plain Mesic Slope Forest (CES203.476) is a similar mesic forest system to the south of this one in the East Gulf Coastal Plain with greater dominance by broad-leaved evergreen trees. The systems of the loess bluffs to the west of this one, bordering the Mississippi River Alluvial Plain, are treated as distinct and are more extensive and continuous in their extent both vertically and latitudinally [see East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481) and East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)]. One association now (2005) included here (*Quercus alba* - *Fagus grandifolia* / *Hydrangea quercifolia* - *Viburnum acerifolium* / *Carex picta* - *Polystichum acrostichoides* Forest (CEGL007213)) has the majority of its occurrences in the interior regions (southern Cumberland Plateau, Ridge and Valley), but its flora contains some Coastal Plain elements as well as more interior ones. It is from a "transition region" where *Quercus rubra* may be present in parts of the upper Coastal Plain and conversely some more southerly affiliated species (e.g., *Decumaria barbara*) range farther north. This association is now affiliated with two different ecological systems.

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481)
- East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)
- Southern Coastal Plain Mesic Slope Forest (CES203.476)

Related Concepts:

- Deep Soil Mesophytic Forest (Evans 1991) Intersecting

DESCRIPTION

Environment: This system occurs along the eastern margin of the Upper Coastal Plain where elevation is greatest and influence of loess is minimal where they occur as predominantly slope forests in relatively deep, dissected stream valleys. The vegetation in this region has been broadly considered distinct from other Coastal Plain forests (Bryant et al. 1993, Fralish and Franklin 2002) but has received almost no specific study (Franklin and Kupfer 2000). Although vastly forested when compared to the loess plains to the west (USGS 1992), most of the vegetation is recovering from one or more forms of severe disturbance (Franklin and Kupfer 2000).

Quercus alba dominates the upland forests which have been studied in a limited portion of this area (Franklin and Kupfer 2000), but communities have not been described to the same detail as in other ecological systems.

Vegetation: The most characteristic feature of the vegetation is a high cover value for *Fagus grandifolia*, but a variety of other hardwood species may also be found in the overstory. Stands are mesic, and some may be dominated by *Fagus grandifolia* and *Quercus alba*, others by *Quercus alba* or *Quercus pagoda* with other mesic hardwoods. This system is defined as being north of the range of *Magnolia grandiflora*, which excludes the "Beech-Magnolia" forests of the deeper south. From north to south, there is some floristic variability in the component floristics of this system. *Quercus rubra* will be of greater importance north of 35 degrees N latitude, and *Pinus taeda* conversely of greater importance to the south of this boundary. The core concept of this system consists of association types in which *Quercus* spp. can be present in the canopy, but are not dominant; but some may exhibit codominance by *Fagus grandifolia* and *Quercus alba* or other mesic *Quercus* spp. Other important canopy components include *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Acer rubrum*, *Nyssa sylvatica*, *Fraxinus americana*, *Magnolia acuminata* (of local distribution), *Magnolia virginiana*, and *Pinus taeda*. Some subcanopy components (in addition to canopy species) include *Carpinus caroliniana*, *Diospyros virginiana*, *Oxydendrum arboreum*, *Cornus florida*, *Acer barbatum*, *Magnolia macrophylla*, *Ostrya virginiana*, *Ulmus alata*, and *Ilex*

opaca. Other shrubs and woody vines include *Decumaria barbara*, *Rhododendron canescens*, *Toxicodendron radicans*, *Vitis rotundifolia*, and *Smilax glauca*. Important herbs include *Polystichum acrostichoides*, *Woodwardia areolata*, *Osmunda cinnamomea*, *Mitchella repens*, and *Hexastylis arifolia*. This system is found north of the distribution of *Pinus glabra* and *Magnolia grandiflora*, which will be absent.

Dynamics: These are stable, generally fire-sheltered forests. There is presumably some natural disturbance from the effects of hurricanes (to the south), or from other windstorms, which are relatively frequent in the range of this system.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Acer saccharum* - *Liriodendron tulipifera* Unglaciated Forest (CEGL002411, G4?)
- *Fagus grandifolia* - *Liriodendron tulipifera* / *Euonymus americanus* / *Athyrium filix-femina* ssp. *aspennioides* Forest (CEGL007201, G4)
- *Fagus grandifolia* - *Quercus alba* / *Cornus florida* Forest (CEGL007881, G4)
- *Pinus taeda* - *Quercus alba* / *Chasmanthium sessiliflorum* Forest (CEGL004763, G3G4)
- *Quercus alba* - *Carya (alba, ovata)* - *Liriodendron tulipifera* - (*Quercus phellos*) / *Cornus florida* Forest (CEGL007709, G4)
- *Quercus alba* - *Carya glabra* - *Carya alba* / *Aesculus pavia* Forest (CEGL007225, G4?)
- *Quercus alba* - *Fagus grandifolia* / *Hydrangea quercifolia* - *Viburnum acerifolium* / *Carex picta* - *Polystichum acrostichoides* Forest (CEGL007213, G3G4)
- *Quercus alba* - *Quercus rubra* - *Carya (alba, ovata)* / *Cornus florida* Acid Forest (CEGL002067, G3)
- *Quercus pagoda* - *Quercus (michauxii, shumardii)* Forest (CEGL004545, G3G4)
- *Quercus pagoda* - *Quercus nigra* Forest (CEGL004109, G3)

Alliances:

- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Pinus taeda* - *Quercus (alba, falcata, stellata)* Forest Alliance (A.404)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)

DISTRIBUTION

Range: This system is found in northern and inland portions of the East Gulf Coastal Plain, including Alabama, Mississippi, western Kentucky, and western Tennessee.

Divisions: 203:C

Nations: US

Subnations: AL, AR?, GA, KY, MS, TN

Map Zones: 46:C, 47:C

TNC Ecoregions: 43:C

SOURCES

References: Braun 1950, Bryant et al. 1993, Comer et al. 2003, Fralish and Franklin 2002, Franklin and Kupfer 2000, Greller 1988, USGS 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723109#references

Description Author: R. Evans, M. Pyne, A. Schotz

Version: 17 Jan 2003

Concept Author: R. Evans, M. Pyne, A. Schotz

Stakeholders: Southeast

ClassifResp: Southeast

1329 EAST GULF COASTAL PLAIN SOUTHERN LOESS BLUFF FOREST (CES203.556)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Loess deposit (undifferentiated); Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2329; ESLF 4135; ESP 1329

CONCEPT

Summary: This system of upland hardwood-dominated forests is defined as including both the steep loess bluffs bordering the eastern edge of the Mississippi River Alluvial Plain, ranging from south-central Mississippi to southeastern Louisiana, as well as hardwood vegetation of the "Loess Plains" immediately to the east of these bluffs and ravines. The vegetation is often richer than surrounding non-loessal areas, or those with only thin loess deposits. At least in some examples of this system, tree species normally associated with bottomland habitats are found to be abundant or even dominant in non-flooded uplands. In many cases, the bluffs provide habitat "refugia" for plant species that are more common to the north (Delcourt and Delcourt 1975). Braun (1950) noted that the general composition of forests along the bluffs changes from north to south; the more northerly examples are represented in this classification by East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481), north of the range of *Magnolia grandiflora* and *Pinus glabra*. As currently defined this system ranges from about 32 degrees N latitude (where the Big Black River dissects the bluffs) southward and is restricted to the southern part of the Loess Bluff Hills (Ecoregion 74a of EPA (2004)).

Classification Comments: The vegetation of this system has been poorly studied and documented, and few associations have currently been described in the USNVC for this system. More information is needed. This system meets the East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506) farther to the east in Louisiana and Mississippi.

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481)
- East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477)
- Southern Coastal Plain Mesic Slope Forest (CES203.476)

DESCRIPTION

Environment: This system occupies upland loess bluffs, ravines, and adjacent plains that are considerably higher in elevation than the adjacent Mississippi River Alluvial Plain. These bluffs consist of a belt of Pleistocene and Tertiary eolian deposits (Braun 1950) that are often deeply eroded and very steep, with fertile top soil and abundant moisture.

Vegetation: Forest stands of the southern loess bluffs are characteristically dominated by *Fagus grandifolia* and *Magnolia grandiflora*, with *Quercus pagoda*, *Liquidambar styraciflua*, and other hardwood species, along with *Pinus glabra* and *Pinus taeda*. Vegetation of the loess plains would more likely be dominated by *Quercus pagoda*, *Liquidambar styraciflua*, and other hardwood species, along with *Pinus taeda*.

MEMBERSHIP

Associations:

- (*Fagus grandifolia*) - *Quercus pagoda* - *Magnolia grandiflora* / *Hydrangea quercifolia* / *Cystopteris protrusa* - *Thelypteris kunthii* Forest (CEGL007461, G3?)
- *Fagus grandifolia* - *Quercus (alba, rubra)* / *Acer barbatum* / *Asimina triloba* Forest (CEGL004072, G2G3)
- *Fagus grandifolia* - *Quercus alba* - *Liquidambar styraciflua* / *Magnolia grandiflora* / *Smilax pumila* - *Hexastylis arifolia* Forest (CEGL007210, G4)
- *Quercus shumardii* - *Quercus pagoda* - *Fraxinus americana* / *Ostrya virginiana* - *Cornus florida* / *Trillium ludovicianum* Forest (CEGL007272, G1)

Alliances:

- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

DISTRIBUTION

Range: This system is endemic to the loess bluffs ("Bluff Hills" [Ecoregion 74a] of EPA (2004)) and the immediately adjacent Southern Rolling Plains (western portion of Ecoregion 74c) along the eastern edge of the Mississippi River Alluvial Plain in southwestern Mississippi and adjacent Louisiana.

Divisions: 203:C

Nations: US

Subnations: LA, MS

Map Zones: 46:C, 99:C
TNC Ecoregions: 43:C

SOURCES

References: Braun 1950, Comer et al. 2003, Delcourt and Delcourt 1975, EPA 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723048#references

Description Author: R. Wieland and R. Evans, mod. M. Pyne

Version: 14 Mar 2005

Concept Author: R. Wieland and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1356 FLORIDA LONGLEAF PINE SANDHILL (CES203.284)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Xeric; Very Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2356; ESLF 4259; ESP 1356

CONCEPT

Summary: This system represents stands of *Pinus palustris* on excessively well-drained, sandy soils in the Outer Coastal Plain and adjacent Inner Coastal Plain of Florida. This includes the "high pine islands" of central Florida, as well as vegetation of extensive areas of sand in the panhandle, as at Eglin Air Force Base. In central Florida, these stands are found in relation with sand pine scrub vegetation. This system represents larger patches of *Pinus palustris* Sandhills, ranging from 60 to 4000 hectares in size. Examples also occur on the Ocala National Forest, the southern end of the Lake Wales Ridge, the Brooksville Ridge, and in other parts of the Florida Peninsula. Fire is absolutely essential to maintain this system, without which it may be almost completely replaced by scrub vegetation or other non-longleaf pine-dominated vegetation.

Related Concepts:

- Sandhill (FNAI 1990) Broader

DESCRIPTION

Environment: Soils are typically Entisols (Psamments), with very limited profile development. Some soil series associated with this system include the Astatula series (Kalisz 1982), as well as the Lake, Tavares, and Orsino series (Abrahamson et al. 1984). In some cases the soils may be unusually dark in color at the surface, which has been attributed, in part, to the presence of charcoal. Soils are strongly acidic (pH 4.7-5.0). At least some of these sites have silt or clay in the subsoil contributing to significantly higher extractable bases at the surface when compared to nearby scrub sites (Kalisz 1982). Excluded are areas with a "shallow sand cap" (K. Outcault pers. comm.). On Eglin Air Force Base, habitat for this system includes areas covered by the Citronelle Formation. Psamments are the dominant soil suborder in the areas of Florida where this system is found (NRCS n.d.).

Vegetation: Stands of this system typically lack a well-developed subcanopy, especially in contrast to surrounding *Pinus clausa* scrub vegetation. However, the shrub layer may be well-developed, even under frequent fire conditions, and appears to be dominated by sprouts of *Quercus laevis* and *Quercus myrtifolia*. A rich herbaceous layer is present. Characteristic species in this stratum are *Aristida beyrichiana* and *Licania michauxii*. In addition, a number of species found primarily in central Florida may also be present, among the most frequent of which is *Chapmannia floridana*. Other geographically limited species may include *Sabal etonia*, *Polygonella ciliata*, and *Arnoglossum floridanum*.

Dynamics: Fire is absolutely essential to maintain this system, without which it may be almost completely replaced by scrub vegetation (in the Florida Peninsula).

MEMBERSHIP

Associations:

- *Pinus palustris* - *Pinus clausa* / *Quercus laevis* / *Sporobolus junceus* Woodland (CEGL003604, GNA)
- *Pinus palustris* / *Quercus (incana, margarettiae)* / *Aristida beyrichiana* - *Asimina angustifolia* Woodland (CEGL008586, G2?)
- *Pinus palustris* / *Quercus (laevis, myrtifolia)* / *Aristida beyrichiana* - *Chapmannia floridana* Woodland (CEGL008569, G2)
- *Pinus palustris* / *Quercus laevis* / *Aristida beyrichiana* - *Pityopsis aspera* Woodland (CEGL003583, G3)
- *Pinus palustris* / *Quercus laevis* / *Schizachyrium scoparium* - *Rhynchosia cytisoides* Woodland (CEGL003587, G3)

Alliances:

- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)

SPATIAL CHARACTERISTICS

Spatial Summary: This system represents larger patches of *Pinus palustris* Sandhills (in Florida), ranging from 60 to 4000 hectares in size.

Adjacent Ecological Systems:

- Central Florida Pine Flatwoods (CES203.382)
- Central Florida Wet Prairie and Herbaceous Seep (CES203.491)
- Florida Peninsula Inland Scrub (CES203.057)

Adjacent Ecological System Comments: Adjacent to Central Florida Wet Prairie and Herbaceous Seep (CES203.491) and Central Florida Pine Flatwoods (CES203.382). It can be surrounded by Florida Peninsula Inland Scrub (CES203.057).

DISTRIBUTION

Range: This system is found in the Outer Coastal Plain and adjacent Inner Coastal Plain of Florida, including the central Florida Peninsula (Ocala National Forest, Brooksville Ridge, southern end of the Lake Wales Ridge) (Abrahamson et al. 1984) and the

panhandle (e.g., Eglin Air Force Base).

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C, 99:C

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Abrahamson et al. 1984, Comer et al. 2003, Kalisz 1982, NRCS n.d., Outcalt pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723204#references

Description Author: R. Evans and C. Nordman, mod. M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

CLASSIFIERS**Classification Status:** Standard**Primary Division:** Gulf and Atlantic Coastal Plain (203)**Land Cover Class:** Forest and Woodland**Spatial Scale & Pattern:** Large patch**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Upland**Diagnostic Classifiers:** Forest and Woodland (Treed); Xeric; F-Patch/High Intensity; Needle-Leaved Tree**FGDC Crosswalk:** Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland**National Mapping Codes:** EVT 2387; ESLF 5318; ESP 1387**CONCEPT**

Summary: This system appears in many forms, but generally consists of xeromorphic shrub vegetation (mostly oak species) with or without an emergent overstory of *Pinus clausa* (sand pine). Ground cover is always sparse, and bare soil patches are typically evident. It is found on a sequence of sand ridges and ancient dune fields which are oriented essentially north-south in the Florida Peninsula. This system has long been noted for its unique and interesting vegetation by authors such as Vignoles (1823), Harper (1914), Mulvania (1931), Kurz (1942), and Laessle (1958, 1968). More recent treatments by Myers (1990) and Menges (1999) have provided the most comprehensive summaries of scrub available. According to Harper (1927), "the nearly pure white sand of the ground surface, when viewed from a short distance, gives the impression of a thin rift of wind-driven snow. The vegetation is mostly dwarfed, gnarled and crooked, and presents a tangled, scraggly aspect." The appearance, floristics, and boundary of Florida scrub contrast dramatically with the "high pine" or sandhill vegetation which is often adjacent (Laessle 1968).

Related Concepts:

- Scrub (FNAI 1990) Finer

DESCRIPTION

Environment: This system is restricted to a sequence of north/south-trending sand ridges, ancient dune fields, and former shorelines in the Florida peninsula. The largest inland scrub is found in two primary areas, essentially isolated from one another. The so called "Big Scrub" of the Ocala National Forest is the largest expanse of this system, with a somewhat smaller, more southerly area associated with the Lake Wales Ridge. According to Myers (1990), inland scrub occurs on Quartzipsamments which are excessively well-drained, nearly pure siliceous sands low in nutrients. Although all scrub soils are Entisols, there is considerable variation in soil color. This color variation appears to be related to the amount of leaching which has taken place, and appears to be related to the amount of time a site has been occupied by scrub vegetation. Excessive leaching, due to inferred long occupation by scrub vegetation, is believed to bleach upper soil horizons and develop pure white soils (such as the St. Lucie series), while moderate leaching, due to shorter occupation by scrub, contributes to less bleaching and consequently more yellow-colored soils (Paola and Orsino series).

Vegetation: This system is dominated by xeromorphic, evergreen shrub species with or without an emergent layer of *Pinus clausa*. The shrub layer composition is relatively constant, as is the abundance of individual species. *Quercus myrtifolia*, *Quercus inopina*, *Serenoa repens*, *Quercus geminata*, *Quercus chapmanii*, *Lyonia ferruginea*, and *Ceratiola ericoides* are the most important species. Myers (1990) indicates that much of the variability in Florida scrub is due to variation in fire-return interval, ranging from once every 10 to 100 years. Ground cover is always sparse but typically includes *Licania michauxii*, *Rhynchospora megalocarpa*, *Andropogon floridanus*, and a variety of lichens (*Cladonia* and *Cladina* species). There are a number of endemic plant species which may occur in inland Florida scrubs, including at least 13 federally listed species; many of the rarest scrub species are found only in the Lake Wales region.

Dynamics: Florida scrub is a pyrogenic system with floral and faunal components adapted to fire. Unlike most ecological systems of the Gulf and Atlantic coastal plains, this system is maintained by high-intensity, infrequent fires. Litter-fall rates are high, while turnover rates are low, contributing to fuel buildup (Lugo and Zucca 1983, Schmalzer and Hinkle 1996). However, scrub typically lacks fine-textured fuels necessary to ignite fires; most scrub fires ignite in other adjacent systems. If fire spreads into scrub it is only under severe conditions of high wind, low humidity, and low fuel moisture. When fires occur in scrub they are often stand-replacing events. *Pinus clausa*, if present, is killed outright but may regenerate from seed released from serotinous cones. The shrub layer is typically killed back to ground layer but rapidly resprouts and returns to prefire levels of cover (Abrahamson 1984, Schmalzer and Hinkle 1992b). Other species such as *Ceratiola ericoides* may regenerate from seeds stored in soil (Johnson 1982). Several narrowly endemic herb species exhibit peaks in survival, recruitment, and density after fire (Menges 1999). Many scrub fires burn heterogeneously with resulting patches of unburned fuels, especially in the most xeric types like rosemary scrub (Menges 1994). In the sustained absence of fire, smaller shrubs and herbs may be lost as a consequence of increasing dominance of oak stems (Menges et al. 1993).

This system has likely persisted on fossil dunes since the Pleistocene (Laessle 1968), but remaining examples are merely remnants of an ecosystem once expansive in the late Pleistocene (Myers 1990). The stature and appearance of Florida scrub may be due primarily to nutrient-poor soils, to which many of the scrub species have adapted evergreen habits (Monk 1966). Drought stress is most likely during winter and early spring, but frequent fog during these periods may ameliorate such conditions (Menges 1994). Surprisingly, given the excessively well-drained soils, drought stress may not be an important ecological factor except to limit seedling establishment (Myers 1987, 1990).

MEMBERSHIP

Associations:

- *Carya floridana* - *Quercus myrtifolia* - *Quercus geminata* Shrubland (CEGL007997, G1)
- *Ceratiola ericoides* - *Quercus geminata* - (*Quercus inopina*) - *Serenoa repens* / *Cladonia* spp. - *Cladina* spp. Shrubland (CEGL003863, G2G3)
- *Pinus clausa* / *Ceratiola ericoides* - *Sabal etonia* / *Cladonia* spp. Woodland (CEGL003553, G1)
- *Pinus clausa* / *Quercus geminata* - *Quercus myrtifolia* - (*Quercus laevis*) / *Garberia heterophylla* Forest (CEGL007074, G2)
- *Pinus clausa* / *Quercus inopina* Woodland (CEGL003555, G1G2)
- *Pinus clausa* / *Quercus myrtifolia* - *Quercus geminata* Woodland (CEGL003556, G2)
- *Quercus inopina* - *Quercus geminata* - *Quercus chapmanii* Shrubland (CEGL003823, G2)
- *Quercus myrtifolia* - *Quercus geminata* - *Lyonia lucida* - *Lyonia ferruginea* Shrubland (CEGL008593, G1?)
- *Quercus myrtifolia* - *Quercus geminata* - *Quercus chapmanii* Shrubland (CEGL003825, G3)

Alliances:

- *Ceratiola ericoides* Shrubland Alliance (A.817)
- *Pinus clausa* Forest Alliance (A.117)
- *Pinus clausa* Woodland Alliance (A.511)
- *Quercus geminata* - *Quercus myrtifolia* - *Quercus chapmanii* Shrubland Alliance (A.779)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Florida Longleaf Pine Sandhill (CES203.284)

DISTRIBUTION

Range: This system is endemic to the Florida Peninsula. It is most common in two discrete islands or patches, the Big Scrub of Ocala and the Lake Wales Ridge.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

TNC Ecoregions: 55:C

SOURCES

References: Abrahamson 1984, Comer et al. 2003, Harper 1914, Harper 1927, Johnson 1982, Kurz 1942, Laessle 1958, Laessle 1968, Lugo and Zucca 1983, Menges 1994, Menges 1999, Menges et al. 1993, Monk 1966, Mulvania 1931, Myers 1987, Myers 1990, Schmalzer and Hinkle 1992b, Schmalzer and Hinkle 1996, Vignoles 1823

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723253#references

Description Author: R. Evans, mod. C.W. Nordman

Version: 08 Jun 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

LOWER MISSISSIPPI RIVER DUNE POND (CES203.189)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.)

Diagnostic Classifiers: Forest and Woodland (Treed); Dune (Substrate); Sand Soil Texture

National Mapping Codes: ESLF 4151

CONCEPT

Summary: This system represents distinctive wetlands that are called "sand ponds" in Arkansas. They occur in isolated depressions in the context of sand dunes and related eolian features of the lower Mississippi River Alluvial Valley in Missouri and Arkansas. These depressions have silty bottoms and may be connected to the local aquifer or have a perched water table (T. Foti pers. comm.). The margin of these ponds are rimmed by *Quercus phellos* and also have *Quercus lyrata* (Heineke 1987). These Pleistocene dunes were overlooked or unrecognized until the late 1970s (Saucier 1978). These dunes are west of Crowley's Ridge and near the Black and White rivers, above the normal flood level of the Mississippi. Examples in Missouri occur amidst a series of low-lying, anastomosing channels that have helped to protect them from extensive alteration more typical in Arkansas where the uplands have been largely cleared.

Classification Comments: These depressions in the dune fields are one of the principal habitats for the rare shrub *Lindera melissifolia* (Heineke 1987). The dunes consist of a layer of sand or sandy loam over an impervious sublayer. This large area of eolian sand dunes occurs "mainly in a long band to the west of Crowley's Ridge" and occupies approximately 1000 square kilometers (400 square miles) in discrete fields of up to 78 square kilometers (30 square miles) each (Heineke 1987).

Quercus lyrata - *Quercus palustris* / *Acer rubrum* var. *drummondii* / *Itea virginica* - *Cornus foemina* - (*Lindera melissifolia*) Forest (CEGL004778), a wetland type, occurs in isolated depressions in the dunes that may be connected to the local aquifer or have a perched water table (T. Foti pers. comm.).

DESCRIPTION

Environment: This system occurs in isolated depressions in the context of sand dunes and related eolian features of the lower Mississippi River Alluvial Valley in Missouri and Arkansas. These depressions have silty bottoms and may be connected to the local aquifer or have a perched water table (T. Foti pers. comm.). These dunes are west of Crowley's Ridge and near the Black and White rivers, above the normal flood level of the Mississippi. Examples in Missouri occur amidst a series of low-lying, anastomosing channels that have helped to protect them from extensive alteration more typical in Arkansas where the uplands have been largely cleared.

Vegetation: The margin of these ponds are rimmed by *Quercus phellos* and also have *Quercus lyrata* (Heineke 1987).

MEMBERSHIP

Associations:

- *Quercus lyrata* - *Quercus palustris* / *Acer rubrum* var. *drummondii* / *Itea virginica* - *Cornus foemina* - (*Lindera melissifolia*) Forest (CEGL004778, G2?)

Alliances:

- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Lower Mississippi River Dune Woodland and Forest (CES203.531)

DISTRIBUTION

Range: This system is found in the Lower Mississippi River Alluvial Valley in Missouri (Ripley County, Sand Ponds Natural Area) and Arkansas. In Arkansas, examples occur in Clay, Jackson, Lawrence, and Woodruff counties.

Divisions: 202:?, 203:C

Nations: US

Subnations: AR, MO

Map Zones: 45:C

TNC Ecoregions: 42:C

SOURCES

References: Foti pers. comm., Heineke 1987, Saucier 1978, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.759075#references

Description Author: T. Foti and M. Pyne

Version: 27 Jan 2005

Stakeholders: Midwest, Southeast

1381 LOWER MISSISSIPPI RIVER DUNE WOODLAND AND FOREST (CES203.531)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Dune (Substrate); Sand Soil Texture

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2381; ESLF 4324; ESP 1381

CONCEPT

Summary: This system represents the vegetation of sand dunes and related eolian features of the lower Mississippi River Alluvial Valley in Missouri and Arkansas. These Pleistocene dunes were overlooked or unrecognized until the late 1970s (Saucier 1978). This fact coupled with long periods of weathering and human disturbance, as well as proximity to a terrace mapped as "prairie" in General Land Office records, has led to considerable confusion regarding this type (T. Foti pers. comm.). These dunes are west of Crowley's Ridge and near the Black and White rivers, above the normal flood level of the Mississippi. Examples in Missouri occur amidst a series of low-lying, anastomosing channels that have helped to protect them from extensive alteration more typical in Arkansas where the uplands have been largely cleared. The uppermost portions of the dunes support a xeric community similar to sandhills of the West Gulf Coastal Plain (WGCP), but are outside the natural range of *Quercus incana*, a diagnostic species typical of the WGCP examples. Instead the dunes support very open *Quercus stellata* woodlands with *Schizachyrium scoparium* and abundant lichen cover (presumably *Cladonia* spp.), along with *Opuntia* sp. Less edaphically extreme slopes support more closed-canopied forests in which *Quercus stellata* is still important, along with *Quercus falcata* and possibly other species. In many instances, distinctive wetlands imbedded within this system are also present (Lower Mississippi River Dune Pond (CES203.189)). Called "sand ponds" in Arkansas, these depressions have silty bottoms and perched water tables. The margin of these ponds are rimmed by *Quercus phellos* and have *Quercus lyrata* (Heineke 1987).

Classification Comments: Heineke (1987) states that this large area of eolian sand dunes occurs "mainly in a long band to the west of Crowley's Ridge," and occupies approximately 1000 square kilometers (400 square miles) in discrete fields of up to 78 square kilometers (30 square miles) each. The dunes consist of a layer of sand or sandy loam over an impervious sublayer (Heineke 1987). Depressions in the dune fields (e.g., Lower Mississippi River Dune Pond (CES203.189)) are one of the principal habitats for the rare shrub *Lindera melissifolia*.

DESCRIPTION

Environment: These dunes are west of Crowley's Ridge and near the Black and White rivers, above the normal flood level of the Mississippi. Examples in Missouri occur amidst a series of low-lying, anastomosing channels that have helped to protect them from extensive alteration more typical in Arkansas where the uplands have been largely cleared. The uppermost portions of the dunes support a xeric community similar to sandhills of the West Gulf Coastal Plain.

Vegetation: The uppermost portions of the dunes support a xeric community of very open *Quercus stellata* woodlands with *Schizachyrium scoparium* and abundant lichen cover (presumably *Cladonia* spp.), along with *Opuntia* sp. Less edaphically extreme slopes support more closed-canopied forests in which *Quercus stellata* is still important, along with *Quercus falcata* and possibly other species.

MEMBERSHIP

Associations:

- *Quercus stellata* - *Quercus marilandica* - *Quercus falcata* / *Schizachyrium scoparium* Sand Woodland (CEGL002417, G2)
- *Quercus stellata* - *Quercus velutina* - *Quercus alba* - (*Quercus falcata*) / *Croton michauxii* Sand Woodland (CEGL002396, G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Aristida lanosa* - *Polypremum procumbens* Herbaceous Vegetation (CEGL002397, G1Q)

Alliances:

- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Lower Mississippi River Dune Pond (CES203.189)

DISTRIBUTION

Range: Lower Mississippi River Alluvial Valley in Missouri (Ripley County, Sand Ponds Natural Area) and Arkansas. In Arkansas, examples occur in Clay, Jackson, Lawrence, and Woodruff counties.

Divisions: 202:?: 203:C

Nations: US

Subnations: AR, MO
Map Zones: 45:C
TNC Ecoregions: 42:C

SOURCES

References: Comer et al. 2003, Heineke 1987, Saucier 1978

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723069#references

Description Author: T. Foti and R. Evans, mod. M. Pyne

Version: 26 Jan 2005

Concept Author: T. Foti and R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1509 MISSISSIPPI RIVER ALLUVIAL PLAIN DRY-MESIC LOESS SLOPE FOREST (CES203.071)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Unglaciaded

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Loess; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2509; ESLF 4155; ESP 1509

CONCEPT

Summary: This system of dry-mesic upland forests occurs most extensively on west-facing loess slopes on southern Crowley's Ridge, with more limited occurrences on northern Crowley's Ridge and in the erosional slopes and hills that bound the Grand Prairie terrace of Arkansas and Macon Ridge in Louisiana and Arkansas. The vegetation is very distinctive from that of the adjacent alluvial plain, and the sites themselves, which occur on distinct slopes that rise above the alluvial plain surface, also contrast sharply with it. Occurrences of this system generally comprise dry-mesic forests that occupy west-facing slopes and narrow, "finger" ridgetops in a highly dissected landscape. In many cases, these slopes provide habitat for plant species that are uncommon in other parts of the alluvial plain. Forests on the ridgetops are dominated by *Quercus alba*, *Quercus rubra* (Crowley's Ridge only), *Quercus falcata*, *Quercus pagoda*, *Quercus stellata*, *Carya texana*, *Quercus shumardii*, and *Quercus velutina*.

Classification Comments: This system is best developed on southern Crowley's Ridge where loess is most pronounced and is more isolated and less extensive elsewhere.

Similar Ecological Systems:

- Northern Crowley's Ridge Sand Forest (CES203.072)
- Southern Crowley's Ridge Mesic Loess Slope Forest (CES203.079)

Related Concepts:

- Dry-mesic Loess/Glacial Till Forest (Nelson 2005) Broader

DESCRIPTION

Environment: These forests occur on narrow ridgetops and slopes in a highly dissected environment. The system is best documented from southern Crowley's Ridge, Arkansas (Cross County south through Phillips County), with additional occurrences on the northern ridge, on the eastern border of the Grand Prairie terrace in Arkansas, on Macon Ridge (Louisiana/Arkansas) and probably on other upland sites within the alluvial plain. Loess soil is a characteristic and diagnostic component of the environment of this system.

Vegetation: This system consists of forests that are typically dominated by oaks and other hardwoods. Depending upon local soil moisture and other factors, canopy composition can vary from *Quercus stellata*- and *Quercus falcata*-dominated on the driest sites to *Quercus alba* and other oaks on more mesic sites. Associated species in the subcanopy and understory vary along this moisture gradient.

Dynamics: These are fire-maintained forests. In Arkansas, they generally lie to the east of hydroxeric Pleistocene terrace flatwoods or prairies (now usually converted to cropland) that burned frequently. Those fires would have continued into these dry to dry-mesic forests. There is presumably also some natural disturbance from the effects of windstorms and collapse of the fragile loess.

MEMBERSHIP

Associations:

- *Pinus echinata* Crowley's Ridge Forest [Provisional] (CEGL007919, G3G4)
- *Quercus alba* - *Quercus falcata* - *Quercus velutina* / *Ostrya virginiana* Forest (CEGL004068, G1G2)
- *Quercus stellata* - *Quercus falcata* / *Ostrya virginiana* Forest (CEGL004064, G1)

Alliances:

- *Pinus echinata* Forest Alliance (A.119)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus falcata* Forest Alliance (A.243)

DISTRIBUTION

Range: This system is endemic to well-drained sites on Crowley's Ridge (Arkansas, Missouri) and Macon Ridge (Louisiana/Arkansas), along the eastern slopes of the Grand Prairie terrace in Arkansas, and perhaps other such sites in the Mississippi River Alluvial Plain.

Divisions: 203:C

Nations: US

Subnations: AR, LA, MO

Map Zones: 45:C

TNC Ecoregions: 42:C

SOURCES

References: Clark 1974, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 2005, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.798104#references

Description Author: T. Foti, D. Zollner, M. Pyne

Version: 02 Feb 2007

Concept Author: T. Foti and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1313 NORTH-CENTRAL INTERIOR BEECH-MAPLE FOREST (CES202.693)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Glaciated; *Acer saccharum* - *Fagus grandifolia*

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2313; ESLF 4119; ESP 1313

CONCEPT

Summary: This system is found primarily along the southern Great Lakes ranging from central Indiana to southern Ontario. It is typically found on flat to rolling uplands to steep slopes with rich loam soils over glacial till. This system is characterized by a dense tree canopy that forms a thick layer of humus and leaf litter leading to a dense and rich herbaceous layer. *Acer saccharum* and *Fagus grandifolia* comprise up to 80% of the canopy. Other associates can include *Quercus rubra*, *Tilia americana*, *Carpinus caroliniana*, and *Ostrya virginiana*. The relative dominance of sugar maple compared to other tree species varies across the range of this system based on regional climate and microclimate. The herbaceous layer is very diverse and typically includes spring ephemerals. Some common species include *Arisaema triphyllum*, *Galium aparine*, *Osmorhiza claytonii*, *Polygonatum biflorum*, and *Trillium grandiflorum*. The primary natural dynamic influencing this system includes wind-driven gap dynamics. Conversion to agriculture has significantly decreased the range of this system, and very few large stands remain intact.

Classification Comments: North-Central Interior Wet Flatwoods (CES202.700) may co-occur in close proximity to this system on clay-plain landscapes. This is on richer sites than the corresponding Appalachian (Hemlock) - Northern Hardwoods Forest (CES202.593).

Similar Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)--occurs on poorer sites.
- Laurentian-Acadian Northern Hardwoods Forest (CES201.564)--can have inclusions of richer stands. Eastern rich forests CEGL005008 are placed in CES201.564, and range for that system includes Mapzones 41, 50, 51.
- North-Central Interior Maple-Basswood Forest (CES202.696)--less beech.
- South-Central Interior Mesophytic Forest (CES202.887)-- present system is in glaciated landscape; this one (CES202.887) is not.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Fagus grandifolia* - *Betula* spp. / *Maianthemum canadense* Forest (CEGL005004, G4G5)
- *Fagus grandifolia* - *Acer saccharum* Glaciated Midwest Forest (CEGL005013, G2G3)

Alliances:

- *Acer saccharum* - *Betula alleghaniensis* - (*Fagus grandifolia*) Forest Alliance (A.216)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North-Central Interior Wet Flatwoods (CES202.700)

Adjacent Ecological System Comments: North-Central Interior Wet Flatwoods (CES202.700) may co-occur in close proximity to this system on clay-plain landscapes.

DISTRIBUTION

Range: This system is located in the southern Great Lakes from central Indiana north into southern Ontario, and east to northwestern Pennsylvania and western New York.

Divisions: 202:C

Nations: CA, US

Subnations: IN, MI, NY, OH, ON, PA

Map Zones: 47:C, 49:C, 51:C, 52:C, 62:P

USFS Ecomap Regions: 221F:CC, 222H:CC, 222I:CC, 222J:CC, 222K:CC, 222L:CC, 222M:CC, 222U:CC, 251D:CC

TNC Ecoregions: 36:C, 45:C, 47:P, 48:C

SOURCES

References: Barbour and Billings 1988, Comer and Albert 1997, Comer et al. 1995a, Comer et al. 1998, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722966#references

Description Author: S. Menard, mod. S.C. Gawler

Version: 20 Jul 2007

Stakeholders: Canada, East, Midwest, Southeast

Concept Author: S. Menard

ClassifResp: Midwest

1311 NORTH-CENTRAL INTERIOR DRY OAK FOREST AND WOODLAND (CES202.047)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Outwash plain; Forest and Woodland (Treed); Sand Soil Texture; Intermediate Disturbance Interval; F-Patch/Medium Intensity

Non-Diagnostic Classifiers: Outwash terrace; Acidic Soil; Ustic; Xeric

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2311; ESLF 4117; ESP 1311

CONCEPT

Summary: This system is found throughout the glaciated regions of the Midwest, typically in gently rolling to flat landscapes. It can occur on uplands within the prairie matrix or within the context of dry-mesic oak-hickory forests and oak savannas. These are common on rolling glacial moraines and outwash plains. Soils are typically well-drained to excessively drained Mollisols or Alfisols that range from sand to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. It is distinguished from other forested systems within the region by a dry edaphic condition that is transitional between dry prairies, oak barrens, or savannas and dry-mesic oak-hickory forests and woodlands. Forest cover can range from dense to moderately open canopy. Fire-resistant oak species, in particular *Quercus velutina*, *Quercus macrocarpa*, *Quercus coccinea*, and *Quercus ellipsoidalis*, dominate the overstory. *Carya glabra*, *Prunus serotina*, and *Sassafras albidum* are also common in portions of the range of this system. Depending on range of distribution and overstory canopy density, the understory may include species such as *Gaylussacia baccata* (in MI, WI, and MN), *Vaccinium angustifolium*, and *Rhus aromatica*, and/or a mixture of woodland and grassland species, including *Schizachyrium scoparium*, *Deschampsia flexuosa*, and *Carex pensylvanica*. Extreme drought, along with periodic ground and crown fire events, constitute the main natural processes for this type and likely maintained a more open canopy structure that supported oak regeneration. In fact, many current examples of this type have resulted from long-term fire suppression and conversion of oak barrens to these forests and woodlands. Fire suppression may also account for examples of this system with the more dry-mesic understorey. It likely has allowed for other associates such as *Quercus rubra* and *Fraxinus americana* to become more prevalent. Extensive conversion for agriculture in the surrounding landscape with more productive soils has fragmented and isolated examples of this system. It is found primarily within the "corn belt" of the United States, and remaining large areas of this system are likely under considerable pressure due to conversion to pastureland and urban development.

DESCRIPTION

Environment: This system can occur on uplands within the prairie matrix or within the context of dry-mesic oak-hickory forests and oak savannas. These are common on rolling glacial moraines and outwash plains. Soils are typically well-drained to excessively drained Mollisols or Alfisols that range from sand to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. It is distinguished from other forested systems within the region by a dry edaphic condition that is transitional between dry prairies, oak barrens, or savannas and dry-mesic oak-hickory forests and woodlands.

Vegetation: Forest cover can range from a dense to moderately open canopy. Fire-resistant oak species, in particular *Quercus velutina*, *Quercus macrocarpa*, *Quercus coccinea*, and *Quercus ellipsoidalis*, dominate the overstory. *Carya glabra*, *Prunus serotina*, and *Sassafras albidum* are also common in portions of the range of this system. Depending on range of distribution and overstory canopy density, the understorey may include species such as *Gaylussacia baccata* (in MI, WI, and MN), *Vaccinium angustifolium*, and *Rhus aromatica*, and/or a mixture of woodland and grassland species, including *Schizachyrium scoparium*, *Deschampsia flexuosa*, and *Carex pensylvanica*.

Dynamics: Extreme drought, along with periodic ground and crown fire events, constitute the main natural processes for this type and likely maintained a more open canopy structure that supported oak regeneration. In fact, many current examples of this type have resulted from long-term fire suppression and conversion of oak barrens to these forests and woodlands. Fire suppression may also account for examples of this system with the more dry-mesic understorey. It likely has allowed for other associates such as *Quercus rubra* and *Fraxinus americana* to become more prevalent. Extensive conversion for agriculture in the surrounding landscape with more productive soils has fragmented and isolated examples of this system. It is found primarily within the "corn belt" of the United States, and remaining large areas of this system are likely under considerable pressure due to conversion to pastureland and urban development.

MEMBERSHIP

Associations:

- *Quercus alba* - *Quercus stellata* - *Quercus velutina* / *Schizachyrium scoparium* Woodland (CEGL002150, G2G3)
- *Quercus ellipsoidalis* - (*Quercus macrocarpa*) Forest (CEGL002077, G4?)
- *Quercus velutina* - (*Quercus ellipsoidalis*) - *Quercus alba* / *Deschampsia flexuosa* Woodland (CEGL005029, GNR)
- *Quercus velutina* - *Quercus alba* - *Carya (glabra, ovata)* Forest (CEGL002076, G4?)
- *Quercus velutina* - *Quercus alba* / *Vaccinium (angustifolium, pallidum)* / *Carex pensylvanica* Forest (CEGL005030, G4?)

- *Quercus velutina* / *Carex pensylvanica* Forest (CEGL002078, G4?)

Alliances:

- *Quercus alba* - (*Quercus velutina*) Woodland Alliance (A.612)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus ellipsoidalis* Forest Alliance (A.255)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

DISTRIBUTION

Range: Found throughout the glaciated regions of the Midwest.

Divisions: 202:C; 205:P

Nations: US

Subnations: IL, IN, MI, MN, MO, ND, OH, WI

Map Zones: 38:P, 39:P, 40:P, 41:C, 42:C, 43:C, 44:P, 47:P, 49:C, 50:C, 51:C, 52:C

USFS Ecomap Regions: 222H:CC, 222J:CC, 222U:CC, 223A:PP, 251B:CC, 251E:CC, 251G:CC, 251H:CC, 255A:CC, 331F:CC, 331M:CC, 332B:PP

TNC Ecoregions: 35:P, 36:C, 37:?, 44:?, 45:C, 46:C, 47:?, 48:C

SOURCES

References: Abrams 1992, Archambault et al. 1989, Archambault et al. 1990, Comer and Albert 1997, Comer et al. 1995a, Comer et al. 1999, Comer et al. 2003, MNNHP 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722662#references

Description Author: P. Comer, K. Kindscher, S. Menard, D. Faber-Langendoen

Version: 18 Jul 2006

Concept Author: P. Comer, K. Kindscher, S. Menard, D. Faber-Langendoen

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1310 NORTH-CENTRAL INTERIOR DRY-MESIC OAK FOREST AND WOODLAND (CES202.046)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Udic; F-Patch/Low Intensity; Quercus - Carya

Non-Diagnostic Classifiers: Footslope; Glaciated uplands; Kame moraine; Lakeplain; Moraine; Temperate [Temperate Continental]; Mesotrophic Soil; Loam Soil Texture

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2310; ESLF 4116; ESP 1310

CONCEPT

Summary: This system is found throughout the glaciated regions of the Midwest, typically in gently rolling landscapes. It can occur on uplands within the prairie matrix and near floodplains, or on rolling glacial moraines and among kettle-kame topography. Soils are typically well-drained Mollisols or Alfisols that range from loamy to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. Well over 700,000 hectares likely occurred in southern Michigan alone (ca. 1800). It is distinguished from other forested systems within the region by a dry-mesic edaphic condition that is transitional between dry oak forests and woodlands and mesic hardwood forests, such as maple-basswood forests. Forest cover can range from a dense to moderately open canopy and there is commonly a dense shrub layer. Fire-resistant oak species, in particular *Quercus macrocarpa*, *Quercus rubra*, and/or *Quercus alba*, dominate the overstory. *Carya* spp., including *Carya ovata*, *Carya cordiformis*, and *Carya alba* (= *Carya tomentosa*), are diagnostic in portions of the range of this system. Depending on site location and overstory canopy density, the understory may include species such as *Corylus americana*, *Amelanchier* spp., *Maianthemum stellatum*, *Caulophyllum thalictroides*, *Laportea canadensis*, *Trillium grandiflorum*, *Aralia nudicaulis*, and *Urtica dioica*. Occasionally, prairie grasses such as *Andropogon gerardii* and *Panicum virgatum* may be present. Fire constitutes the main natural process for this type and likely maintained a more open canopy structure to support oak regeneration. Historic fire frequency was likely highest in the prairie-forest border areas. Fire suppression may account for the more closed oak forest examples of this system with the more mesic understory. It likely has allowed for other associates, such as *Acer saccharum*, *Celtis occidentalis*, *Liriodendron tulipifera*, *Ostrya virginiana*, and *Juglans nigra*, to become more prevalent, especially in upland areas along floodplains. Periodic drought, intensified by local conditions, such as slope, southern exposure, or sandy soil, also inhibit growth of mesophytic trees. Extensive conversion for agriculture has fragmented this system. Continued fire suppression has also resulted in succession to mesic hardwoods, such that in many locations, no oak species are regenerating. Remaining large areas of this system are likely under considerable pressure due to conversion to agriculture, pastureland, and urban development.

Similar Ecological Systems:

- Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)

DESCRIPTION

Environment: This system can occur on uplands within the prairie matrix and near floodplains, or on rolling glacial moraines and among kettle-kame topography. Soils are typically well-drained Mollisols or Alfisols that range from loamy to sandy loam in texture. Historically, this type was quite extensive in Michigan, Indiana, Illinois, Missouri, Iowa, Wisconsin, and Minnesota. Well over 700,000 hectares likely occurred in southern Michigan alone (ca. 1800). It is distinguished from other forested systems within the region by a dry-mesic edaphic condition that is transitional between dry oak forests and woodlands and mesic hardwood forests, such as maple-basswood forests.

Vegetation: Forest cover can range from a dense to moderately open canopy and there is commonly a dense shrub layer. Fire-resistant oak species, in particular *Quercus macrocarpa*, *Quercus rubra*, and/or *Quercus alba*, dominate the overstory. *Carya* spp., including *Carya ovata*, *Carya cordiformis*, and *Carya alba* (= *Carya tomentosa*), are diagnostic in portions of the range of this system. Depending on site location and overstory canopy density, the understory may include species such as *Corylus americana*, *Amelanchier* spp., *Maianthemum stellatum*, *Caulophyllum thalictroides*, *Laportea canadensis*, *Trillium grandiflorum*, *Aralia nudicaulis*, and *Urtica dioica*. Occasionally, prairie grasses such as *Andropogon gerardii* and *Panicum virgatum* may be present. Fire suppression likely has allowed for other associates, such as *Acer saccharum*, *Celtis occidentalis*, *Liriodendron tulipifera*, *Ostrya virginiana*, and *Juglans nigra*, to become more prevalent, especially in upland areas along floodplains.

Dynamics: Fire constitutes the main natural process for this type and likely maintained a more open canopy structure to support oak regeneration. Historic fire frequency was likely highest in the prairie-forest border areas. Fire suppression may account for the more closed oak forest examples of this system with the more mesic understory. It likely has allowed for other associates, such as *Acer saccharum*, *Celtis occidentalis*, *Liriodendron tulipifera*, *Ostrya virginiana*, and *Juglans nigra*, to become more prevalent, especially in upland areas along floodplains. Periodic drought, intensified by local conditions like slope, southern exposure, or sandy soil, also inhibit growth of mesophytic trees. Extensive conversion for agriculture has fragmented these systems. Continued fire suppression has also resulted in succession to mesic hardwoods, such that in many locations, no oak species are regenerating. Remaining large areas of this system are likely under considerable pressure due to conversion to agriculture, pastureland, and urban development.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Quercus muehlenbergii* Forest (CEGL005010, GNR)
- *Quercus alba* - (*Carya ovata*) / *Carex pensylvanica* Glaciated Woodland (CEGL002134, G1Q)
- *Quercus alba* - (*Quercus velutina*) - *Carya ovata* / *Ostrya virginiana* Forest (CEGL002011, G3)
- *Quercus alba* - *Quercus macrocarpa* - *Quercus rubra* / *Corylus americana* Woodland (CEGL002142, G3G4)
- *Quercus alba* - *Quercus rubra* - *Acer saccharum* - *Carya cordiformis* / *Lindera benzoin* Forest (CEGL002058, G3?)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* Glaciated Forest (CEGL002068, G4?)
- *Quercus alba* - *Quercus rubra* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL002070, G4G5)
- *Quercus alba* / *Cornus florida* Unglaciated Forest (CEGL002066, G4?)
- *Quercus bicolor* - (*Quercus macrocarpa*, *Quercus stellata*) Woodland (CEGL005181, G1)
- *Quercus macrocarpa* / (*Amelanchier alnifolia*, *Cornus drummondii*) / *Aralia nudicaulis* Forest (CEGL002072, G4)
- *Quercus macrocarpa* / *Andropogon gerardii* - *Panicum virgatum* Woodland (CEGL002052, G1G2)
- *Quercus macrocarpa* / *Corylus americana* - *Amelanchier alnifolia* Woodland (CEGL000556, G3)
- *Quercus rubra* - *Quercus alba* - (*Quercus velutina*, *Acer rubrum*) / *Viburnum acerifolium* Forest (CEGL002462, GNR)
- *Tilia americana* - (*Quercus macrocarpa*) / *Ostrya virginiana* Forest (CEGL002012, G3)

Alliances:

- *Acer saccharum* - *Tilia americana* - (*Quercus rubra*) Forest Alliance (A.220)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - (*Quercus velutina*) Woodland Alliance (A.612)
- *Quercus macrocarpa* - *Quercus* (*alba*, *ellipsoidalis*, *velutina*) Woodland Alliance (A.619)
- *Quercus macrocarpa* Forest Alliance (A.245)
- *Quercus macrocarpa* Woodland Alliance (A.620)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

DISTRIBUTION

Range: Found throughout the glaciated regions of the Midwest.

Divisions: 202:C; 205:C

Nations: US

Subnations: IA, IL, IN, KS, MI, MN, MO, ND, NE, OH, SD, WI

Map Zones: 38:C, 39:C, 40:C, 41:?, 42:C, 43:C, 44:C, 47:P, 49:C, 50:C, 51:C, 52:C

USFS Ecomap Regions: 222H:CC, 222J:CC, 222K:CC, 222L:CC, 222M:CC, 222U:CC, 251B:CC

TNC Ecoregions: 35:C, 36:C, 44:?, 45:C, 46:C, 47:?, 48:C

SOURCES

References: Abrams 1992, Archambault et al. 1989, Archambault et al. 1990, Comer and Albert 1997, Comer et al. 1995a, Comer et al. 2003, MNNHP 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722663#references

Description Author: P. Comer, K. Kindscher, S. Menard, D. Faber-Langendoen, mod. J. Drake

Version: 18 Jul 2006

Concept Author: P. Comer, K. Kindscher, S. Menard, D. Faber-Langendoen

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1303 NORTHEASTERN INTERIOR DRY-MESIC OAK FOREST (CES202.592)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); Acidic Soil; Quercus - Carya

Non-Diagnostic Classifiers: Sideslope; Toeslope/Valley Bottom; Mineral: W/ A-Horizon >10 cm; Loam Soil Texture; Ustic; F-Patch/Medium Intensity; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2303; ESLF 4109; ESP 1303

CONCEPT

Summary: These oak-dominated forests are one of the matrix forest systems in the northeastern and north-central U.S. Occurring in dry-mesic settings, they are typically closed-canopy forests, though there may be areas of patchy-canopy woodlands. They cover large expanses at low to mid elevations, where the topography is flat to gently rolling, occasionally steep. Soils are mostly acidic and relatively infertile but not strongly xeric. Local areas of calcareous bedrock, or colluvial pockets, may support forests typical of richer soils. Oak species characteristic of dry-mesic conditions (e.g., *Quercus rubra*, *Quercus alba*, *Quercus velutina*, and *Quercus coccinea*) and *Carya* spp. are dominant in mature stands. *Quercus prinus* may be present but is generally less important than the other oak species. *Castanea dentata* was a prominent tree before chestnut blight eradicated it as a canopy constituent. *Acer rubrum*, *Betula lenta*, and *Betula alleghaniensis* may be common associates; *Acer saccharum* is occasional. With a long history of human habitation, many of the forests are early- to mid-successional, where *Pinus strobus*, *Pinus virginiana*, or *Liriodendron tulipifera* may be dominant or codominant. Within these forests, hillslope pockets with impeded drainage may support small isolated wetlands, including non-forested seeps or forested wetlands with *Acer rubrum*, *Quercus bicolor*, or *Nyssa sylvatica* characteristic.

Classification Comments: The oak-dominated forest matrix in this region spans a range of elevational and moisture regimes, reflected in different ecological systems. Those in drier settings, within the general range of this system, are placed in either Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359) or Central Appalachian Dry Oak-Pine Forest (CES202.591).

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)--is somewhat more xeric and confined to the Southern Unglaciated Allegheny Plateau.
- Central Appalachian Dry Oak-Pine Forest (CES202.591)--is also more xeric and with *Quercus prinus* generally more important.
- Southern Appalachian Oak Forest (CES202.886)--is an equivalent system to the south (in the Southern Blue Ridge, EPA 66).

DESCRIPTION

Environment: These oak-dominated forests are one of the matrix forest systems in the northeastern and north-central U.S. Occurring in dry-mesic settings, they are typically closed-canopy forests, though there may be areas of patchy-canopy woodlands. They cover large expanses at low to mid elevations, where the topography is flat to gently rolling, occasionally steep. The typical landscape position is midslope to toeslope, transitioning to more xeric systems on the upper slopes and ridges. Soils are acidic and relatively infertile but not strongly xeric.

Vegetation: Mature stands are dominated by oak species characteristic of dry-mesic conditions (e.g., *Quercus rubra*, *Quercus alba*, *Quercus velutina*, and *Quercus coccinea*), along with various *Carya* spp. *Quercus prinus* may be present but is generally less important than the other oak species. *Castanea dentata* was a prominent tree before chestnut blight eradicated it as a canopy constituent. *Acer rubrum* and *Betula lenta* are frequently common associates. Local areas of calcareous bedrock may support forests typical of richer soils (e.g., with *Acer saccharum* and/or *Quercus muehlenbergii*).

MEMBERSHIP

Associations:

- *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014, GNR)
- *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (CEGL006132, GNR)
- *Acer rubrum* / *Carex stricta* - *Onoclea sensibilis* Woodland (CEGL006119, G3G5)
- *Acer saccharum* - *Quercus muehlenbergii* / *Carex platyphylla* Forest (CEGL006162, GNR)
- *Betula lenta* - *Acer rubrum* / *Lycopodium annotinum* - *Dennstaedtia punctilobula* Forest (CEGL008503, GNA)
- *Carya (glabra, ovata)* - *Fraxinus americana* - *Quercus* spp. Forest (CEGL006236, GNR)
- *Castanea dentata* - *Quercus rubra* Forest (CEGL007286, GH)
- *Deschampsia caespitosa* - *Claytonia virginica* var. *hammondiae* Herbaceous Vegetation (CEGL006101, G1)
- *Fagus grandifolia* - *Betula lenta* - *Liriodendron tulipifera* - *Acer saccharum* Forest (CEGL006296, GNR)
- *Fagus grandifolia* - *Betula lenta* - *Quercus (alba, rubra)* / *Carpinus caroliniana* Forest (CEGL006921, GNR)
- *Pinus strobus* - *Quercus (rubra, alba)* - *Liriodendron tulipifera* Forest (CEGL006304, GNR)
- *Pinus strobus* - *Quercus (rubra, velutina)* - *Fagus grandifolia* Forest (CEGL006293, G5)
- *Pinus strobus* / *Vaccinium pallidum* Forest (CEGL007099, GNR)

- *Pinus strobus* Successional Forest (CEGL007944, GNA)
- *Pinus virginiana* Successional Forest (CEGL002591, GNA)
- *Populus tremuloides* - *Betula populifolia* Forest (CEGL006560, GNR)
- *Prunus serotina* - *Liriodendron tulipifera* - *Acer rubrum* - *Fraxinus americana* Forest (CEGL006599, GNA)
- *Quercus* (*alba*, *rubra*, *velutina*) / *Cornus florida* / *Viburnum acerifolium* Forest (CEGL006336, G4G5)
- *Quercus alba* - *Quercus rubra* - *Carya* (*alba*, *ovata*) / *Cornus florida* Acid Forest (CEGL002067, G3)
- *Quercus alba* - *Quercus rubra* - *Carya alba* / *Cornus florida* / *Vaccinium stamineum* / *Desmodium nudiflorum* Piedmont Forest (CEGL008475, G4G5)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* Glaciated Forest (CEGL002068, G4?)
- *Quercus alba* - *Quercus rubra* - *Quercus prinus* - *Acer saccharum* / *Lindera benzoin* Forest (CEGL002059, GNR)
- *Quercus bicolor* / *Vaccinium corymbosum* / *Carex stipata* Forest (CEGL006241, GNR)
- *Quercus prinus* - *Quercus rubra* - *Carya ovalis* / *Solidago* (*ulmifolia*, *arguta*) - *Galium latifolium* Forest (CEGL008516, G3G4)
- *Quercus prinus* - *Quercus rubra* / *Hamamelis virginiana* Forest (CEGL006057, G5)
- *Quercus prinus* - *Quercus velutina* / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL008522, G4?)
- *Quercus rubra* - *Acer rubrum* / *Pyrolaria pubera* / *Thelypteris noveboracensis* Forest (CEGL006192, G4?)
- *Quercus rubra* - *Acer saccharum* / *Ostrya virginiana* / *Cardamine concatenata* Forest (CEGL008517, G4)
- *Quercus rubra* - *Carya* (*glabra*, *ovata*) / *Ostrya virginiana* / *Carex lucorum* Forest (CEGL006301, G4?)
- *Quercus rubra* - *Quercus alba* - *Fraxinus americana* - *Carya* (*ovata*, *ovalis*) / *Actaea racemosa* Forest (CEGL008518, G3)
- *Quercus rubra* - *Quercus prinus* - *Carya ovalis* / (*Cercis canadensis*) / *Solidago caesia* Forest (CEGL008514, G3G4)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Acer rubrum* Seasonally Flooded Woodland Alliance (A.653)
- *Carya* (*glabra*, *ovata*) - *Fraxinus americana* - *Quercus* (*alba*, *rubra*) Forest Alliance (A.258)
- *Castanea dentata* - *Quercus rubra* Forest Alliance (A.268)
- *Deschampsia caespitosa* Saturated Herbaceous Alliance (A.1456)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Pinus strobus* - *Quercus* (*alba*, *rubra*, *velutina*) Forest Alliance (A.401)
- *Pinus strobus* Forest Alliance (A.128)
- *Pinus virginiana* Forest Alliance (A.131)
- *Populus tremuloides* - *Betula papyrifera* Forest Alliance (A.269)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus* spp. Forest Alliance (A.237)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus prinus* - *Quercus* (*alba*, *falcata*, *rubra*, *velutina*) Forest Alliance (A.249)
- *Quercus prinus* - *Quercus rubra* Forest Alliance (A.250)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

SPATIAL CHARACTERISTICS

Spatial Summary: These were historically among the most important matrix forests of the Northeast. They cover extensive areas where conditions are not extreme. Upslope they may grade into more xeric oak ridge systems or rocky oak-pine forests/woodlands. Mesic cove forest systems may be embedded within this matrix in protected draws. Small pocket wetlands, not discriminated as separate systems, may also occur within these forests.

DISTRIBUTION

Range: This system is found from southern New York west through Ohio and Pennsylvania and south to Virginia. It does not extend to the southernmost part of Virginia, except in the Ridge and Valley.

Divisions: 202:C

Nations: US

Subnations: MD, NJ, NY, OH, PA, VA, WV

Map Zones: 53:C, 57:C, 60:C, 61:C, 62:C, 63:C, 64:C

USFS Ecomap Regions: 211E:CC, 211F:CC, 211G:CC, 221A:CC, 221B:CC, 221D:CC, 221F:CC, M221A:CC, M221B:CC, M221Da:CCC

TNC Ecoregions: 49:C, 52:C, 59:C, 60:C, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723014#references

Description Author: S.C. Gawler

Version: 20 Aug 2007

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

1324 NORTHERN ATLANTIC COASTAL PLAIN HARDWOOD FOREST (CES203.475)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2324; ESLF 4130; ESP 1324

CONCEPT

Summary: This system is comprised of dry hardwood forests largely dominated by oaks, ranging from sandy glacial and outwash deposits of Cape Cod, Massachusetts, and Long Island, New York, south to the Coastal Plain portions of Maryland and Virginia south to about the James River. In the northern half of the range, conditions can grade to dry-mesic, reflected in the local abundance of *Fagus grandifolia*. These forests occur on acidic, sandy to gravelly soils with a thick duff layer, often with an ericaceous shrub layer. **Classification Comments:** This system grades into other hardwood types of the northeastern U.S. as one moves inland. In Delaware and New York these coastal forests are apparently distinct (fauna, flora and substrate are distinct) from more inland forests. The southern part of this type's range overlaps with Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242); where they overlap, they are separated based on moisture regime, with the drier forests (often with an ericaceous shrub layer) going to this type.

Similar Ecological Systems:

- Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Quercus* (*alba*, *rubra*) - *Liriodendron tulipifera* / (*Ilex opaca* var. *opaca*) / *Polystichum acrostichoides* Forest (CEGL006075, G5)
- *Fagus grandifolia* - *Quercus* (*alba*, *velutina*, *prinus*) / *Kalmia latifolia* Forest (CEGL006919, GNR)
- *Fagus grandifolia* - *Quercus* *alba* - *Quercus* *rubra* Forest (CEGL006377, GNR)
- *Quercus* (*alba*, *velutina*, *stellata*, *falcata*) / *Carya pallida* - *Quercus* *prinoides* / *Carex pensylvanica* Woodland (CEGL006954, GNR)
- *Quercus* *alba* - *Quercus* (*coccinea*, *velutina*, *prinus*) / *Gaylussacia baccata* Forest (CEGL008521, G5)
- *Quercus* *alba* - *Quercus* *falcata* - (*Carya pallida*) / *Gaylussacia frondosa* Forest (CEGL006269, G4G5)
- *Quercus* *alba* - *Quercus* *rubra* - *Carya* *alba* / *Cornus florida* / *Vaccinium stamineum* / *Desmodium nudiflorum* Piedmont Forest (CEGL008475, G4G5)
- *Quercus coccinea* - *Quercus velutina* / *Sassafras albidum* / *Vaccinium pallidum* Forest (CEGL006375, GNR)
- *Quercus rubra* - *Acer rubrum* - *Betula* spp. - *Pinus strobus* Forest (CEGL006506, GNR)
- *Quercus rubra* - *Betula alleghaniensis* / *Osmunda cinnamomea* Forest (CEGL006000, GNR)
- *Quercus velutina* - *Quercus coccinea* - *Quercus prinus* / *Kalmia latifolia* Forest (CEGL006374, GNR)
- *Quercus velutina* / *Ilex opaca* Forest (CEGL006378, GNR)

Alliances:

- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus* (*falcata*, *stellata*) Forest Alliance (A.241)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

DISTRIBUTION

Range: This system ranges from sandy glacial and outwash deposits of Massachusetts and Long Island, New York (and occasionally north to southern Maine), south to the Coastal Plain portions of Maryland and Virginia, south to about the James River.

Divisions: 202:C; 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME?, NH?, NJ, NY, VA

Map Zones: 60:C, 65:C, 66:C

USFS Ecomap Regions: 221A:CC

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723111#references

Description Author: R. Evans, mod. S.C. Gawler

Version: 26 Jul 2007

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

1379 NORTHERN ATLANTIC COASTAL PLAIN MARITIME FOREST (CES203.302)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2379; ESLF 4322; ESP 1379

CONCEPT

Summary: This system encompasses a range of woody vegetation present on barrier islands and near-coastal strands, from Virginia Beach, the northern range limit of *Quercus virginiana*, northward to the extent of the Atlantic Coastal Plain. It includes forests and shrublands whose structure and composition are influenced by proximity to marine environments, including both upland and wetlands. Vegetation includes narrow bands of forests with often stunted trees with contorted branches and wilted leaves and dense vine layers (Edinger et al. 2002). A range of trees may be present depending upon actual location and degree of protection from most extreme maritime influences.

Classification Comments: In New York this concept includes Maritime Holly Forest, Maritime Post Oak Forest, Maritime Beech Forest, Maritime Red Cedar Forest (Edinger et al. 2002).

Similar Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)
- Northern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.264)

DESCRIPTION

Environment: These areas occur in general proximity to marine environments and are subject to salt spray, high winds, dune deposition, sand shifting and blasting, and occasional overwash during extreme disturbance events.

Vegetation: Vegetation includes narrow bands of forest with often stunted trees with contorted branches and wilted leaves and dense vine layers (Edinger et al. 2002). A range of trees may be present depending upon actual location and degree of protection from most extreme maritime influences. Species range from deciduous hardwoods to pitch pine and Virginia pine. A rare pitch pine variant is found in Delaware (Cape Henlopen) and New York.

MEMBERSHIP

Associations:

- *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest (CEGL006156, GNR)
- *Amelanchier canadensis* - *Viburnum* spp. - *Morella pensylvanica* Scrub Forest (CEGL006379, GNR)
- *Cornus foemina* / *Berchemia scandens* Forest (CEGL007384, G1)
- *Fagus grandifolia* / *Smilax rotundifolia* Forest (CEGL006043, G1)
- *Ilex opaca* / *Morella pensylvanica* Forest (CEGL006376, G1)
- *Juniperus virginiana* var. *virginiana* / *Morella pensylvanica* Woodland (CEGL006212, G2)
- *Morella pensylvanica* - *Prunus maritima* Shrubland (CEGL006295, G4)
- *Pinus rigida* / *Hudsonia tomentosa* Woodland (CEGL006117, G2G3)
- *Pinus rigida* / *Quercus ilicifolia* / *Morella pensylvanica* Woodland (CEGL006315, G3)
- *Pinus taeda* / *Hudsonia tomentosa* Woodland (CEGL006052, G1G2)
- *Pinus taeda* / *Morella cerifera* / *Osmunda regalis* var. *spectabilis* Forest (CEGL006137, G3)
- *Pinus taeda* / *Morella cerifera* / *Vitis rotundifolia* Forest (CEGL006040, G3)
- *Pinus thunbergiana* - (*Pinus nigra*) Forest (CEGL006012, GNA)
- *Pinus virginiana* - *Quercus falcata* - *Carya pallida* Forest (CEGL006354, GNR)
- *Prunus serotina* - *Sassafras albidum* - *Amelanchier canadensis* - *Quercus velutina* / *Smilax rotundifolia* Forest (CEGL006145, G2G3)
- *Prunus serotina* / *Morella cerifera* / *Smilax rotundifolia* Scrub Forest (CEGL006319, G1G2)
- *Quercus falcata* - *Fagus grandifolia* - *Pinus taeda* Forest (CEGL007540, G1?)
- *Quercus stellata* - *Quercus velutina* / *Morella pensylvanica* / *Deschampsia flexuosa* Forest (CEGL006373, GNR)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Cornus foemina* Seasonally Flooded Forest Alliance (A.319)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Ilex opaca* Forest Alliance (A.3002)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Morella pensylvanica* - (*Prunus maritima*) Shrubland Alliance (A.902)
- *Pinus rigida* Woodland Alliance (A.524)

- *Pinus taeda* - *Quercus nigra* Forest Alliance (A.406)
- *Pinus taeda* Saturated Forest Alliance (A.3009)
- *Pinus taeda* Woodland Alliance (A.526)
- *Pinus thunbergiana* Forest Alliance (A.3016)
- *Pinus virginiana* Forest Alliance (A.131)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus* spp. Forest Alliance (A.237)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus falcata* Forest Alliance (A.243)

DISTRIBUTION

Range: This system ranges from Virginia Beach northward to the extent of the Atlantic Coastal Plain.

Divisions: 203:C

Nations: US

Subnations: DE, MA, MD, NJ, NY, VA

Map Zones: 60:C, 65:C

USFS Ecomap Regions: 221Ab:CCC, 221Ad:CCC, 221An:CCC

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003, Edinger et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723189#references

Description Author: R. Evans, G. Fleming, P. Coulling, L. Sneddon

Version: 22 Nov 2002

Concept Author: R. Evans, G. Fleming, P. Coulling, L. Sneddon

Stakeholders: East, Southeast

ClassifResp: East

1355 NORTHERN ATLANTIC COASTAL PLAIN PITCH PINE BARRENS (CES203.269)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Xeric; F-Patch/High Intensity; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2355; ESLF 4258; ESP 1355

CONCEPT

Summary: This system is comprised of a group of dry pitch pine woodlands and forests of deep sandy soils ranging from Cape Cod (Massachusetts) south through Long Island (New York) and the New Jersey Coastal Plain, with occasional occurrences south to the Anacostia watershed (Maryland). The vegetation is characterized by a tree canopy of *Pinus rigida* with a tall-shrub layer dominated by *Quercus ilicifolia* and a low-shrub layer characterized by *Vaccinium pallidum* or *Vaccinium angustifolium*. The system is heavily influenced by fire, the composition and structure of its components varying with fire frequency. In general, tree oaks are more prevalent in those stands having a longer fire-return interval, while at the other extreme, fire frequencies of 8-10 years foster the growth of "pine plains," i.e., dwarf pine stands 1 meter in height. The pine cones of pine plains have a very high incidence of serotiny as compared to the other associations of this system. Dwarf-shrubs such as *Arctostaphylos uva-ursi* and *Hudsonia ericoides* typify the field layer of pine plains.

Scrub oak stands may occur without pine cover, particularly in low-lying areas that do not intersect the water table, where cold-air drainage inhibits pine growth. North of the glacial boundary, heathlands characterized by *Arctostaphylos uva-ursi*, *Corema conradii*, and *Morella pensylvanica* and grasslands characterized by *Schizachyrium littorale* and *Danthonia spicata* occur as small patches. The Pine Barrens of New Jersey are very similar in structure and composition to those north of the glacial boundary but are characterized by additional species, such as *Quercus marilandica*, *Pyxidantha barbulata*, *Leiophyllum buxifolium*, and others. Where the water table is close to the surface, pitch pine lowland vegetation (described as a separate system) occurs.

Classification Comments: The uniqueness of the Pine Barrens has long been recognized, and the system is well studied and summarized in a number of recent treatments (Forman 1979, Buckholz and Good 1982, Gibson et al. 1999).

Similar Ecological Systems:

- Northeastern Interior Pine Barrens (CES202.590)--occurs farther inland and lacks coastal elements.
- Northern Atlantic Coastal Plain Heathland and Grassland (CES203.895)

DESCRIPTION

Environment: This system occurs on Cohansey sand, a deep sand formation, which is sometimes overlain with hilltop gravel deposits.

Vegetation: The uniqueness of the Pine Barrens flora has long been recognized (Stone 1911, Harshberger 1916). More recent treatments by Forman (1979) and Buckholz and Good (1982) have compiled much of the available information. *Pinus rigida* is the dominant and characteristic species of this system. It may be found in well-developed tree form or as a short-statured, shrubby ecotype. *Pinus rigida* may occur as the sole dominant or occur with a variety of oak species, especially *Quercus marilandica* and *Quercus ilicifolia*. In some examples *Pinus echinata* may co-occur.

MEMBERSHIP

Associations:

- *Gaylussacia baccata* - *Vaccinium angustifolium* - *Arctostaphylos uva-ursi* / *Schizachyrium littorale* Dwarf-shrubland (CEGL006066, G3)
- *Morella pensylvanica* / *Schizachyrium littorale* - *Danthonia spicata* Shrub Herbaceous Vegetation (CEGL006067, G2)
- *Pinus (rigida, echinata)* - *Quercus coccinea* / *Ilex opaca* Woodland (CEGL006115, GNR)
- *Pinus rigida* - (*Pinus echinata*) / *Quercus (marilandica, ilicifolia)* / *Vaccinium pallidum* Woodland (CEGL006383, G2?)
- *Pinus rigida* - *Nyssa sylvatica* / *Clethra alnifolia* - *Leucothoe racemosa* Forest (CEGL006926, G2)
- *Pinus rigida* - *Quercus coccinea* - *Quercus falcata* / (*Quercus marilandica*) / *Gaylussacia frondosa* Woodland (CEGL006329, G2G3)
- *Pinus rigida* - *Quercus coccinea* / *Vaccinium pallidum* - (*Morella pensylvanica*) Woodland (CEGL006381, GNR)
- *Pinus rigida* - *Quercus ilicifolia* / *Arctostaphylos uva-ursi* Shrubland (CEGL006097, G1Q)
- *Pinus rigida* - *Quercus marilandica* / *Corema conradii* Shrubland (CEGL006148, G2)
- *Pinus rigida* / *Carex pensylvanica* Woodland (CEGL006385, GNR)
- *Pinus rigida* / *Quercus (marilandica, ilicifolia)* / *Pyxidantha barbulata* Woodland (CEGL006051, G2)
- *Pinus rigida* / *Quercus ilicifolia* - *Kalmia angustifolia* / *Pyxidantha barbulata* Woodland (CEGL006384, G2?)
- *Pinus rigida* / *Quercus ilicifolia* / *Morella pensylvanica* Woodland (CEGL006315, G3)
- *Quercus ilicifolia* - *Quercus prinoides* Shrubland (CEGL006111, GNR)
- *Quercus prinus* - *Quercus velutina* / *Gaylussacia frondosa* Forest (CEGL006334, GNR)

- *Robinia pseudoacacia* Forest (CEGL007279, GNA)

Alliances:

- *Pinus rigida* - *Acer rubrum* Saturated Forest Alliance (A.3005)
- *Pinus rigida* Shrubland Alliance (A.809)
- *Pinus rigida* Woodland Alliance (A.524)
- *Quercus ilicifolia* Shrubland Alliance (A.906)
- *Quercus prinus* - *Quercus* (*alba*, *falcata*, *rubra*, *velutina*) Forest Alliance (A.249)
- *Robinia pseudoacacia* Forest Alliance (A.256)
- *Schizachyrium littorale* Shrub Herbaceous Alliance (A.1533)
- *Vaccinium* (*angustifolium*, *myrtilloides*, *pallidum*) Dwarf-shrubland Alliance (A.1113)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522)
- Northern Atlantic Coastal Plain Pondshore (CES203.518)

Adjacent Ecological System Comments: Coastal Plain ponds and Atlantic white-cedar swamps may be embedded in these pine barrens.

DISTRIBUTION

Range: This system is found in the Coastal Plain from Delaware Bay northward through the New Jersey Coastal Plain and Long Island (New York) to Cape Cod, Massachusetts, with peripheral and historical occurrence in New Hampshire.

Divisions: 203:C

Nations: US

Subnations: DE, MA, MD, NH, NJ, NY, RI

Map Zones: 60:C, 65:C

USFS Ecomap Regions: 221Ab:CCC, 221Ac:CCP, 232A:CC, 232Hc:CCC

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Buckholz and Good 1982, Comer et al. 2003, Forman 1979, Gibson et al. 1999, Harshberger 1916, Stone 1911

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723217#references

Description Author: R. Evans, mod. S.C. Gawler

Version: 20 Aug 2007

Concept Author: L. Sneddon and K. Straskoch-Walz

Stakeholders: East, Southeast

ClassifResp: East

1510 NORTHERN CROWLEY'S RIDGE SAND FOREST (CES203.072)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Sand; Unglaciaded

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Needle-Leaved Tree; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2510; ESLF 4332; ESP 1510

CONCEPT

Summary: This system of upland shortleaf pine - hardwood forests is confined to Crowley's Ridge on the western side of the Mississippi River. This vegetation is very distinctive from that of the adjacent alluvial plain, and the ridge itself also contrasts sharply with the adjacent alluvial plain. Crowley's Ridge is a remnant loess-capped feature rising from 30 m to over 60 m (100-200 feet) above the alluvial plain surface, to about 150 m (450 feet) above sea level. The base of the northern ridge is comprised of Tertiary substrates overlain by alluvial deposits and capped with generally thin layers of Pleistocene loess. The Pleistocene alluvial deposits are often sandy, and in a very limited area, there are outcrops of sandstone of uncertain origin. Forests on the ridgetops are dominated by *Pinus echinata* with varying amounts of *Quercus alba*, *Quercus rubra*, *Quercus falcata*, *Quercus stellata*, *Carya texana*, and *Quercus velutina*. Loess slopes and ravines are dominated by mesic or dry-mesic hardwood forests such as those of the southern ridge, but are of relatively limited extent.

Classification Comments: This system has been little studied, with the best description in Clark (1974). The presettlement and then-current distribution were mapped, and several sites were sampled. Clark classed the predominant community as Oak-Hickory-Pine, with shortleaf pine dominance ranging from 12-56% and combined white oak and post oak, the most abundant oaks, ranging from 24-60%.

Similar Ecological Systems:

- Mississippi River Alluvial Plain Dry-Mesic Loess Slope Forest (CES203.071)

Related Concepts:

- Dry-mesic Sand Forest (Nelson 2005) Intersecting

DESCRIPTION

Environment: These forests occur on sandy ridges and slopes in a dissected environment. The system is best expressed on northern Crowley's Ridge, but there are limited occurrences on the southern ridge as well, on sandy, exposed sites. They generally lie to the east of hydroxeric Pleistocene terrace flatwoods (now usually converted to cropland) that burned frequently. Those fires would have continued into these dry to dry-mesic forests, thereby increasing the fire frequency.

Vegetation: This system consists of forests that are typically dominated by shortleaf pine with oaks and other hardwoods. Depending upon local soil moisture and other factors, canopy oaks can vary from *Quercus stellata* and *Quercus falcata* on the driest sites to *Quercus alba* and other oaks on more mesic sites. Associated species in the subcanopy and understory vary along this moisture gradient as well (refer to association-level descriptions for more details).

Dynamics: These are fire-adapted forests. There is presumably some natural disturbance from the effects of windstorms and collapse of the fragile loess.

MEMBERSHIP

Associations:

- *Pinus echinata* Crowley's Ridge Forest [Provisional] (CEGL007919, G3G4)
- *Quercus stellata* - *Quercus falcata* / *Ostrya virginiana* Forest (CEGL004064, G1)

Alliances:

- *Pinus echinata* Forest Alliance (A.119)
- *Quercus falcata* Forest Alliance (A.243)

DISTRIBUTION

Range: This system is endemic to Crowley's Ridge in the Mississippi River Alluvial Plain of Arkansas and Missouri (Nelson 2005).

Divisions: 203:C

Nations: US

Subnations: AR, MO

Map Zones: 45:C

TNC Ecoregions: 42:C

SOURCES

References: Clark 1974, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 2005, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.798110#references

Description Author: T. Foti, D. Zollner, M. Pyne

Version: 02 Feb 2007

Concept Author: T. Foti, D. Zollner, M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1342 PIEDMONT HARDPAN WOODLAND AND FOREST (CES202.268)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Clay Soil Texture; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2342; ESLF 4149; ESP 1342

CONCEPT

Summary: This Piedmont system occurs in places where a particularly dense clay hardpan has developed over a range of typically mafic rocks, sometimes with more limited areas of shallow glade-like vegetation. In the deeper soil portions of this system, the density of the clay, in combination with its shrink-swell properties, limits water and root penetration into the soil and creates xeric conditions for plants despite the presence of deep soil. Possibly most typical of this system in North Carolina is an open forest or woodland of *Quercus stellata*, with *Quercus marilandica* as a characteristic associate. The open canopy leads to a better developed herb layer than in most Piedmont forests, one that is usually grassy. In Virginia, typical canopy trees include *Quercus alba*, *Carya glabra*, and *Fraxinus americana*. Some of these sites may have once supported open prairies or prairie savannas when they burned more frequently. Fire was probably once the most important natural dynamic process, but the universal elimination of fire in the Piedmont makes this difficult to observe on most of the modern landscape.

Classification Comments: This system is distinguished from others in the Piedmont by occurrence on distinctive substrates. These include hardpan soils in the Triassic basins, as well as on soils derived from gabbro and on acidic metasediments in the Carolina Slate Belt. Despite the contrast in vegetation, this system will sometimes grade quite gradually into Piedmont Upland Depression Swamp (CES202.336), with which it often co-occurs.

Similar Ecological Systems:

- Piedmont Upland Depression Swamp (CES202.336)

Related Concepts:

- Piedmont Flatwoods (Wharton 1978) Finer
- Piedmont Hardpan Forests (Fleming et al. 2005) Equivalent
- Xeric Hardpan Forest (Schafale and Weakley 1990) Equivalent

DESCRIPTION

Environment: This system occurs in places in the Piedmont where a particularly dense clay hardpan, apparently generally of Montmorillonite, has developed. The substrate is typically mafic igneous or metamorphic rock (gabbro, basalt, diabase, or amphibolite) but occasionally is slate. The density of the clay, or its shrink-swell properties, limits penetration of water into the soil and limits penetration of roots, creating xeric conditions for plants despite the presence of deep soil. These areas generally occur on unusually flat uplands but may occur on tops of narrower ridges. Only a minority of these substrates form the distinctive soil conditions of this system. Local topography that promotes runoff is important to forming this system. Areas with these soil conditions but with concave topography perch water and support Piedmont depressional wetlands. Soils in most examples are basic or circumneutral, but those formed from slate are somewhat acidic. In Virginia and adjacent Maryland, this system occupies one of the largest Triassic basins in eastern North America. It includes a mix of sedimentary rocks, especially siltstone, mixed with igneous intrusions. The igneous rocks weather to form more mafic soils, while the sedimentary rocks are more acidic. The local landscape may best be thought of as a lowland, in comparison with the surrounding and prevailing topography.

Vegetation: Vegetation consists of xerophytic species, most typically consisting of open forests or woodlands of *Quercus stellata*, with *Quercus marilandica* as a characteristic associate in North Carolina. In Virginia and adjacent Maryland, *Quercus alba*, *Fraxinus americana*, and *Carya glabra* are common canopy components. The open canopy leads to a better developed herb layer than in most Piedmont forests, one that is usually grassy. Some of these sites may have once supported open prairies or prairie savannas when they burned more frequently. A significant flora of shade-intolerant herbs with prairie affinities is present in open areas on these soils to support this idea. In contrast to upland forests of adjacent portions of the Virginia Piedmont, there is a pronounced difference in the abundance of hickory present (Farrell and Ware 1991, Ware 1992).

Dynamics: Fire was probably once the most important natural dynamic process, but the universal elimination of fire in the Piedmont makes this difficult to tell. The xeric nature of the sites may have allowed fire to create open vegetation on these sites at the same frequency at which it allowed forests to exist on more typical soils. Fire would have kept canopies open by limiting trees and would have promoted a more diverse, grass-dominated herb layer. Bison may have once been a significant influence on this system.

MEMBERSHIP

Associations:

- *Fraxinus americana* - *Juniperus virginiana* / *Talinum teretifolium* - *Polygonum tenue* - *Opuntia humifusa* Wooded Herbaceous Vegetation (CEGL006294, G1)
- *Quercus alba* - *Carya glabra* - *Fraxinus americana* / *Cercis canadensis* / *Muhlenbergia sobolifera* - *Elymus hystrix* Forest

- (CEGL006216, G3)
- *Quercus alba* - *Quercus rubra* - *Carya alba* / *Cornus florida* / *Vaccinium stamineum* / *Desmodium nudiflorum* Piedmont Forest (CEGL008475, G4G5)
- *Quercus stellata* - (*Pinus echinata*) / *Schizachyrium scoparium* - *Echinacea laevigata* - *Oligoneuron album* Woodland (CEGL003558, G1)
- *Quercus stellata* - (*Pinus echinata*) / *Schizachyrium scoparium* - *Symphotrichum georgianum* Woodland (CEGL003711, G1)
- *Quercus stellata* - (*Quercus marilandica*) / *Gaylussacia frondosa* Acidic Hardpan Woodland (CEGL004413, G2)
- *Quercus stellata* - *Carya (carolinae-septentrionalis, glabra)* - (*Quercus marilandica*) / *Ulmus alata* / (*Schizachyrium scoparium*, *Piptochaetium avenaceum*) Woodland (CEGL003714, G2G3)
- *Quercus stellata* - *Carya carolinae-septentrionalis* / *Acer leucoderme* / *Piptochaetium avenaceum* - *Danthonia spicata* Woodland (CEGL003713, G2)
- *Sporobolus vaginiflorus* var. *ozarkanus* - *Diodia teres* - *Croton willdenowii* - *Ruellia humilis* Herbaceous Vegetation (CEGL004276, G1)

Alliances:

- (*Fraxinus americana*, *Juniperus virginiana*) / *Carex pensylvanica* - *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.3014)
- *Carya (glabra, ovata)* - *Fraxinus americana* - *Quercus (alba, rubra)* Forest Alliance (A.258)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Sporobolus (neglectus, vaginiflorus)* Herbaceous Alliance (A.1815)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system.

Size: Occurs in large patches, ranging up to dozens of acres.

Adjacent Ecological Systems:

- Piedmont Upland Depression Swamp (CES202.336)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Adjacent Ecological System Comments: Piedmont Upland Depression Swamp (CES202.336) occurs on similar soils with topography that limits runoff of rainwater. Most are surrounded by basic soil associations of Southern Piedmont Dry Oak-(Pine) Forest (CES202.339) on less extreme soils.

DISTRIBUTION

Range: As currently known, this system is found in the Piedmont of Maryland, Virginia, North Carolina, South Carolina and Georgia. Its status in Alabama is not known. Its occurrence may be more frequent in the Triassic basins, but it is not restricted to them.

Divisions: 202:C

Nations: US

Subnations: GA, MD, NC, SC, VA

Map Zones: 54:C, 59:C, 60:C, 61:C

USFS Ecomap Regions: 221D:CC, 231A:CC, 231I:CC

TNC Ecoregions: 52:C, 61:C

SOURCES

References: Comer et al. 2003, EPA 2004, Farrell and Ware 1991, Southeastern Ecology Working Group n.d., Ware 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723218#references

Description Author: M. Schafale, R. Evans, G. Fleming, M. Pyne, mod. J. Teague

Version: 23 Jul 2007

Concept Author: M. Schafale, R. Evans, G. Fleming, M. Pyne

Stakeholders: East, Southeast

ClassifResp: Southeast

1333 SOUTH FLORIDA HARDWOOD HAMMOCK (CES411.287)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Alkaline Soil; Broad-Leaved Evergreen Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2333; ESLF 4139; ESP 1333

CONCEPT

Summary: This rockland tropical hammock system, as currently defined, occurs only in extreme southern Florida. It consists of upland hardwood forest on elevated ridges of limestone in three discrete major regions; the Keys, southeastern Big Cypress, and the Miami Rock Ridge. Tropical hardwood species are diagnostic of the system, although few are common or dominant in all regions where these hammocks occur (Snyder et al. 1990). Among the species likely to be encountered throughout are *Bursera simaruba*, *Coccoloba diversifolia*, and *Eugenia axillaris*. The northward ranges of these species are limited by the incidence of frosts (Drew and Schomer 1984). *Quercus laurifolia* is one of the few temperate species which attains prominence in this system. These forests tend to have a dense canopy that produces deeper shade, less evaporation, and lower air temperature than surrounding vegetation. This microclimate, in combination with high water tables, tends to keep humidity levels high and the community quite mesic (FNAI 1990). A number of orchid and bromeliad species thrive in such conditions. Unlike most coastal plain systems, fire is a major threat to South Florida Hardwood Hammock (CES411.287). For this reason, many examples occur alongside natural firebreaks, such as the leeward side of exposed limestone (Robertson 1955), moats created by limestone solution (Duever et al. 1986), and elevated outcrops above marshes, scrub cypress, or sometimes mangrove swamps (Snyder et al. 1990).

Related Concepts:

- Coastal Rock Barren (FNAI 1990) Intersecting
- Rockland Hammock (FNAI 1990) Finer
- Tropical Hammock (Snyder et al. 1990) Equivalent

DESCRIPTION

Environment: This system occurs in three discrete regions of south Florida. Underlying geology and soils are somewhat different among these regions, and the juxtaposition of the system may be somewhat unique. Generally, soils are highly organic with uneven and widely ranging thickness (Snyder et al. 1990). Unlike most coastal plain systems, fire is a major threat to South Florida Hardwood Hammock (CES411.287). For this reason, many examples occur alongside natural firebreaks, such as the leeward side of exposed limestone (Robertson 1955), moats created by limestone solution (Duever et al. 1986), and elevated outcrops above marshes, scrub cypress, or sometimes mangrove swamps (Snyder et al. 1990).

Vegetation: There tends not to be strong dominance in these forests, so the principal species list can be long. Some typical dominant tree species, in no real order, are *Bursera simaruba*, *Coccoloba diversifolia*, *Metopium toxiferum*, *Swietenia mahagoni*, *Zanthoxylum fagara*, *Gymnanthes lucida* (= *Ateramnus lucidus*), *Piscidia piscipula*, and *Pithecellobium keyense* (T. Armentano pers. comm.). Other species can include *Lysiloma latisiliquum*, *Nectandra coriacea*, *Ficus aurea*, *Sideroxylon foetidissimum*, *Eugenia foetida*, *Guapira discolor*, *Coccoloba uvifera*, *Thrinax morrisii*, *Thrinax radiata*, *Erithalis fruticosa*, *Krugiodendron ferreum*, *Casasia clusiifolia*, *Erithalis fruticosa*, *Byrsonima lucida*, and *Capparis flexuosa*.

MEMBERSHIP

Associations:

- *Bursera simaruba* - *Swietenia mahagoni* - *Lysiloma latisiliquum* / *Nectandra coriacea* - *Coccoloba diversifolia* Forest (CEGL007003, G1G2)
- *Conocarpus erectus* - *Sideroxylon celastrinum* - *Erithalis fruticosa* - *Manilkara jaimiqui* ssp. *emarginata* Forest (CEGL007058, G1)
- *Ficus aurea* - *Sideroxylon foetidissimum* - *Bursera simaruba* / *Eugenia foetida* - *Guapira discolor* - *Nectandra coriacea* Forest (CEGL007001, G1)
- *Metopium toxiferum* - *Eugenia foetida* - *Coccoloba uvifera* - *Thrinax morrisii* / *Erithalis fruticosa* Forest (CEGL007008, G2)
- *Metopium toxiferum* - *Eugenia foetida* - *Krugiodendron ferreum* - *Swietenia mahagoni* / *Capparis flexuosa* Forest (CEGL007007, G2)
- *Metopium toxiferum* - *Thrinax morrisii* - *Byrsonima lucida* / *Schizachyrium* spp. Woodland (CEGL003503, G1)
- *Morella cerifera* - *Ilex cassine* - *Quercus virginiana* - *Serenoa repens* Shrubland (CEGL003788, G2)
- *Pteridium caudatum* Herbaceous Vegetation (CEGL004259, GNR)
- *Sideroxylon foetidissimum* - *Sideroxylon salicifolium* - *Ficus aurea* - *Quercus virginiana* - *Celtis laevigata* Forest (CEGL007004, G1Q)
- *Thrinax radiata* - *Casasia clusiifolia* - *Erithalis fruticosa* Forest (CEGL004711, G1Q)

Alliances:

- *Bursera simaruba* - *Coccoloba diversifolia* - *Nectandra coriacea* - *Eugenia axillaris* Forest Alliance (A.33)
- *Casasia clusiifolia* - *Guapira discolor* Forest Alliance (A.34)
- *Conocarpus erectus* - *Sideroxylon celastrinum* Saturated Forest Alliance (A.78)
- *Metopium toxiferum* - *Eugenia foetida* Forest Alliance (A.38)
- *Metopium toxiferum* Woodland Alliance (A.465)
- *Morella cerifera* - *Ilex cassine* Shrubland Alliance (A.722)
- *Pteridium caudatum* Herbaceous Alliance (A.1578)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South Florida Depression Pondshore (CES411.054)

DISTRIBUTION

Range: This system is endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Armentano pers. comm., Comer et al. 2003, Drew and Schomer 1984, Duever et al. 1986, FNAI 1990, Robertson 1955, Ross et al. 1992, Snyder et al. 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723201#references

Description Author: R. Evans, mod. M. Pyne

Version: 31 Jan 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1360 SOUTH FLORIDA PINE ROCKLAND (CES411.367)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Circumneutral Soil; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2360; ESLF 4263; ESP 1360

CONCEPT

Summary: This system includes pinelands of extreme south Florida growing on limestone. The uniqueness of the flora associated with this type has long been recognized, including the number of endemic and West Indian species. It has been estimated that nearly one-third of the taxa found in this system are restricted to it, including half of south Florida's endemic plants (Stout and Marion 1993). Unlike pinelands elsewhere in the southeastern coastal plain, *Pinus elliottii* var. *densa* is the only native pine species in this system. Understory vegetation consists of many hardwood species, including a number with tropical origins, and the herbaceous flora is species-rich and fire-adapted.

Similar Ecological Systems:

- South Florida Pine Flatwoods (CES411.381)--is also dominated nearly exclusively by *Pinus elliottii* var. *densa* in the canopy, but is on more acidic substrates (e.g., sand) and lacks much of the diversity and tropical characteristics of the understory.

Related Concepts:

- Coastal Rock Barren (FNAI 1990) Intersecting
- Pine Forest (Duever et al. 1986) Broader
- Pine Rockland (FNAI 1990) Equivalent

DESCRIPTION

Environment: Along the southeast coast of Florida this system occurs on Miami Oolitic Limestone, while in the Big Cypress region (southwest Florida) it is found on outcrops of Tamiami Limestone.

Vegetation: *Pinus elliottii* var. *densa* is the only native pine species in this system. It has been estimated that nearly one-third of the taxa found in this system are restricted to it, including half of south Florida's endemic plants (Stout and Marion 1993). The range of this system is largely outside the natural range of *Pinus serotina*, *Pinus elliottii* var. *elliottii*, and *Pinus palustris*.

Dynamics: In the absence of fire, this system may be replaced by hardwoods species within several decades (Stout and Marion 1993).

MEMBERSHIP

Associations:

- *Pinus elliottii* var. *densa* / *Coccothrinax argentata* - *Thrinax morrisii* Woodland (CEGL003532, G1)
- *Pinus elliottii* var. *densa* / *Sabal palmetto* / *Schizachyrium rhizomatum* - *Muhlenbergia filipes* - *Rhynchospora divergens* Tropical Woodland (CEGL003533, G1G2)
- *Pinus elliottii* var. *densa* / *Sabal palmetto* / *Serenoa repens* Woodland (CEGL003534, G2?)
- *Pinus elliottii* var. *densa* / *Serenoa repens* - *Tetrazygia bicolor* - *Guettarda scabra* Woodland (CEGL003538, G1)
- *Pinus elliottii* var. *densa* / *Sideroxylon salicifolium* - *Chrysobalanus icaco* - *Ilex cassine* Woodland (CEGL003535, G2?)

Alliances:

- *Pinus elliottii* Saturated Tropical Woodland Alliance (A.493)
- *Pinus elliottii* Tropical Woodland Alliance (A.491)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South Florida Depression Pondshore (CES411.054)

DISTRIBUTION

Range: Davis (1943) mapped this system, which occurred primarily on the Miami ridge bordering the Everglades, with disjunct examples found in the Big Cypress Swamp. McPherson's (1986) map of Big Cypress shows "pine forest," which includes both pine rocklands and pine flatwoods, scattered across the unit. It may be possible to differentiate based on soil type or geology. In the Florida Keys it is found on Big Pine Key, No Name Key, Little Pine Key, Cudjoe Key, and Upper Sugarloaf Key.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Davis 1943, McPherson 1986, Stout and Marion 1993, USFWS 1998b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723149#references

Description Author: R. Evans, mod. M. Pyne

Version: 18 Apr 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)**Land Cover Class:** Forest and Woodland**Spatial Scale & Pattern:** Large patch**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland**Diagnostic Classifiers:** Pimple mounds; Forest and Woodland (Treed); Broad-Leaved Deciduous Tree**FGDC Crosswalk:** Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy**National Mapping Codes:** EVT 2326; ESLF 4132; ESP 1326

CONCEPT

Summary: This system represents hardwood-dominated "xerohydric flatwoods" of limited areas of the most inland portions of the East Gulf Coastal Plain in western Kentucky, as well as in the nearby Shawnee Hills in the western Interior Low Plateau. The core of the area from which this system was initially described is referred to as the Jackson Purchase or "Jackson Plain," where these areas have long been recognized as a distinctive subdivision within this region (Davis 1923, Bryant and Martin 1988). There is some local variability in the expression of this system along a hydrologic/microtopographic gradient. The elevated ridges are composed of somewhat coarser-textured soils and retain less moisture than do the lower areas, although both occur in a tight local mosaic. The soils appear to have well-developed subsurface hardpans, the impermeability of which contributes to shallowly perched water tables during portions of the year when precipitation is greatest and evapotranspiration is lowest (not due to overbank flooding). Thus, soil moisture fluctuates widely throughout the growing season, from saturated to very dry, a condition sometimes referred to as xerohydric (Evans 1991). Fire was an important natural process in this system, and well-burned examples tend to be relatively open-canopied with well-developed herbaceous layers (M. Evans pers. comm.).

Classification Comments: The component associations are poorly known and described. More work is needed to clarify which types are present.

Similar Ecological Systems:

- South-Central Interior / Upper Coastal Plain Wet Flatwoods (CES203.480)

Related Concepts:

- Flatwoods (Evans 1991) Broader

DESCRIPTION

Environment: Examples of this system occur along the northeastern flank of the Upper East Gulf Coastal Plain ecoregion where loess deposits thin out and gravelly or sandy soils predominate. Examples occur on relatively high flat areas that are not directly affected by overbank flooding. These environments include ancient Quaternary or Tertiary post-glacial meltwater lakebeds and high terraces of the Upper Gulf Coastal Plain. The most typical soil is Okaw Silt Loam. The same system is found in the Shawnee Hills of Kentucky (M. Evans pers. comm. 2006). The lakes were originally formed by glacial damming of the Ohio River.

Vegetation: Stands of this system are dominated by *Quercus stellata*, a somewhat fire-tolerant oak. In addition, *Quercus alba*, *Carya ovata*, *Carya glabra*, and *Quercus velutina* may be present. The presence of *Quercus falcata* indicates longer fire-return times. The presence of *Quercus imbricaria* indicates that the stands were formerly more open. *Pinus* spp. are not prevalent in this area, but could invade from nearby plantations. Herbaceous cover is sparse to moderate; leaf litter is the dominant ground cover. Some shrubs include *Crataegus viridis*, *Ilex decidua*, and *Ulmus alata*. Characteristic grasses could include *Schizachyrium scoparium*, *Sorghastrum nutans*, and *Andropogon* spp. Some other typical herbs include *Manfreda virginica*, *Croton willdenowii*, *Danthonia spicata*, *Porteranthus stipulatus*, and *Pycnanthemum tenuifolium* (Hendricks et al. 1991). Lower areas (drainage ways and depressions) have *Quercus michauxii*, *Quercus pagoda*, *Quercus phellos*, *Liquidambar styraciflua*, or even *Taxodium distichum*. Local herb dominance in depressions is of wetland species such as *Juncus* spp. and *Carex* spp. For this related and possibly juxtaposed wetland vegetation, see South-Central Interior / Upper Coastal Plain Wet Flatwoods (CES203.480).

MEMBERSHIP

Associations:

- *Quercus stellata* / (*Danthonia spicata*, *Croton willdenowii*) Woodland (CEGL005057, G1)
- *Quercus stellata* / *Cinna arundinacea* Flatwoods Forest (CEGL002405, G2G3)

Alliances:

- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Quercus stellata* Flatwoods Forest Alliance (A.261)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483)
- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)

Adjacent Ecological System Comments: East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483).

DISTRIBUTION

Range: This system occurs in limited areas of the most inland portions of the East Gulf Coastal Plain in western Kentucky and adjacent Tennessee (the "Jackson Purchase" or "Jackson Plain" region; 222Cb; 74b in part), as well as in the nearby "Shawnee Hills" of the Interior Low Plateau (222Dh, 222Di; 72c) of Kentucky and adjacent Indiana.

Divisions: 203:C

Nations: US

Subnations: IL?, IN, KY, TN

Map Zones: 46:P, 47:C, 49:?

TNC Ecoregions: 43:C, 44:C

SOURCES

References: Bryant and Martin 1988, Comer et al. 2003, Davis 1923, Evans 1991, Hendricks et al. 1991, M. Evans pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723107#references

Description Author: R. Evans and M. Evans, mod. M. Pyne

Version: 18 Apr 2006

Concept Author: R. Evans and M. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1321 SOUTH-CENTRAL INTERIOR MESOPHYTIC FOREST (CES202.887)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Sideslope; Unglaciated; Eutrophic Soil; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2321; ESLF 4127; ESP 1321

CONCEPT

Summary: These high-diversity, predominately deciduous forests occur on deep and enriched soils (in some cases due to, or enhanced by, the presence of limestone or related base-rich geology), in non-montane settings and usually in somewhat protected landscape positions such as coves or lower slopes. The core distribution of this system lies in the Cumberland and Allegheny plateaus, extending into the adjacent southern Ridge and Valley and portions of the Interior Low Plateau where it is located entirely south of the glacial boundary. Dominant species include *Acer saccharum*, *Fagus grandifolia*, *Liriodendron tulipifera*, *Tilia americana*, *Quercus rubra*, *Magnolia acuminata*, and *Juglans nigra*. *Tsuga canadensis* may be a component of some stands. Trees may grow very large in undisturbed areas. The herb layer is very rich, often with abundant spring ephemerals. Many examples may be bisected by small streams.

Classification Comments: Southern and Central Appalachian Cove Forest (CES202.373) (Ecoregions 51 and 59) is being treated as a separate system. The concept of this type (CES202.887) is more-or-less consistent with the "Mixed Mesophytic Communities" of both the Mixed Mesophytic Forest Region and the non-coastal plain portion of the Western Mesophytic Forest Region, extending north into unglaciated portions of the Beech-Maple Forest Region, of Braun (1950) and Greller (1988). There is much variability in different examples of this system across its range, with the composition of some occurrences in the escarpment of the Cumberland Plateau approaching that of examples of Southern and Central Appalachian Cove Forest (CES202.373). In limited areas of the region, some stands may contain hemlock (*Tsuga canadensis*). These are noteworthy on a local basis, as the tree is less well distributed in the range of this system than it is in corresponding environments at higher elevation in the Appalachians or to the north.

Similar Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)--found to the north and east.
- North-Central Interior Beech-Maple Forest (CES202.693)--is an equivalent system of glaciated terrain to the north.
- Ozark-Ouachita Mesic Hardwood Forest (CES202.043)
- Southern and Central Appalachian Cove Forest (CES202.373)--is found in adjacent regions to the east.

Related Concepts:

- Acidic Mesophytic Forest (Evans 1991) Finer
- Bluegrass Mesophytic Cane Forest (Evans 1991) Finer
- Calcareous Mesophytic Forest (Evans 1991) Finer
- Rich mesophytic forest (Edinger et al. 2002) Finer

DESCRIPTION

Environment: These high-diversity deciduous forests occur on deep and enriched soils, usually in somewhat protected landscape positions such as coves or lower slopes.

Vegetation: Dominant tree species include *Acer saccharum*, *Fagus grandifolia*, *Liriodendron tulipifera*, *Tilia americana*, *Quercus rubra*, *Magnolia acuminata*, and *Juglans nigra*. *Tsuga canadensis* may be a component of some stands. The herb layer is very rich, often with abundant spring ephemerals.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Carya ovata* - *Juglans nigra* / *Symphoricarpos orbiculatus* / *Galium circaezans* Forest (CEGL004741, G3G4)
- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* - *Liriodendron tulipifera* / *Actaea racemosa* Forest (CEGL006237, G4?)
- *Fagus grandifolia* - *Acer saccharum* - *Liriodendron tulipifera* Unglaciated Forest (CEGL002411, G4?)
- *Fagus grandifolia* - *Liriodendron tulipifera* / *Euonymus americanus* / *Athyrium filix-femina* ssp. *asplenioides* Forest (CEGL007201, G4)
- *Fagus grandifolia* - *Quercus alba* / *Cornus florida* Forest (CEGL007881, G4)
- *Fagus grandifolia* - *Quercus alba* / *Kalmia latifolia* - (*Symplocos tinctoria*, *Rhododendron catawbiense*) / *Galax urceolata* Forest (CEGL004539, G2G3)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* / (*Magnolia tripetala*) Forest (CEGL005222, G4?)
- *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Forest (CEGL007220, GNA)
- *Quercus alba* - (*Liriodendron tulipifera*, *Liquidambar styraciflua*) / *Calycanthus floridus* / *Athyrium filix-femina* Forest (CEGL008428, G3G4)

- *Quercus alba* - (*Quercus rubra*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest (CEGL007233, G4)
- *Quercus alba* - *Fagus grandifolia* / *Hydrangea quercifolia* - *Viburnum acerifolium* / *Carex picta* - *Polystichum acrostichoides* Forest (CEGL007213, G3G4)
- *Quercus rubra* - *Acer saccharum* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - (*Cladrastis kentukea*) Forest (CEGL007698, G3)
- *Quercus rubra* - *Tilia americana* var. *heterophylla* - *Carya carolinae-septentrionalis* / *Acer (barbatum, leucoderme)* / *Hydrangea quercifolia* Forest (CEGL008488, G2G3)
- *Tsuga canadensis* - (*Liriodendron tulipifera*, *Fagus grandifolia*) / (*Magnolia macrophylla*, *Ilex opaca*) / *Polystichum acrostichoides* Forest (CEGL004767, G1G2)
- *Tsuga canadensis* - *Fagus grandifolia* - *Acer saccharum* / (*Hamamelis virginiana*, *Kalmia latifolia*) Forest (CEGL005043, G3?)

Alliances:

- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* Forest Alliance (A.217)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* Forest Alliance (A.235)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)
- Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)

DISTRIBUTION

Range: This system occurs in southeastern Ohio east to Virginia, West Virginia, Kentucky, Tennessee, Georgia, and Alabama, with disjunct occurrences in unglaciated southwestern Pennsylvania and southwestern New York. This range is more-or-less consistent with the "Mixed Mesophytic" and "Western Mesophytic" (non-coastal plain portion only) forest regions of Braun (1950) and Greller (1988), although it does extend into unglaciated portions of the "Beech-Maple" region to the north. Thus, this system is most extensive in the Cumberland and Allegheny plateaus, as well as the unglaciated Interior Low Plateau, and becomes relatively limited in extent towards its western limit in the Ozark Hills of Illinois, and towards its northern limit in southwestern New York.. It is replaced in the Upper East Gulf Coastal Plain by other systems. Its range also includes the southern Ridge and Valley from Tennessee (and adjacent southwestern Virginia) to Alabama. Parts of the Cumberland Mountains (EPA 69 in Kentucky and Tennessee) are instead occupied by Southern and Central Appalachian Cove Forest (CES202.373).

Divisions: 202:C

Nations: US

Subnations: AL, GA, IL, IN, KY, NY, OH, PA, TN, VA, WV

Map Zones: 47:C, 48:C, 49:C, 53:C, 57:C, 61:C, 62:C, 63:C

USFS Ecomap Regions: 221E:CC, 221F:C?, 221H:CC, 223D:CC, 223E:CC, 223F:CC, 231C:CC, 231D:CC, M221C:CC

TNC Ecoregions: 44:C, 49:C, 50:C, 60:C

SOURCES

References: Braun 1950, Comer et al. 2003, Greller 1988

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722791#references

Description Author: M. Pyne and R. Evans

Version: 20 Aug 2007

Concept Author: M. Pyne and R. Evans

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

1337 SOUTHEAST FLORIDA COASTAL STRAND AND MARITIME HAMMOCK (CES411.369)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2337; ESLF 4143; ESP 1337

CONCEPT

Summary: This ecological system occurs as a narrow band of hardwood forest and shrublands along the Atlantic coast of southeastern Florida (approximately Volusia County southward). It is found on stabilized, old, coastal dunes, often with substantial shell components. The vegetation is characterized by hardwood species with tropical affinities. As such, the northern extent of this type is limited by periodic freezes and cold tolerance of tropical constituent species, such as *Guapira discolor* and *Exothea paniculata* (Johnson and Muller 1993a). This system is closely related to both inland tropical hammocks and southwest Florida maritime hammocks, and may share some species overlap with each.

Classification Comments: This system may be distinguished from southwest Florida maritime hammocks by geographic location, presence of certain indicator species lacking from southwest type (*Guapira discolor* and *Exothea paniculata*), and relatively harsher coastal exposure. It is distinguished from maritime hammocks further north which contain temperate species including *Persea borbonia*, *Quercus virginiana*, *Magnolia grandiflora*, and *Juniperus virginiana* var. *silicicola* (Johnson and Muller 1993a). Thatch palms (*Thrinax morrisii*, *Thrinax radiata*) are found in rockland hammocks, but absent from maritime hammocks.

Similar Ecological Systems:

- Southwest Florida Coastal Strand and Maritime Hammock (CES411.368)

Related Concepts:

- Coastal Strand (FNAI 1990) Intersecting
- Maritime Hammock (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- *Ficus aurea* - *Sideroxylon foetidissimum* - *Bursera simaruba* / *Eugenia foetida* - *Guapira discolor* - *Nectandra coriacea* Forest (CEGL007001, G1)
- *Quercus geminata* - *Quercus myrtifolia* - *Serenoa repens* - *Sideroxylon tenax* - *Ximenia americana* Shrubland (CEGL003822, G1)
- *Quercus virginiana* - *Sabal palmetto* - *Persea borbonia* / *Myrcianthes fragrans* - *Ardisia escallonoidea* - *Psychotria nervosa* Forest (CEGL007033, G1)
- *Serenoa repens* - *Coccoloba uvifera* - *Pithecellobium keyense* - *Dalbergia ecastaphyllum* Shrubland (CEGL003782, G1)
- *Serenoa repens* - *Sabal palmetto* - *Coccoloba uvifera* - *Sideroxylon tenax* - *Myrcianthes fragrans* - *Myrsine floridana* Shrubland (CEGL003811, G2)

Alliances:

- *Bursera simaruba* - *Coccoloba diversifolia* - *Nectandra coriacea* - *Eugenia axillaris* Forest Alliance (A.33)
- *Coccoloba uvifera* Shrubland Alliance (A.715)
- *Quercus geminata* - *Quercus myrtifolia* - *Quercus chapmanii* Shrubland Alliance (A.779)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Serenoa repens* Temperate Shrubland Alliance (A.750)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Johnson and Muller 1993a

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723147#references

Description Author: R. Evans, after Johnson and Muller

Version: 16 Dec 2002

Concept Author: R. Evans, after Johnson and Muller

Stakeholders: Southeast

ClassifResp: Southeast

1351 SOUTHEASTERN INTERIOR LONGLEAF PINE WOODLAND (CES202.319)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2351; ESLF 4254; ESP 1351

CONCEPT

Summary: This system encompasses the fire-maintained woodlands and forests of the outer Piedmont of Georgia and the Carolinas and the Talladega upland region (quartzite-slate transition) of Alabama, where *Pinus palustris* is a dominant or codominant canopy species. Examples occur on rolling to somewhat mountainous upland slopes in North Carolina, South Carolina, Georgia, and Alabama. They are believed to naturally be open woodlands with grassy ground cover, but many are now closed forests with dense shrubs or with little ground cover.

Classification Comments: This system is closely related to the upland longleaf pine systems of the Coastal Plain, with which it shares the ecological importance of fire, much of its flora and presumably fauna, and probably canopy dynamics. It is distinguished by the distinctive Piedmont soils, by some floristic and compositional differences, and by the distinctive Piedmont/Talladega upland landscape with its greater topographic relief. It probably had less frequent natural fire and a somewhat more mixed canopy, with additional pine species in addition to oaks.

This system is distinguished from all other Piedmont and interior systems in having *Pinus palustris*, an indicator of frequent fire, as a dominant species. However, universal logging and fire suppression have blurred the distinction and have made many former examples indistinguishable from one of these other systems. This system should be recognized where there remains evidence of its past occurrence in the form of remnant flora.

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland (CES203.496)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

DESCRIPTION

Environment: This system occurs in upland settings, which may range from gently rolling to rugged and mountainous. Geologic substrates vary. Most portions are dry to dry-mesic, but occasional moist areas and seepage wetlands occur. The primary influence on the system is frequent fire, associated with a location near a fire-prone portion of the Coastal Plain or with other factors. Apparently once widespread along the Fall Zone, remnants are now largely limited to two clusters, in eastern Alabama and adjacent Georgia and in south-central North Carolina. The former occurs on rugged terrain associated with the extension of geologic belts of the Blue Ridge. The latter is on gently to moderately rolling topography of metasedimentary and volcanic rocks.

Vegetation: Vegetation consists of open woodlands or forests. *Pinus palustris* is either dominant, codominant, or present in circumstances that indicate former dominance or codominance. *Pinus echinata*, *Pinus taeda*, *Quercus falcata*, *Quercus stellata*, *Quercus prinus*, *Quercus coccinea*, and *Quercus velutina* are frequent associates, often codominating. Alteration of fire regimes and universal logging have made the natural condition of the vegetation somewhat uncertain. Almost certainly *Pinus palustris* was more abundant than it usually is at present, but very likely some component of other pines and of oaks was present. Under conditions of frequent fire, understories and shrub layers were sparse and the grassy herb layer dense. There is no evidence that *Aristida stricta* or *Aristida beyrichiana* were present in most examples, but many other grasses and forbs are shared with the upland longleaf pine systems of the Coastal Plain. Other frequently dominant species, such as *Piptochaetium avenaceum* and *Danthonia spicata*, are not characteristic of Coastal Plain longleaf pine systems. In remnant examples, where fire suppression has affected vegetation structure, the ground cover is often shrubby, with dense ericaceous shrubs leaving little space for herbs. Examples that have been burned recently often have ground cover dominated by shrubs and hardwood sprouts, with somewhat increased herb cover.

Dynamics: The dynamics of this system are strongly dominated by fire. Fires probably once occurred at frequencies somewhat lower than in the Coastal Plain but more frequently than in any other Piedmont system. Fires would be fairly low in intensity and would kill few individual plants in the fire-adapted vegetation. Modern fire suppression has allowed other pines and oaks to increase in density, along with shrubs, and has resulted in the loss of the herb layer. Reproduction of *Pinus palustris* has been largely eliminated by the lack of fire. Where the canopy was also logged, *Pinus palustris* has often been completely eliminated, leaving the system indistinguishable from logged Southern Piedmont Dry Oak-(Pine) Forest (CES202.339). Because most of the canopy species are fairly resilient to fire, and many have the ability to sprout, reintroduction of fire returns this system to its natural composition and structure only gradually. Despite frequent fire, canopy dynamics were probably naturally dominated by gap-phase regeneration, with trees reproducing in small to medium-sized gaps created by wind storms and hot spots in fires. Fire would cause canopy gaps to persist longer. *Pinus palustris* and most of the other canopy species are long-lived.

MEMBERSHIP

Associations:

- *Pinus palustris* - *Pinus echinata* - (*Pinus virginiana*) / *Quercus marilandica* - (*Quercus prinus*) / *Vaccinium pallidum* Woodland (CEGL008437, G2)
- *Pinus palustris* - *Pinus echinata* / *Quercus coccinea* - *Quercus georgiana* Woodland (CEGL004432, G1Q)
- *Pinus palustris* - *Pinus echinata* / *Schizachyrium scoparium* - *Manfreda virginica* Serpentine Woodland (CEGL003608, G1)
- *Pinus palustris* - *Pinus taeda* - *Pinus serotina* / *Chasmanthium laxum* - *Panicum virgatum* Piedmont Woodland (CEGL003663, G1)
- *Quercus prinus* - *Pinus palustris* Forest (CEGL004060, G2G3)

Alliances:

- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* / *Quercus* spp. Woodland Alliance (A.499)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)

SPATIAL CHARACTERISTICS

Spatial Summary: This system was once a large-patch to matrix system, locally dominating the landscape matrix. Remnants are mostly large patches, some up to hundreds of acres or possibly even more.

Size: This system naturally occurs as a large-patch system, or as matrix system in limited areas. Contiguous examples or complexes of related patches of thousands of acres probably once occurred. Remnants are mostly large to medium patches. Occurrences over 1000 acres are present in Alabama, and patches up to 400 acres are present in North Carolina.

Adjacent Ecological Systems:

- Piedmont Seepage Wetland (CES202.298)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Adjacent Ecological System Comments: Examples are interfingered or associated with various mesic and floodplain or bottomland systems. Upland systems such as Southern Piedmont Dry Oak-(Pine) Forest (CES202.339) sometimes occur adjacent to remnants, especially on more rugged terrain. It is not always clear which oak-hickory forests are true examples of that system and which represent longleaf pine systems that have been degraded beyond recognition.

DISTRIBUTION

Range: This system once ranged throughout the southern two-thirds of the Piedmont, from central North Carolina to Alabama. More extensive areas now are largely, if not exclusively, restricted to south-central North Carolina (outer Piedmont) and to eastern Alabama (Talladega upland). Smaller remnants are found in very limited areas of South Carolina and Georgia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC

Map Zones: 48:C, 54:C, 59:C

TNC Ecoregions: 50:C, 52:C

SOURCES

References: Anderson 1999a, Comer et al. 2003, Schafale pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723180#references

Description Author: M. Schafale and R. Evans

Version: 17 Jan 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1318 SOUTHERN AND CENTRAL APPALACHIAN COVE FOREST (CES202.373)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2318; ESLF 4124; ESP 1318

CONCEPT

Summary: This system consists of mesophytic hardwood or hemlock-hardwood forests of sheltered topographic positions in the Southern Blue Ridge and central Appalachian Mountains. Examples are generally found on concave slopes that promote moist conditions. The system includes a mosaic of acidic and "rich" coves that may be distinguished by individual plant communities based on perceived differences in soil fertility and species richness (rich examples have higher diversity and density in the herbaceous layer). Both acidic and rich coves may occur in the same site, with the acidic coves potentially creeping out of the draw-up to at least midslope on well-protected north-facing slopes. Characteristic species in the canopy include *Aesculus flava*, *Acer saccharum*, *Fraxinus americana*, *Tilia americana*, *Liriodendron tulipifera*, *Halesia tetraptera*, *Tsuga canadensis*, *Fagus grandifolia*, *Magnolia acuminata*, and *Magnolia fraseri*.

Classification Comments: This system is best distinguished from others in its range by the combination of sheltered topography, low elevation, and mesophytic flora with high species richness. Canopies can sometimes become depauperate after repeated logging. It is presently defined as not including rich, mesophytic "cove" forests of the Cumberland Plateau and Interior Low Plateau, even though some of these approach or exceed Appalachian examples in their species composition and or their "coveyness." This will be interpreted as variability within South-Central Interior Mesophytic Forest (CES202.887).

Similar Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)
- South-Central Interior Mesophytic Forest (CES202.887)--found in adjacent regions to the west, out of the mountains, with a more matrix landscape character.
- Southern Piedmont Mesic Forest (CES202.342)--found in adjacent regions to the east.

DESCRIPTION

Environment: This system occurs below 1525 m (5000 feet) elevation and generally below 1375 m (4500 feet) in low topographic positions such as valley bottoms and ravines. This cove type has two primary components, an acid cove of lower soil fertility that ranges from the lowest slope positions up the slope on north-facing protected slopes, and a rich, high-fertility cove forest that tends to occur only at the lowest slope positions. Both are sheltered from wind and may be shaded by topography, promoting moist conditions. Local slopes are usually concave. Bedrock may be of virtually any type. Acidic rocks, such as felsic igneous and metamorphic rocks, support rich cove forests in a more limited range of sites than do basic rocks, such as mafic metamorphic rocks or marble. Soils may be rocky or fine-textured, and may be residual, alluvial, or colluvial. In the southern Appalachians, the hemlock "phase" of this ("acidic cove forest") often occurs between "richer" examples of Southern and Central Appalachian Cove Forest (CES202.373) in the lowest areas and Southern Appalachian Oak Forest (CES202.886) on the midslopes.

Vegetation: Vegetation consists of forests dominated by various combinations of mesophytic species, usually with many different species of primarily deciduous trees present. *Liriodendron tulipifera*, *Tilia americana*, *Tilia americana* var. *heterophylla*, *Fraxinus americana*, *Aesculus flava*, *Betula lenta*, *Magnolia acuminata*, *Magnolia fraseri*, *Halesia tetraptera*, *Prunus serotina*, and *Tsuga canadensis* are the most frequent dominant canopy species. Canopies are generally very diverse, with all species potentially occurring in one 20x50-meter plot in rich cove areas. A well-developed herb layer, often very dense and usually high in species richness, is present in all but the acid coves. Well-developed and fairly diverse subcanopy and shrub layers are often also present in all but the acid coves. Ulrey (1999) listed *Caulophyllum thalictroides*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Laportea canadensis*, *Osmorhiza claytonii*, *Sanguinaria canadensis*, *Viola canadensis*, *Acer saccharum*, *Aesculus flava*, *Carya cordiformis*, and *Tilia americana* var. *heterophylla* as characteristic species.

Dynamics: This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration on a fine scale. Occasional extreme wind or ice events may disturb larger patches. Natural fire dynamics are not well-known and probably only occurred in years that were extremely dry. Fires may have occurred at moderate frequency but were probably usually low enough in intensity to have only limited effects. Most of the component species are among the less fire-tolerant in the region.

MEMBERSHIP

Associations:

- *Acer (nigrum, saccharum)* - *Tilia americana* / *Asimina triloba* / *Jeffersonia diphylla* - *Caulophyllum thalictroides* Forest (CEGL008412, G4G5)
- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* - *Liriodendron tulipifera* / *Actaea racemosa* Forest (CEGL006237, G4?)

- *Acer saccharum* - *Liriodendron tulipifera* - *Fraxinus americana* / *Staphylea trifolia* Forest (CEGL006201, G4?)
- *Aesculus flava* - *Acer saccharum* - (*Fraxinus americana*, *Tilia americana* var. *heterophylla*) / *Hydrophyllum canadense* - *Solidago flexicaulis* Forest (CEGL007695, G3G4)
- *Betula alleghaniensis* - *Tilia americana* var. *heterophylla* / *Acer spicatum* / *Ribes cynosbati* / *Dryopteris marginalis* Forest (CEGL004982, G3)
- *Caltha palustris* - *Impatiens capensis* - *Viola cucullata* Herbaceous Vegetation [Provisional] (CEGL006258, GNR)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Herbaceous Vegetation (CEGL004296, G3)
- *Fagus grandifolia* - *Acer saccharum* Glaciated Midwest Forest (CEGL005013, G2G3)
- *Impatiens (capensis, pallida)* - *Monarda didyma* - *Rudbeckia laciniata* var. *humilis* Herbaceous Vegetation (CEGL004293, G3)
- *Liriodendron tulipifera* - *Aesculus flava* - (*Fraxinus americana*, *Tilia americana*) / *Actaea racemosa* - *Laportea canadensis* Forest (CEGL007710, G4)
- *Liriodendron tulipifera* - *Betula lenta* - *Tsuga canadensis* / *Rhododendron maximum* Forest (CEGL007543, G5)
- *Liriodendron tulipifera* - *Quercus rubra* - *Magnolia acuminata* / *Cornus florida* Forest (CEGL008510, G5?)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - (*Aesculus flava*) / *Actaea racemosa* Forest (CEGL007291, G4?)
- *Pinus strobus* - *Tsuga canadensis* / *Rhododendron maximum* - (*Leucothoe fontanesiana*) Forest (CEGL007102, G4)
- *Quercus alba* - (*Quercus rubra*, *Acer saccharum*, *Fagus grandifolia*) / *Aesculus flava* Forest (CEGL007233, G4)
- *Quercus rubra* - *Tilia americana* var. *heterophylla* - *Halesia tetraptera* var. *monticola* / *Collinsonia canadensis* - *Tradescantia subaspera* Forest (CEGL007878, G3?)
- *Tilia americana* var. *heterophylla* - *Fraxinus americana* - (*Ulmus rubra*) / *Sanguinaria canadensis* - (*Aquilegia canadensis*, *Asplenium rhizophyllum*) Forest (CEGL007711, G2G3)
- *Tsuga canadensis* - (*Fagus grandifolia*, *Tilia americana* var. *heterophylla*) / *Magnolia tripetala* Forest (CEGL008407, G4)
- *Tsuga canadensis* - *Halesia tetraptera* - (*Fagus grandifolia*, *Magnolia fraseri*) / *Rhododendron maximum* / *Dryopteris intermedia* Forest (CEGL007693, G2)
- *Tsuga canadensis* / *Rhododendron maximum* - (*Clethra acuminata*, *Leucothoe fontanesiana*) Forest (CEGL007136, G3G4)

Alliances:

- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* Forest Alliance (A.217)
- *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* Forest Alliance (A.266)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* Saturated Herbaceous Alliance (A.1688)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Impatiens (capensis, pallida)* - *Monarda didyma* Saturated Herbaceous Alliance (A.1690)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* Forest Alliance (A.235)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Pinus strobus* - *Tsuga canadensis* Forest Alliance (A.127)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Symplocarpus foetidus* - *Caltha palustris* Saturated Herbaceous Alliance (A.1694)
- *Tsuga canadensis* - *Liriodendron tulipifera* Forest Alliance (A.413)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system commonly occurring in a landscape mosaic with several other systems.

Size: Most individual patches are tens to sometimes a few hundred acres. Because it frequently occurs in mosaics with other systems, separation distance for occurrences has a strong effect on the size of occurrences. Complexes of thousands of acres of this system are possible.

Adjacent Ecological Systems:

- Southern and Central Appalachian Bog and Fen (CES202.300)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Oak Forest (CES202.886)
- Southern Appalachian Seepage Wetland (CES202.317)
- Southern Appalachian Spray Cliff (CES202.288)

Adjacent Ecological System Comments: This system is usually bordered by Southern Appalachian Oak Forest (CES202.886) in the Southern Blue Ridge. The border with adjacent systems is gradational. It may also contain small embedded patches of Southern Appalachian Montane Cliff and Talus (CES202.330) or other small-patch systems. In the southern Appalachians, the "richer" phase of Southern and Central Appalachian Cove Forest (CES202.373) occurs downslope from the hemlock "phase" ("acidic cove forests") and tends to be more mesic and more species-rich than the hemlock-dominated areas. Southern Appalachian Oak Forest (CES202.886) occurs upslope from this system and tends to be drier and even less diverse than the hemlock areas, which may grade into Southern Appalachian Low-Elevation Pine Forest (CES202.332) in especially dry occurrences.

DISTRIBUTION

Range: This system occurs in the southern and central Appalachian Mountains, ranging into the Cumberland Mountains of Kentucky and Tennessee. This range is more-or-less consistent with the "Oak-Chestnut" forest region of Braun (1950) and Geller (1988), versus the "Mixed Mesophytic" and "Western Mesophytic" forest regions to the west.

Divisions: 202:C

Nations: US

Subnations: GA, KY, MD, NC, SC, TN, VA, WV
Map Zones: 53:C, 57:C, 61:C, 62:C
USFS Ecomap Regions: M221A:CC, M221B:CC, M221C:CC, M221D:CC
TNC Ecoregions: 50:C, 51:C, 52:P, 59:C, 61:P

SOURCES

References: Comer et al. 2003, Ulrey 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723143#references

Description Author: M. Schafale, M. Pyne, R. White, R. Evans, mod. S. Gawler

Version: 23 Jul 2007

Concept Author: M. Schafale, M. Pyne, R. White, R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1353 SOUTHERN APPALACHIAN LOW-ELEVATION PINE FOREST (CES202.332)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Acidic Soil; Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2353; ESLF 4256; ESP 1353

CONCEPT

Summary: This system consists of shortleaf pine- and Virginia pine-dominated forests in the lower elevation southern Appalachians and adjacent Piedmont and Cumberland Plateau, extending into the Interior Low Plateau of Kentucky and Tennessee. Examples can occur on a variety of topographic and landscape positions, including ridgetops, upper and midslopes, as well as lower elevations (generally below 700 m [2300 feet]) in the southern Appalachians such as mountain valleys. Examples occur on a variety of acidic bedrock types. Frequent, low-intensity fires coupled with severe fires (Harrod and White 1999) may have been the sole factor determining the occurrence of this system rather than hardwood forests under natural conditions.

Classification Comments: This system and its component associations are among the least studied in the southern Appalachians (Harrod and White 1999). Settlement, universal logging, pine beetle outbreaks, and fire suppression potentially have altered their character and blurred their boundaries more than most systems in the region. The situation is further complicated by the potential for pine-dominated forests to have been both created and destroyed in different places by these disturbances. Obviously successional pine forests associated with the recovery of heavily logged or plowed slopes and valleys are grouped into the matrix Central and Southern Appalachian Montane Oak Forest (CES202.596).

The relationship between this system and Southern Appalachian Montane Pine Forest and Woodland (CES202.331) may need further clarification. Southern Appalachian Low-Elevation Pine Forest (CES202.332) is distinguished by its occurrence as large patches on lower terrain (generally below 700 m [2300 feet]) and less extreme topography. The vegetation of the two systems may overlap due to the factors outlined above, but pitch pine and Table Mountain pine are more typical of the former, while shortleaf pine and Virginia pine are more typical of the latter.

Presently the shortleaf pine-dominated vegetation of the Interior Low Plateau (ILP), including the Tennessee portion of Land Between the Lakes, is included in this system. Frost (1998) treats the ILP region in a different fire-return-interval class than the core range of this system, although local variation may overwhelm the broad regional differences. If more detailed information becomes available to document important ecological differences between these areas, a new system may be required.

This system (CES202.332) at its western extent in central Tennessee would be distinguished from equivalent Ozarkian systems (e.g., Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)) by the presence of *Pinus virginiana* and *Quercus prinus*, which do not cross the Mississippi River.

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)
- Central and Southern Appalachian Montane Oak Forest (CES202.596)
- Ozark-Ouachita Shortleaf Pine-Bluestem Woodland (CES202.325)
- Ozark-Ouachita Shortleaf Pine-Oak Forest and Woodland (CES202.313)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Related Concepts:

- Appalachian Pine-Oak Forest (Evans 1991) Finer

DESCRIPTION

Environment: Occurs on ridge tops, upper and mid slopes, in mountain valleys and the lower ranges. Bedrock may be a variety of types, but the system may be limited to acidic substrates. Fire is undoubtedly a very important influence.

Vegetation: Vegetation consists of closed to open forests or woodlands dominated by *Pinus echinata* or *Pinus virginiana*. *Pinus rigida* may sometimes be present. Hardwoods are sometimes abundant, especially dry-site oaks such as *Quercus falcata*, *Quercus prinus*, and *Quercus coccinea*, but also *Carya glabra*, *Acer rubrum*, and others. The hardwood component may be partly the result of fire suppression. The shrub layer may be well-developed, with *Vaccinium pallidum*, *Gaylussacia baccata*, or other acid-tolerant species most characteristic. Herbs are usually sparse but may include *Pityopsis graminifolia* and *Tephrosia virginiana*. Herbs probably were more abundant and shrubs less dense when fires occurred more frequently, and the communities of this system may have been grassy under more natural conditions, with *Schizachyrium scoparium* being a typical component, possibly with *Danthonia* sp.

Dynamics: Little is known about the dynamics of this system. Fire is clearly an important influence, and may be the sole factor determining the occurrence of this system rather than hardwood forests under natural conditions. Fires probably were frequent and of low intensity, or a mix of low and higher intensity. Fire probably is important for determining the balance of the two pine species, the

component of hardwoods, and the overall vegetation structure. *Pinus echinata* is fairly resilient to fire once mature, while *Pinus virginiana* individuals are fairly susceptible to fire but well-adapted to establishing in areas opened by intense fire.

Southern pine beetles are an important factor in this system, at least under present conditions. Beetle outbreaks can kill all the pines without creating the conditions for the pines to regenerate.

Effects of logging and past clearing as well as fire suppression make understanding of this system's natural character and dynamics difficult. Some pine-dominated areas appear to be successional stands established in former hardwood forests after logging or cultivation, and would not be expected to have the same dynamics or ecosystem characteristics as natural pine forests maintained by fire. In natural pine forests, logging may allow pines to regenerate or may change the composition to weedy hardwoods. It might alter canopy composition as well as structure.

MEMBERSHIP

Associations:

- *Pinus echinata* - *Quercus* (*prinus*, *falcata*) / *Oxydendrum arboreum* / *Vaccinium pallidum* Forest (CEGL007493, G3G4)
- *Pinus echinata* - *Quercus alba* / *Vaccinium pallidum* / *Hexastylis arifolia* - *Chimaphila maculata* Forest (CEGL008427, G3G4)
- *Pinus echinata* - *Quercus prinus* - *Quercus stellata* / *Vaccinium pallidum* / *Pityopsis graminifolia* var. *latifolia* Woodland (CEGL004445, G2?)
- *Pinus echinata* - *Quercus prinus* / *Rhododendron minus* / *Vaccinium pallidum* Forest (CEGL007496, G2G3)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* / *Vaccinium pallidum* Woodland (CEGL003765, G4?)
- *Pinus echinata* - *Quercus stellata* - *Quercus prinus* - *Carya glabra* / (*Danthonia spicata*, *Piptochaetium avenaceum*) Forest (CEGL007500, G3?)
- *Pinus echinata* / *Schizachyrium scoparium* Appalachian Woodland (CEGL003560, G2)
- *Pinus echinata* / *Vaccinium* (*pallidum*, *stamineum*) - *Kalmia latifolia* Forest (CEGL007078, G4?)
- *Pinus echinata* Early-Successional Forest (CEGL006327, GNA)
- *Pinus strobus* / *Kalmia latifolia* - (*Vaccinium stamineum*, *Gaylussacia ursina*) Forest (CEGL007100, G2G3)
- *Pinus virginiana* - (*Pinus rigida*, *Pinus pungens*) / *Schizachyrium scoparium* Forest (CEGL008500, G3G4)
- *Pinus virginiana* - *Pinus* (*rigida*, *echinata*) - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Pinus virginiana* Successional Forest (CEGL002591, GNA)

Alliances:

- *Pinus echinata* - *Quercus* (*alba*, *falcata*, *stellata*, *velutina*) Forest Alliance (A.394)
- *Pinus echinata* - *Quercus* (*coccinea*, *prinus*) Forest Alliance (A.395)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.680)
- *Pinus echinata* Forest Alliance (A.119)
- *Pinus echinata* Woodland Alliance (A.515)
- *Pinus strobus* Forest Alliance (A.128)
- *Pinus virginiana* Forest Alliance (A.131)

SPATIAL CHARACTERISTICS

Spatial Summary: Probably naturally a large-patch system, covering thousands of acres. Most remnants in relatively natural condition are probably small patches

Size: Natural size distribution not well-known, but probably a large-patch system with patches or complexes covering hundreds to thousands of acres. The current distribution of patch size is also not well-known. Size of defined occurrences may be strongly affected by standards for condition and separation distances.

Adjacent Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Appalachian Oak Forest (CES202.886)

Adjacent Ecological System Comments: Probably usually bordered and intermixed with Southern Appalachian Oak Forest (CES202.886). Southern and Central Appalachian Cove Forest (CES202.373) may be present in more mesic areas. This system may also intergrade into Southern Appalachian Montane Pine Forest and Woodland (CES202.331) at high elevations.

DISTRIBUTION

Range: This system is found primarily in the Appalachian regions of Kentucky and the Southern Blue Ridge in northern Georgia, western North Carolina, southeastern Tennessee, the Cumberlands of Alabama, parts of the Interior Low Plateau (e.g., the Knobs Region of Kentucky), and southwestern Virginia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, NC, SC, TN, VA, WV?

Map Zones: 47:C, 48:C, 53:C, 54:C, 57:C, 59:C

TNC Ecoregions: 44:C, 50:C, 51:C, 52:C

SOURCES

References: Comer et al. 2003, Frost 1998, Harrod and White 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723171#references

Description Author: M. Schafale, R. Evans, R. White, mod. M. Pyne

Version: 17 Apr 2006

Concept Author: M. Schafale, R. Evans, R. White

Stakeholders: East, Southeast

ClassifResp: Southeast

1352 SOUTHERN APPALACHIAN MONTANE PINE FOREST AND WOODLAND (CES202.331)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Forest and Woodland (Treed); Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2352; ESLF 4255; ESP 1352

CONCEPT

Summary: This system consists of predominantly evergreen woodlands (or more rarely forests) occupying very exposed, convex, often rocky south- and west-facing slopes, ridge spurs, crests, and clifftops in the central Appalachians, Southern Ridge and Valley and Southern Blue Ridge. They occur at moderate to upper elevations (450-1200 m [1500-4000 feet]), with the more southerly examples at the higher elevations. In the Southern Blue Ridge, this system is best developed above 700 m (2300 feet) in elevation. The underlying rock is acidic and sedimentary or metasedimentary (e.g., quartzites, sandstones and shales). The soils are very infertile, shallow and droughty. A thick, poorly decomposed duff layer, along with dead wood and highly volatile ericaceous shrubs, creates a strongly fire-prone habitat. Most examples are dominated by *Pinus pungens*, often with *Pinus rigida* and/or *Pinus virginiana*, and occasionally *Tsuga caroliniana*. The canopy is usually patchy to open, but areas of closed canopy may be present, especially where *Tsuga caroliniana* is prominent. Fire is a very important ecological process in this system. Pines may be able to maintain dominance due to edaphic conditions, such as very shallow soil or extreme exposure in some areas, but most sites appear eventually to succeed to oak dominance in the absence of fire. Fire is also presumably a strong influence on vegetation structure, producing a more open woodland canopy structure and more herbaceous ground cover.

Classification Comments: This system is related to Central Appalachian Pine-Oak Rocky Woodland (CES202.600), which is distinguished by a mixed or deciduous canopy and absence of *Pinus pungens*. Stands with *Pinus echinata* present are generally accommodated by Southern Appalachian Low-Elevation Pine Forest (CES202.332). The relationship between these two systems may need further clarification. This system is distinguished by occurrence as small patches on the most extreme topography, as well as by the species of pines dominating. However, *Pinus echinata* may codominate in Southern Appalachian Low-Elevation Pine Forest (CES202.332) at times. Sites that would support this system under a natural fire regime, but which have lost the pines by logging, southern pine beetle or senescence in the absence of fire, should probably be regarded as degraded examples of this system. However, they become virtually indistinguishable from Southern Appalachian Oak Forest (CES202.886) and Central Appalachian Pine-Oak Rocky Woodland (CES202.600) over time.

Similar Ecological Systems:

- Central Appalachian Pine-Oak Rocky Woodland (CES202.600)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Oak Forest (CES202.886)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Related Concepts:

- Pine Savanna/Woodland (Evans 1991) Finer

DESCRIPTION

Environment: This system occurs on ridgetops, usually only on the sharpest and narrowest spur ridges, and adjacent convex upper slopes. These sites are the extreme of convex landforms. Rapid drainage of rainfall and exposure to wind, sun and lightning are probably the important characteristics. Bedrock may be of any acidic type, including felsic igneous and metamorphic rocks, sandstone and quartzite. Soils are shallow and rocky residual soils. Fire appears to be an important factor.

Vegetation: Vegetation consists of open forests or woodlands dominated by *Pinus pungens*, often with *Pinus rigida* or less commonly *Tsuga caroliniana*, and sometimes with *Pinus virginiana* or rarely *Pinus echinata* codominant. In examples that have not had fire in a long time, *Quercus prinus*, *Quercus coccinea*, or other oaks are usually present and are sometimes abundant, as are *Nyssa sylvatica* and *Acer rubrum*. *Castanea dentata* may also have once been abundant. A dense heath shrub layer is almost always present. *Kalmia latifolia* is the most typical dominant, but species of *Rhododendron*, *Vaccinium*, or *Gaylussacia* may be dominant. Herbs are usually sparse but probably were more abundant and shrubs less dense when fires occurred more frequently.

Dynamics: Fire is apparently a very important process in this system (Harrod and White 1999). Pines may be able to maintain dominance due to shallow soils and extreme exposure in some areas, but most sites appear eventually to succeed to oak dominance in the absence of fire. Fire is also presumably a strong influence on vegetation structure, producing a more open woodland canopy structure and more herbaceous ground cover. Occurrence in highly exposed sites may make this system more prone to ignition, but most fires probably spread from adjacent oak forests. Fires could be expected to show more extreme behavior in this system than in oak forests under similar conditions, due to the flammability of the vegetation and the dry, windy and steep location. Both intense catastrophic fires and lower-intensity fires probably occurred naturally. Natural occurrences probably include both even-aged and

uneven-aged canopies.

Southern pine beetles are an important factor in this system, at least under present conditions. Beetle outbreaks can kill all the pines without creating the conditions for the pines to regenerate. If the pines are lost, the distinction between this system and Southern Appalachian Oak Forest (CES202.886) or Central Appalachian Pine-Oak Rocky Woodland (CES202.600) becomes blurred.

MEMBERSHIP

Associations:

- *Pinus (pungens, rigida) - Quercus prinus / (Quercus ilicifolia) / Gaylussacia baccata* Woodland (CEGL004996, G4)
- *Pinus pungens - Pinus rigida - (Quercus prinus) / Kalmia latifolia - Vaccinium pallidum* Woodland (CEGL007097, G3)
- *Pinus rigida - (Pinus pungens) / Rhododendron catawbiense - Kalmia latifolia / Galax urceolata* Woodland (CEGL004985, G2)
- *Pinus rigida / Schizachyrium scoparium - Sorghastrum nutans - Baptisia tinctoria* Woodland (CEGL003617, G2?)
- *Pinus virginiana - Pinus (rigida, echinata) - (Quercus prinus) / Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Tsuga caroliniana - Pinus (rigida, pungens, virginiana)* Forest (CEGL006178, G2)
- *Tsuga caroliniana / Kalmia latifolia - Rhododendron catawbiense* Forest (CEGL007139, G2)

Alliances:

- *Pinus (rigida, pungens, virginiana) - Quercus prinus* Woodland Alliance (A.677)
- *Pinus pungens - (Pinus rigida)* Woodland Alliance (A.521)
- *Pinus rigida* Woodland Alliance (A.524)
- *Pinus virginiana* Forest Alliance (A.131)
- *Tsuga caroliniana* Forest Alliance (A.144)

SPATIAL CHARACTERISTICS

Spatial Summary: Large- to small-patch system, occurring as a frequent part of the landscape mosaic.

Size: Occurs as a large- to small-patch system. Contiguous bodies probably once covered dozens to 100 or more acres. Patches often occur in complexes with other systems. Size of defined occurrences may be strongly affected by separation distances for occurrences.

Adjacent Ecological Systems:

- Southern Appalachian Grass and Shrub Bald (CES202.294)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Oak Forest (CES202.886)

Adjacent Ecological System Comments: This system is almost always bordered and intermixed with Southern Appalachian Oak Forest (CES202.886). Distinctions are made more difficult by the suppression of fire and subsequent invasion of less fire-tolerant species such as *Acer rubrum* and *Nyssa sylvatica*. Generally speaking, communities with a heavy component of pine (at least 25 or 50% of canopy, and with some *Pinus pungens*) are categorized as Southern Appalachian Montane Pine Forest and Woodland (CES202.331), whereas communities with a much smaller component of pines are considered Southern Appalachian Oak Forest (CES202.886). At the highest elevations that this system is seen, it may intergrade with Southern Appalachian Grass and Shrub Bald (CES202.294).

DISTRIBUTION

Range: This system is centered on the Southern Blue Ridge, from northern Georgia and South Carolina north through Virginia, with outlying occurrences north through the Central Appalachians to a small incursion in south-central Pennsylvania.

Divisions: 202:C

Nations: US

Subnations: GA, KY, MD, NC, OH, PA, SC, TN, VA, WV

Map Zones: 53:C, 54:C, 57:C, 59:C, 60:C, 61:C

USFS Ecomap Regions: M221D:CC

TNC Ecoregions: 49:C, 50:C, 51:C, 52:C, 59:C

SOURCES

References: Comer et al. 2003, Harrod and White 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723172#references

Description Author: M. Schafale, R. Evans, M. Pyne, R. White, mod. S.C. Gawler

Version: 23 Jul 2007

Concept Author: M. Schafale, R. Evans, M. Pyne, R. White

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

1309 SOUTHERN APPALACHIAN NORTHERN HARDWOOD FOREST (CES202.029)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Broad-Leaved Tree

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2309; ESLF 4115; ESP 1309

CONCEPT

Summary: This system consists of hardwood forests of the higher elevation zones of the southern Appalachians, generally above 1372 m (4500 feet) elevation. Included are classic northern hardwood forests as well as the highest elevation oak forests. Thus, examples may be dominated by *Quercus rubra* or various combinations of mesophytic hardwoods. High-elevation climate is the most important ecological factor. Included in this system are limited areas locally known as "beech gaps" and "boulderfields." In Kentucky, this system is of extremely limited extent, being restricted to areas above about 1100-1160 m (3600-3800 feet) elevation on Black Mountain, the highest elevation in Kentucky, which is apparently higher in elevation than adjacent areas in Tennessee and Virginia.

Classification Comments: The high-elevation *Quercus rubra* associations are placed in this system rather than the related Central and Southern Appalachian Montane Oak Forest (CES202.596) because they occur in the same elevation zone as the mesophytic northern hardwood forests, with the same set of landscape associations. They differ from the mesophytic northern hardwood forests in the dominance of oaks and the probable importance of fire as a process. The border of this system with adjacent systems is usually gradational. The transition to Central and Southern Appalachian Spruce-Fir Forest (CES202.028) that often adjoins at higher elevation is marked by a gradual shift in canopy dominance from hardwoods to conifers. The transition to a lower elevation hardwood forest systems is similarly marked by a gradual turnover of dominant trees but may be more subtle because more species are shared. The transition to Southern and Central Appalachian Cove Forest (CES202.373) is particularly gradual, being marked mainly by the addition of species without loss of species. The non-forested systems that occur in the same elevation zone may have transition zones of open woody vegetation, though some have sharp borders. In relatively undisturbed stands, the canopy composition and structure are the best way to determine the boundary of this system.

This system is similar to the northern hardwood forests of the northeastern U.S., i.e., Laurentian-Acadian Northern Hardwoods Forest (CES201.564), but differs in having a southern mountain climate (shorter winters, less extreme cold temperatures, shorter summer days), lacking a history of glaciation, and in having a flora and fauna with many southern Appalachian endemics. A few characteristic dominants of the northern hardwoods are lacking, including *Betula papyrifera* and *Populus tremuloides*. It differs from Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593) in its more montane setting and its flora and fauna having many southern Appalachian endemics. The northern hardwoods in the Ridge and Valley are primarily included in CES202.593. The northern boundary of this system follows a gradual northward transition through central and northern Virginia and West Virginia.

Similar Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)
- Central and Southern Appalachian Montane Oak Forest (CES202.596)
- Southern Appalachian Oak Forest (CES202.886)

DESCRIPTION

Environment: This system occurs at elevations above 1372 m (4500 feet), occasionally up to nearly 1830 m (6000 feet). It occurs on most of the landforms that are present in this elevational range, from exposed peaks and ridges to sheltered coves. Convex slopes are the most abundant landform. Elevation and orographic effects make the climate cool and wet, with significant moisture input from fog as well as high rainfall. Strong winds, ice glaze, and extreme cold may occur but are less important than in Central and Southern Appalachian Spruce-Fir Forest (CES202.028). Soils are generally very rocky, with the matrix ranging from well-weathered parent material to coarse colluvial boulder deposits. Soils are probably moist but not saturated most of the time. Any kind of bedrock may be present. Limited areas support boulderfields. In Kentucky, this system is of extremely limited extent, being restricted to areas above about 1100-1160 m (3600-3800 feet) elevation on Black Mountain, the highest elevation in Kentucky, which is apparently higher in elevation than adjacent areas in Tennessee and Virginia.

Vegetation: Vegetation consists of forests dominated by various combinations of *Betula alleghaniensis*, *Fagus grandifolia*, *Aesculus flava*, *Acer saccharum*, *Quercus rubra*, and *Tsuga canadensis*. *Prunus serotina* and *Tilia americana* var. *heterophylla* are occasionally abundant. *Quercus rubra* dominates on warmer exposures, the mesophytic species on cooler. Lower strata usually include a dense herb layer and often a well-developed deciduous shrub layer as well. Limited areas may have a dense evergreen shrub layer. Plant species richness ranges from fairly high to very low.

Dynamics: This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration on a fine to medium scale. Occasional extreme wind or ice events disturb larger patches on exposed slopes. Fire appears to be uncommon under natural conditions, perhaps extremely rare in the more mesic portions. Fire may be important in regeneration

of *Quercus rubra* and may be crucial in maintaining its dominance in drier sites. Many *Quercus rubra* forests now appear to be succeeding to mesophytic hardwoods. Little is known about natural fire behavior. Fires are likely to be low in intensity because of limited flammability of the vegetation and prevailing moist conditions, but most of the component tree species are probably not very tolerant of fire.

MEMBERSHIP

Associations:

- *Aesculus flava* - *Betula alleghaniensis* - *Acer saccharum* / *Acer spicatum* / *Caulophyllum thalictroides* - *Laportea canadensis* Forest (CEGL004973, G3)
- *Betula alleghaniensis* - (*Tsuga canadensis*) / *Rhododendron maximum* / (*Leucothoe fontanesiana*) Forest (CEGL007861, G3G4Q)
- *Betula alleghaniensis* - *Acer saccharum* - *Aesculus flava* / *Acer pensylvanicum* / *Trillium grandiflorum* Forest (CEGL004417, G2G3Q)
- *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* / *Viburnum lantanoides* / *Eurybia chlorolepis* - *Dryopteris intermedia* Forest (CEGL007285, G3G4)
- *Betula alleghaniensis* / *Ribes glandulosum* / *Polypodium appalachianum* Forest (CEGL006124, G2G3)
- *Fagus grandifolia* / *Ageratina altissima* var. *roanensis* Forest (CEGL006246, G1)
- *Fagus grandifolia* / *Carex pensylvanica* - *Carex brunnescens* Forest (CEGL006130, G1)
- *Liriodendron tulipifera* - *Tilia americana* - *Betula lenta* / *Asimina triloba* / *Dryopteris marginalis* Forest [Provisional] (CEGL008527, GNR)
- *Quercus rubra* / (*Kalmia latifolia*, *Rhododendron maximum*) / *Galax urceolata* Forest (CEGL007299, G4)
- *Quercus rubra* / (*Vaccinium simulatum*, *Rhododendron calendulaceum*) / (*Dennstaedtia punctilobula*, *Thelypteris noveboracensis*) Forest (CEGL007300, G4)
- *Quercus rubra* / *Carex pensylvanica* - *Ageratina altissima* var. *roanensis* Forest (CEGL007298, G2)

Alliances:

- *Betula alleghaniensis* - *Fagus grandifolia* - *Aesculus flava* Forest Alliance (A.266)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Quercus rubra* Montane Forest Alliance (A.272)
- *Tsuga canadensis* - *Betula alleghaniensis* Forest Alliance (A.412)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch to local matrix system, dominating the landscape of fairly high mountain ranges and occurring as a broad elevational zone on the highest. Small-patch systems may be embedded.

Size: Generally covers most of the landscape in the elevational range where it occurs. In the highest ranges it occupies a broad elevational zone on the flanks. On somewhat lower mountain ranges it dominates the mountain tops. Natural patches covered thousands to maybe 10,000 to 20,000 acres. A few remnant patches of thousands of acres remain, along with patches of hundreds of acres.

Adjacent Ecological Systems:

- Central and Southern Appalachian Montane Oak Forest (CES202.596)
- Central and Southern Appalachian Spruce-Fir Forest (CES202.028)
- High Allegheny Wetland (CES202.069)
- Southern and Central Appalachian Bog and Fen (CES202.300)
- Southern Appalachian Grass and Shrub Bald (CES202.294)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Appalachian Seepage Wetland (CES202.317)

Adjacent Ecological System Comments: Central and Southern Appalachian Montane Oak Forest (CES202.596) most typically adjoins at lower elevation. Central and Southern Appalachian Spruce-Fir Forest (CES202.028) may adjoin at higher elevation. Small-patch systems such as Southern Appalachian Rocky Summit (CES202.327), Southern Appalachian Seepage Wetland (CES202.317), Southern and Central Appalachian Bog and Fen (CES202.300), and Southern Appalachian Grass and Shrub Bald (CES202.294) may be embedded.

DISTRIBUTION

Range: This system ranges from northwestern Georgia, western North Carolina and eastern Tennessee northward to southern Virginia and West Virginia. In Kentucky, this system is restricted to the Cumberland Mountains in the extreme southeastern corner of that state.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, TN, VA, WV

Map Zones: 53:C, 57:C, 61:C

USFS Ecomap Regions: M221A:CP, M221Bc:CCC, M221C:CC, M221D:CC

TNC Ecoregions: 50:C, 51:C, 59:P

SOURCES

References: Comer et al. 2003, Lohman and Watson 1943

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722676#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne and S. Gawler

Version: 23 Jul 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1315 SOUTHERN APPALACHIAN OAK FOREST (CES202.886)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Ridge/Summit/Upper Slope; Unglaciated; Broad-Leaved Deciduous Tree; Quercus - Carya

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2315; ESLF 4121; ESP 1315

CONCEPT

Summary: This system consists of predominantly dry-mesic forests occurring on open and exposed topography at lower to mid elevations in the Southern Blue Ridge and Southern Ridge and Valley ecoregions. Substrates of stands included in this system can range from acidic to circumneutral or basic, and the vegetation varies accordingly. Typically, the vegetation consists of forests dominated by oaks, especially *Quercus prinus*, *Quercus alba*, *Quercus rubra*, and *Quercus coccinea*, with varying amounts of *Carya* spp., *Acer rubrum*, and other species. This system concept also includes many successional communities that have been impacted by logging or agriculture, such as types dominated by *Liriodendron tulipifera*, *Pinus* spp., and *Robinia pseudoacacia*.

Classification Comments: This system is distinguished from the oak forests of the Piedmont by substantial floristic differences that probably are determined by biogeography as well as climate and topography. Compositional differences were more pronounced in the past, when *Castanea dentata* was a major species in this system and not in Piedmont oak forests. This system is distinguished from most other systems in its primary range by the canopy dominance of oaks (other than strong dominance by red oak) without a large component of yellow pines (*Pinus echinata*, *Pinus virginiana*, *Pinus pungens*) in the canopy. It shares those characteristics with Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359), which might be thought of as a subtype of this system on the more exposed and acidic substrates. The environment is intermediate within the region in topography and moisture. Northward this system grades into Northeastern Interior Dry-Mesic Oak Forest (CES202.592), which occurs in similar environmental conditions. This southern Appalachian system is characterized by the presence, in most occurrences, of plant species of southern Appalachian affinity, such as *Magnolia fraseri*, *Gaylussacia ursina*, *Rhododendron calendulaceum*, etc.

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)--may represent a narrower concept subset of this.
- Central and Southern Appalachian Montane Oak Forest (CES202.596)
- Central Appalachian Dry Oak-Pine Forest (CES202.591)
- Northeastern Interior Dry-Mesic Oak Forest (CES202.592)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

DESCRIPTION

Environment: Occurs on open slopes, ridgetops, lower elevation peaks, and higher parts of broad valley bottoms, at low to moderate elevations. Bedrock may be of any type. Soils are usually deep residual soils, but are often rocky. Some shallow soils, colluvium, and other soils may be present locally within the system, but shallow soils tend to produce environments that are more extreme and have a larger component of *Pinus* spp. than this system. Moisture levels are intermediate for the region. Soil chemistry and topography are important determinants of different associations within the system. Topography, elevation, and soil depth are the most important factors separating this system from others.

Vegetation: Vegetation consists of forests dominated by *Quercus* species, most typically *Quercus prinus*, *Quercus alba*, and *Quercus coccinea*, with varying amounts of *Carya* spp., *Acer rubrum*, and other species. Less typical are stands dominated by other species, such as *Pinus strobus*, or other hardwood species. *Castanea dentata* was once dominant or codominant in many of these forests. Subcanopies and shrub layers are usually well-developed. Some associations have dense evergreen shrub layers, while others have open shrub layers. Herbs are usually sparse to moderate in density.

Dynamics: This system is naturally dominated by stable, uneven-aged forests, with canopy dynamics dominated by gap-phase regeneration. Extreme wind or ice storms occasionally create larger canopy openings. Fire occurred fairly frequently in presettlement times, though there is some dispute whether most of the fires were natural or anthropogenic in origin (Abrams 1992, Delcourt and Delcourt 1997). Fires were usually low-intensity surface fires. The dominant species are fairly fire-tolerant, making most fires non-catastrophic. Fire may be important for favoring oak dominance over more mesophytic tree species within some of the topographic range of this system. Fire also can be expected to have a moderate effect on vegetation structure, producing a somewhat more open canopy and less dense understory and shrub layer than currently seen in most examples. Fire frequency or intensity may be important for determining the boundary between this system and both the more mesic and the drier systems. Virtually all examples have been strongly affected by the introduction of the chestnut blight, which killed all of the *Castanea dentata* trees, eliminating it as a canopy dominant. Past logging affected most occurrences by changing canopies to an even-aged, or more even-aged, structure.

MEMBERSHIP

Associations:

- *Acer rubrum* var. *rubrum* - *Betula (alleghaniensis, lenta)* - *Magnolia fraseri* / (*Rhododendron maximum, Kalmia latifolia*) Forest (CEGL008558, GNA)
- *Carya glabra* - *Fraxinus americana* - *Quercus prinus* / *Ostrya virginiana* / *Philadelphus hirsutus* Woodland (CEGL004995, G2)
- *Pinus strobus* - *Quercus (coccinea, prinus)* / (*Gaylussacia ursina, Vaccinium stamineum*) Forest (CEGL007519, G4)
- *Pinus strobus* - *Quercus alba* - (*Carya alba*) / *Gaylussacia ursina* Forest (CEGL007517, G3G4)
- *Quercus (prinus, coccinea)* / *Kalmia latifolia* / (*Galax urceolata, Gaultheria procumbens*) Forest (CEGL006271, G5)
- *Quercus alba* - *Quercus (rubra, prinus)* / *Rhododendron calendulaceum* - *Kalmia latifolia* - (*Gaylussacia ursina*) Forest (CEGL007230, G5)
- *Quercus alba* - *Quercus coccinea* - *Quercus falcata* / *Kalmia latifolia* - *Vaccinium pallidum* Forest (CEGL007691, G2G3)
- *Quercus alba* - *Quercus falcata* / *Vaccinium (arboreum, hirsutum, pallidum)* Forest (CEGL008567, G3G4)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* var. *virginiana* Forest (CEGL007240, G4)
- *Quercus alba* - *Quercus rubra* - *Quercus prinus* / *Collinsonia canadensis* - *Podophyllum peltatum* - *Amphicarpaea bracteata* Forest (CEGL007692, G3)
- *Quercus alba* / *Kalmia latifolia* Forest (CEGL007295, G2Q)
- *Quercus muehlenbergii* - *Quercus (alba, rubra)* - *Carya cordiformis* / *Viburnum prunifolium* Forest (CEGL004793, G3G4)
- *Quercus prinus* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum* Forest (CEGL008431, G4G5)
- *Quercus prinus* - (*Quercus rubra*) - *Carya* spp. / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL007267, G4G5)
- *Quercus prinus* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest (CEGL007268, G4?)
- *Quercus prinus* - *Quercus rubra* - *Carya* spp. - *Fraxinus americana* / *Cercis canadensis* / *Solidago sphacelata* Forest (CEGL008549, G3?)
- *Quercus prinus* - *Quercus rubra* / *Rhododendron maximum* / *Galax urceolata* Forest (CEGL006286, G4)
- *Quercus prinus* - *Quercus velutina* / *Oxydendrum arboreum* - *Cornus florida* Forest (CEGL008522, G4?)
- *Quercus rubra* - *Acer rubrum* / *Pyrolaria pubera* / *Thelypteris noveboracensis* Forest (CEGL006192, G4?)
- *Quercus rubra* - *Quercus muehlenbergii* / *Hamamelis virginiana* / *Polymnia canadensis* Forest (CEGL007215, G1Q)
- *Sassafras albidum* - *Quercus* spp. Forest (CEGL004096, G5)
- *Vitis aestivalis* Vine-Shrubland (CEGL003890, G2G3)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* - *Magnolia fraseri* Forest Alliance (A.2009)
- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Pinus strobus* - *Quercus (alba, rubra, velutina)* Forest Alliance (A.401)
- *Pinus strobus* - *Quercus (coccinea, prinus)* Forest Alliance (A.402)
- *Quercus alba* - (*Quercus rubra, Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus alba* Montane Forest Alliance (A.271)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus prinus* - (*Quercus coccinea, Quercus velutina*) Forest Alliance (A.248)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus prinus* - *Quercus rubra* Forest Alliance (A.250)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)
- *Sassafras albidum* Forest Alliance (A.2019)
- *Vitis aestivalis* Vine-Shrubland Alliance (A.911)

SPATIAL CHARACTERISTICS

Spatial Summary: Matrix system, covering a majority of the landscape over large areas.

Size: Occurs as a large-patch to matrix system. Contiguous bodies of tens of thousands of acres once occurred. The oak forests probably make up slightly more than 50% of the landscape in all but the higher elevations of the region. Size of existing occurrences may be strongly affected by separation distances for occurrences. A few remaining occurrences over 10,000 acres are probably present.

Adjacent Ecological Systems:

- Central and Southern Appalachian Montane Oak Forest (CES202.596)
- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)

Adjacent Ecological System Comments: This system is almost always bordered by Southern and Central Appalachian Cove Forest (CES202.373) in more mesic sites. It is often bordered by Southern Appalachian Low-Elevation Pine Forest (CES202.332) on more exposed topography. It may grade into Central and Southern Appalachian Montane Oak Forest (CES202.596) at the highest elevations. Various rock outcrop systems may be present as embedded small patches.

DISTRIBUTION

Range: This system ranges throughout the southern Appalachians, from northern Georgia and South Carolina north into the Southern Blue Ridge of Virginia to the Roanoke River in the Blue Ridge, and slightly farther south in the Ridge and Valley.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, SC, TN, VA, WV

Map Zones: 57:C, 61:P

USFS Ecomap Regions: 231Aa:CCC, M221C:CC, M221D:CC

TNC Ecoregions: 50:C, 51:C, 52:C

SOURCES

References: Abrams 1992, Comer et al. 2003, Delcourt and Delcourt 1997, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722792#references

Description Author: M. Schafale, R. Evans, M. Pyne, R. White, mod. S.C. Gawler

Version: 23 Jul 2007

Concept Author: M. Schafale, R. Evans, M. Pyne, R. White

Stakeholders: East, Southeast

ClassifResp: Southeast

1382 SOUTHERN ATLANTIC COASTAL PLAIN MARITIME FOREST (CES203.537)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2382; ESLF 4325; ESP 1382

CONCEPT

Summary: This system encompasses a range of woody vegetation present on stabilized upland dunes of barrier islands and near-coastal strands, from central South Carolina (approximately Cooper River) southward to approximately Volusia County, Florida. It includes vegetation whose structure and composition are influenced by salt spray, extreme disturbance events, and the distinctive climate of the immediate coast. Examples are known from the barrier islands of Georgia and Florida, such as Big Talbot Island, Florida, and probably Sapelo Island, Georgia. Most typical stands are dominated by oaks, primarily *Quercus virginiana* and/or *Quercus geminata*. Vegetation may also include different woodland communities often dominated by southern pine species. *Pinus palustris*, *Pinus serotina*, and *Pinus elliotii* var. *elliottii* are all important in documented examples. These examples tend to have densely shrubby subcanopies and understories with species such as *Quercus virginiana*, *Quercus geminata*, *Quercus hemisphaerica*, *Quercus chapmanii*, *Quercus myrtifolia*, and *Magnolia grandiflora*. Unlike maritime vegetation to the north, this system may be more heavily influenced by natural fire regimes that may help to explain the predominance of the fire-tolerant pine species. It has been postulated that the natural fire frequency is from 20-30 years.

Similar Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)--occurs to north.
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Related Concepts:

- Maritime Hammock (FNAI 1990) Broader
- Shell Mound (FNAI 1990) Intersecting

DESCRIPTION

Environment: The primary range of this system coincides with the Sea Islands, a chain of more than 100 low islands off the Atlantic coast of South Carolina, Georgia, and northern Florida, extending from the Cooper River to the St. Johns River. Many of these islands have a long history of human use and occupation, including Spanish missions and garrisons in the 16th century. In addition, the Sea Islands were the first important cotton-growing area in North America. The degree to which this system has been altered by these events is unknown.

Vegetation: Most typical stands are dominated by oaks, primarily *Quercus virginiana* and/or *Quercus geminata*. Vegetation may also include different woodland communities often dominated by southern pine species. *Pinus palustris*, *Pinus serotina*, and *Pinus elliotii* var. *elliottii* are all important in documented examples. These examples tend to have densely shrubby subcanopies and understories with species such as *Quercus virginiana*, *Quercus geminata*, *Quercus hemisphaerica*, *Quercus chapmanii*, *Quercus myrtifolia*, and *Magnolia grandiflora*.

MEMBERSHIP

Associations:

- *Ceratiola ericoides* - *Quercus geminata* - *Ximenia americana* / *Cladonia* spp. - *Cladina* spp. Shrubland (CEGL003862, G2)
- *Juniperus virginiana* var. *silicicola* - *Zanthoxylum clava-herculis* - *Quercus virginiana* - (*Sabal palmetto*) / *Sageretia minutiflora* - (*Sideroxylon tenax*) Woodland (CEGL003525, G2?)
- *Pinus elliotii* var. *elliottii* - (*Pinus palustris*) / *Ilex vomitoria* - *Serenoa repens* - *Morella cerifera* Woodland (CEGL004658, G2G3)
- *Pinus palustris* - *Pinus serotina* / *Quercus chapmanii* - *Quercus myrtifolia* - *Quercus geminata* - *Lyonia ferruginea* Woodland (CEGL003662, G2?)
- *Quercus geminata* - (*Quercus virginiana*) / *Serenoa repens* - *Lyonia fruticosa* Forest (CEGL007020, G2?)
- *Quercus geminata* - *Quercus myrtifolia* - *Serenoa repens* - *Persea borbonia* Shrubland (CEGL003821, G2)
- *Quercus virginiana* - (*Pinus elliotii* var. *elliottii*, *Sabal palmetto*) / *Persea borbonia* - *Callicarpa americana* Forest (CEGL007032, G2)
- *Quercus virginiana* - *Quercus hemisphaerica* - *Pinus taeda* / *Persea (borbonia, palustris)* - *Ilex vomitoria* Forest (CEGL007027, G2)
- *Quercus virginiana* - *Quercus pagoda* - *Magnolia grandiflora* - *Carya glabra* / *Ilex opaca* Forest (CEGL007850, G1Q)
- *Quercus virginiana* / *Vaccinium arboreum* - *Ilex vomitoria* Forest (CEGL007028, G2G3)
- *Sabal palmetto* - (*Juniperus virginiana* var. *silicicola*) Woodland (CEGL003526, G2?)

Alliances:

- *Ceratiola ericoides* Shrubland Alliance (A.817)

- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* Woodland Alliance (A.520)
- *Quercus geminata* - *Quercus myrtifolia* - *Quercus chapmanii* Shrubland Alliance (A.779)
- *Quercus geminata* Forest Alliance (A.52)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Quercus virginiana* - *Juniperus virginiana* - (*Sabal palmetto*) Woodland Alliance (A.479)
- *Quercus virginiana* - *Quercus pagoda* Forest Alliance (A.375)
- *Sabal palmetto* Temperate Woodland Alliance (A.481)

DISTRIBUTION

Range: This system occurs from central South Carolina (Cooper River) southward to approximately Volusia County, Florida (ca. 28 degrees 30 minutes N latitude).

Divisions: 203:C

Nations: US

Subnations: FL, GA, SC

Map Zones: 55:C, 58:C

TNC Ecoregions: 56:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723065#references

Description Author: R. Evans, mod. M. Pyne

Version: 30 May 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1330 SOUTHERN COASTAL PLAIN DRY UPLAND HARDWOOD FOREST (CES203.560)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2330; ESLF 4136; ESP 1330

CONCEPT

Summary: This is one of three hardwood-dominated systems found in the East Gulf Coastal Plain and adjacent areas of central Florida. This type is found in the Southern Coastal Plain and Southeastern Plains (EPA Level III Ecoregion 75 and parts of 65). Examples attributable to this type are typically deciduous or mixed evergreen oak-dominated forests, often with a pine component present. Although the southern portion of the range of this system overlaps Southern Coastal Plain Oak Dome and Hammock (CES203.494), the latter is dominated by evergreen oak species, and the two should not be confused. The core range of this type extends northward to the approximate historical range of longleaf pine; although most deciduous species do not mimic this range, this boundary does appear to be a reasonable demarcation boundary north of which *Quercus alba* becomes more abundant and south of which *Quercus hemisphaerica* is more diagnostic. Like all hardwood systems of this region, examples occur within a landscape matrix historically occupied by pine-dominated uplands and consequently only occurred in fire-sheltered locations in naturally small to large patches. Examples of this system tend to occur on sites intermediate in moisture tendency (mostly dry to dry-mesic), although occasional xeric stands may also be included. Toward the northern range limits of this system, it may have been less restricted to small patches in fire-protected locations, and may have been formerly more prevalent on the landscape even in areas heavily influenced by fire.

Important tree species vary geographically and according to previous disturbance. *Quercus hemisphaerica* is a typical species in many examples, with *Quercus stellata*, *Quercus falcata*, and *Quercus alba* less frequently encountered, but dominant in some stands. The overstory of some examples may be quite diverse, with hickories and other hardwood species often present. Typically mesic sites, as indicated by species indicative of these conditions, are covered under other systems. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past cutting. *Pinus glabra* or *Pinus echinata* may also be present in some examples. Stands may be found on slopes above rivers and adjacent to sinkholes, as well as other fire-infrequent habitats.

Classification Comments: As currently conceived, the Alabama range of this type extends throughout the Southern Hilly Gulf Coastal Plain (Ecoregion 65d), as mapped by the U.S. Environmental Protection Agency (EPA 2004) northward across the Black Belt and into the Fall Line Hills (Ecoregion 65i) to approximately Tuscaloosa (A. Schotz pers. comm.). To the north it is eventually replaced by East Gulf Coastal Plain Northern Dry Upland Hardwood Forest (CES203.483), but along this northern range it occurs in a mosaic with CES203.483 as well as East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506). In Mississippi the range extends almost to the same latitude, but this range is confined to Ecoregion 65d.

Similar Ecological Systems:

- Southern Coastal Plain Oak Dome and Hammock (CES203.494)

Related Concepts:

- Upland Hardwood Forest (FNAI 1990) Finer
- Upland Mixed Forest (FNAI 1990) Finer

DESCRIPTION

Environment: Topographically, these sites tend to occur on upper to mid slopes, but occasionally on broader uplands with reduced fire frequencies. A range of soils may be present from loamy and clayey to coarse sands, but are generally well-drained but not excessively drained. Soils are generally acidic, though calcareous soils occur occasionally. Sites are somewhat protected from most natural fires by steep topography and by limited flammability of the vegetation. Fires that penetrate them are generally low in intensity and have fairly limited ecological effect.

Vegetation: Vegetation consists of forests dominated by combinations of upland oaks, particularly *Quercus alba*, *Quercus falcata*, *Quercus stellata*, *Quercus margarettiae*, and other species. There is some variation between the composition of northern versus southern examples in which evergreen species such as *Quercus nigra* and *Quercus hemisphaerica* become more prominent. Hickories (*Carya alba*, *Carya glabra*) may be present. There is some variation in composition with aspect and degree of exposure to fire. More mesophytic species such as *Fagus grandifolia* and *Magnolia grandiflora* are absent or are confined to the understory. *Pinus echinata* may be present in some stands, particularly on drier south- and west-facing slopes, but is typically not dominant. *Pinus taeda* is sometimes present, but it is unclear if it is a natural component or has entered only as a result of past cutting. Some examples of this system will have pine (*Pinus echinata*, *Pinus glabra*, *Pinus taeda*) as a natural component, where occasional fires may allow them to regenerate. In most examples, the understory is well-developed. A well-developed shrub layer may be present, with *Vaccinium* spp. and *Gaylussacia* spp. most typical. The herb layer is generally sparse; species richness tends to be low but may be richer if fire has played a role in shaping the structure and composition of the stand. The most likely grass taxa (found in open-understory examples)

are *Schizachyrium scoparium*, *Andropogon* spp., *Chasmanthium* spp., *Dichanthelium* spp., and *Danthonia sericea*.

Dynamics: Sites where this system occurs almost invariably grade into pine-dominated systems, especially longleaf pine and to a lesser extent shortleaf pine. If these sites were burned more frequently, the vegetation would likely be replaced by more fire-tolerant southern pines.

MEMBERSHIP

Associations:

- *Pinus taeda* - *Quercus (falcata, hemisphaerica, nigra)* - *Liquidambar styraciflua* / *Rhus copallinum* - *Vaccinium stamineum* Forest (CEGL008450, GNA)
- *Quercus alba* - *Carya alba* / *Vaccinium elliotii* Forest [Provisional] (CEGL007224, G5?)
- *Quercus falcata* - *Quercus stellata* - *Carya alba* / *Vaccinium* spp. Coastal Plain Forest (CEGL007246, G4?)
- *Quercus hemisphaerica* - *Carya glabra* - *Magnolia grandiflora* / *Sabal etonia* Forest (CEGL003792, G2?)
- *Quercus hemisphaerica* - *Carya glabra* / *Oxydendrum arboreum* / *Sebastiania fruticosa* / *Carex baltzellii* Forest (CEGL007023, G2G3)
- *Quercus hemisphaerica* - *Magnolia grandiflora* - *Carya (glabra, pallida)* / *Vaccinium arboreum* / *Chasmanthium sessiliflorum* Forest (CEGL004788, G3G4)
- *Quercus hemisphaerica* - *Quercus (falcata, nigra)* / *Ilex opaca* - *Vaccinium arboreum* / *Cnidioscolus stimulosus* Forest (CEGL007751, G4)
- *Quercus velutina* - *Carya pallida* - (*Pinus echinata*) / *Vaccinium arboreum* / *Yucca filamentosa* Forest (CEGL008553, G3G4)

Alliances:

- *Pinus taeda* Forest Alliance (A.130)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus hemisphaerica* - *Carya glabra* Forest Alliance (A.372)
- *Quercus hemisphaerica* Forest Alliance (A.53)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)

SPATIAL CHARACTERISTICS

Spatial Summary: Examples occur within a landscape matrix historically occupied by pine-dominated uplands and therefore typically occur in somewhat fire-sheltered locations in naturally small to large patches. Toward the northern range limits of this system, it may have been less restricted to small patches in fire-protected locations, and may have been formerly more prevalent on the landscape even in areas heavily influenced by fire.

Adjacent Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

DISTRIBUTION

Range: East Gulf Coastal Plain and adjacent areas of central Florida ranging northward into central Mississippi and Alabama.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, MS

Map Zones: 46:C, 55:C, 56:C, 99:C

TNC Ecoregions: 43:C, 53:C, 55:C

SOURCES

References: Comer et al. 2003, EPA 2004, Schotz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723044#references

Description Author: M. Pyne and R. Evans

Version: 05 Jul 2006

Concept Author: M. Pyne and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1357 SOUTHERN COASTAL PLAIN MESIC SLOPE FOREST (CES203.476)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Slope; Long Disturbance Interval; Broad-Leaved Evergreen Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Evergreen closed tree canopy

National Mapping Codes: EVT 2357; ESLF 4260; ESP 1357

CONCEPT

Summary: This forested system of the southern East Gulf and Atlantic coastal plains occurs on steep slopes, bluffs, or sheltered ravines where fire is naturally rare, generally within the natural range of *Pinus glabra* as mapped by Kossuth and Michael (1990) and *Magnolia grandiflora* as mapped by Outcalt (1990). Stands are mesic, and vegetation typically includes species such as *Fagus grandifolia*, *Magnolia grandiflora*, *Illicium floridanum*, and other species rarely encountered outside this system in the region. Related forests which occur on deep loess soils along the western margin of the region are classified as East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556). Some component associations are also found in temporarily flooded floodplains adjacent to these slopes, but this is primarily an upland system. The system also includes essentially upland vegetation of Pleistocene terraces, although these are conceptually transitional to creek floodplain systems.

Classification Comments: East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477) is a similar mesic forest system to the north of this one in the Upper East Gulf Coastal Plain that has greater dominance by deciduous trees. The systems of the loess bluffs to the west of this one, bordering the Mississippi River Alluvial Plain, are treated as distinct and are more extensive and continuous in their extent both vertically and latitudinally [see East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481) and East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)]. To the north of the combined ranges of *Pinus glabra* and *Magnolia grandiflora* in the Atlantic Coastal Plain, this system is replaced by Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242).

Similar Ecological Systems:

- Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)
- East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481)
- East Gulf Coastal Plain Northern Mesic Hardwood Slope Forest (CES203.477)
- East Gulf Coastal Plain Southern Loess Bluff Forest (CES203.556)

Related Concepts:

- Slope Forest (FNAI 1990) Intersecting

DESCRIPTION

Environment: This system is restricted to steep slopes, bluffs, or sheltered ravines where fire is naturally rare. This mesic habitat is confined to very limited, fire-sheltered areas within the natural ranges of *Pinus glabra* (Kossuth and Michael 1990) and *Magnolia grandiflora* (Outcalt 1990). This system occurs in a variety of moist, non-wetland sites that are naturally sheltered from frequent fire. These are typically narrow bands of vegetation between floodplain forests and upland communities dominated by *Pinus palustris* (Batista and Platt 1997). Most common are lower slope, bluff, and ravine examples along streams and rivers in dissected terrain, but some examples occur on mesic flats between drier pine-dominated uplands and floodplains or on local high areas within bottomland terraces or nonriverine wet flats. There may be larger patches where side-drains join larger streams. Under closed-canopy conditions, fire may only partially penetrate this system from adjacent uplands. Soils are typically deep, fine-textured, and moderately well-drained. Soils cover the full range of mineral soil textures, except for the coarsest sands. Soils are not saturated for any significant time during the growing season and seldom, if ever, are extremely dry. Soils developed from calcareous materials or rich alluvium may be basic; others are strongly acidic. Richer and more mesic stands occur in more strongly concave and finer-textured areas. Sites are normally protected from most natural fires by steep topography or by surrounding extensive areas of non-flammable vegetation. This system occurs in a region of mild winters, high annual rainfall and high evapotranspiration, as well as a high likelihood of hurricane landfall (Ware et al. 1993). These forests may represent relicts derived from the early Tertiary flora (Batista and Platt 1997).

Vegetation: Stands are mesic, and vegetation typically includes species such as *Fagus grandifolia*, *Magnolia grandiflora*, *Pinus glabra*, and other species rarely encountered outside this system in the region. All woody strata contain a mixture of evergreen and deciduous species. Canopies are diverse; in addition to the aforementioned taxa, other canopy taxa may include *Quercus alba*, *Quercus pagoda*, *Quercus michauxii*, *Quercus falcata*, *Quercus shumardii*, *Quercus velutina*, *Quercus laurifolia*, *Quercus nigra*, *Quercus hemisphaerica*, *Pinus echinata*, *Pinus taeda*, *Nyssa sylvatica*, *Fraxinus americana*, *Carya alba* (in the north), *Carya glabra*, *Ulmus alata*, *Ulmus americana*, *Ulmus rubra*, *Liriodendron tulipifera*, and *Liquidambar styraciflua* (NatureServe Ecology unpubl. data 2003). The presence of *Pinus taeda* is normal at lower frequencies, but higher ones may indicate past disturbance or removal of the hardwood canopy and subsequent invasion. Additional subcanopy taxa may include *Acer barbatum*, *Acer rubrum*, *Oxydendrum arboreum*, *Carpinus caroliniana* ssp. *caroliniana*, *Ostrya virginiana*, *Prunus caroliniana*, *Prunus serotina*, *Symplocos tinctoria*, *Magnolia macrophylla* (rare to the west), *Halesia diptera*, *Styrax grandifolius*, *Sassafras albidum*, *Ilex opaca*, *Hamamelis virginiana*,

Magnolia pyramidata, *Tilia americana* var. *caroliniana*, *Zanthoxylum clava-herculis*, *Crataegus marshallii*, *Morus rubra*, and *Cornus florida*. The shrub layer can be very diverse. Trees support lianas and epiphytes. Shrubs and woody vines include *Illicium floridanum*, *Hydrangea quercifolia*, *Arundinaria gigantea*, *Halesia diptera*, *Aesculus pavia*, *Calycanthus floridus* var. *floridus*, *Toxicodendron radicans*, *Parthenocissus quinquefolia*, *Viburnum rufidulum*, *Ilex vomitoria*, *Berchemia scandens*, *Vitis rotundifolia*, *Decumaria barbara*, *Callicarpa americana*, *Symplocos tinctoria*, *Ampelopsis arborea*, *Frangula caroliniana*, *Smilax tamnoides* (= *Smilax hispida*), *Gelsemium sempervirens*, *Sabal minor*, *Schisandra glabra*, *Lindera benzoin*, *Asimina parviflora*, *Cornus drummondii*, *Bignonia capreolata*, and *Euonymus americanus*. Except in gaps, herbs are scarce (Batista and Platt 1997). Herbs and herbaceous vines include *Thelypteris kunthii*, *Cystopteris protrusa*, *Viola walteri*, *Polystichum acrostichoides*, *Galium obtusum*, *Chasmanthium sessiliflorum*, *Aristolochia serpentaria*, *Trillium foetidissimum*, *Desmodium nudiflorum*, *Lithospermum tuberosum*, *Boehmeria cylindrica*, *Agerata altissima* var. *altissima*, *Sanicula canadensis*, *Sanicula marilandica*, *Arisaema dracontium*, *Tillandsia usneoides*, *Cryptotaenia canadensis*, *Adiantum pedatum*, *Passiflora lutea*, *Cynoglossum virginianum*, *Botrychium virginianum*, *Ranunculus recurvatus*, *Mikania scandens*, and *Clematis crispa* (NatureServe Ecology unpubl. data 2003).

Dynamics: These are stable, fire-sheltered forests. There is presumably some natural disturbance from the effects of hurricanes, which are relatively frequent in the range of this system.

MEMBERSHIP

Associations:

- (*Fagus grandifolia*) - *Quercus pagoda* - *Magnolia grandiflora* / *Hydrangea quercifolia* / *Cystopteris protrusa* - *Thelypteris kunthii* Forest (CEGL007461, G3?)
- *Fagus grandifolia* - *Magnolia grandiflora* - *Fraxinus americana* / *Acer barbatum* - *Cercis canadensis* - *Ostrya virginiana* Forest (CEGL007458, G1G2)
- *Fagus grandifolia* - *Magnolia grandiflora* - *Pinus glabra* - (*Magnolia macrophylla*) / (*Illicium floridanum*) / *Hexastylis arifolia* Forest (CEGL007460, G3)
- *Fagus grandifolia* - *Magnolia grandiflora* - *Quercus pagoda* - *Acer barbatum* - *Pinus taeda* Forest (CEGL004963, G1G2)
- *Fagus grandifolia* - *Magnolia grandiflora* / *Ilex opaca* - (*Persea borbonia*) / *Mitchella repens* Forest (CEGL007459, G2G3)
- *Fagus grandifolia* - *Magnolia grandiflora* / *Ostrya virginiana* / *Aesculus parviflora* Forest (CEGL008554, G2?)
- *Fagus grandifolia* - *Pinus glabra* - *Magnolia grandiflora* / *Serenoa repens* Forest (CEGL004977, G2G3)
- *Fagus grandifolia* - *Quercus alba* - *Liquidambar styraciflua* / *Magnolia grandiflora* / *Smilax pumila* - *Hexastylis arifolia* Forest (CEGL007210, G4)
- *Fagus grandifolia* - *Quercus alba* / *Symplocos tinctoria* East Gulf Coastal Plain Forest (CEGL003859, G3G4)
- *Liriodendron tulipifera* - *Quercus* spp. Forest (CEGL007221, GNA)
- *Pinus taeda* - *Quercus alba* / *Chasmanthium sessiliflorum* Forest (CEGL004763, G3G4)
- *Quercus alba* - *Carya glabra* - *Carya alba* / *Aesculus pavia* Forest (CEGL007225, G4?)
- *Quercus alba* - *Quercus nigra* - *Carya pallida* - (*Quercus pagoda*) / *Magnolia (grandiflora, macrophylla)* Forest (CEGL004775, G3G4)
- *Quercus pagoda* - *Liquidambar styraciflua* / *Quercus shumardii* / *Verbesina virginica* - *Solidago auriculata* Forest (CEGL008585, G3G4)
- *Quercus pagoda* - *Quercus (michauxii, shumardii)* - *Magnolia grandiflora* - (*Tilia americana* var. *caroliniana*) / *Sabal minor* Forest (CEGL007712, G2?)
- *Tilia americana* (var. *caroliniana*, var. *heterophylla*) - *Acer barbatum* - *Fraxinus americana* / *Arundinaria gigantea* / *Tillandsia usneoides* Forest (CEGL008557, G2G3)

Alliances:

- *Acer barbatum* - *Fraxinus americana* - (*Juglans nigra*) Forest Alliance (A.214)
- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Pinus taeda* - *Quercus (alba, falcata, stellata)* Forest Alliance (A.404)
- *Quercus alba* - (*Quercus nigra*) Forest Alliance (A.238)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)

DISTRIBUTION

Range: This mesic upland system of the southern (Atlantic and Gulf) coastal plains is found in suitable conditions from Georgia south to northern Florida and west to (and including) the loessal plains of Mississippi and Louisiana. Its range is generally congruent with the natural range of *Pinus glabra* and *Magnolia grandiflora*.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS, SC

Map Zones: 46:C, 55:C, 56:?, 58:C, 99:C

TNC Ecoregions: 43:C, 53:C, 55:P, 56:C, 58:C

SOURCES

References: Batista and Platt 1997, Comer et al. 2003, Kossuth and Michael 1990, NatureServe Ecology - Southeastern U.S. unpubl. data, Outcalt 1990, Ware et al. 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723110#references

Description Author: A. Schotz and R. Evans, mod. M. Pyne

Version: 28 Sep 2006

Concept Author: A. Schotz and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN COASTAL PLAIN OAK DOME AND HAMMOCK (CES203.494)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Long Disturbance Interval; Broad-Leaved Evergreen Tree

National Mapping Codes: ESLF 4275

CONCEPT

Summary: This small-patch system occurs in the Southern Coastal Plain (Omernik ecoregion 75). Examples are known from inland portions of this region including parts of the East Gulf Coastal Plain (TNC ecoregion 53) and Florida peninsula (TNC ecoregion 55), and nearby portions of the South Atlantic Coastal Plain (TNC ecoregion 56). Thick stands of *Quercus virginiana* and/or *Quercus geminata* are diagnostic of this system. Examples often occupy locally distinct microhabitats that differ from the surrounding landscape, such as shallow depressions or slight topographic highs in a predominantly longleaf pine-dominated landscape. Although embedded in a matrix of vegetation with extremely frequent fire regimes, patches of this system are subject to only infrequent or rare fire events. Under more frequent fire regimes, these sites would likely be occupied by longleaf pine. It has been postulated that winter burning regimes have allowed this type to expand. A range of soil and moisture conditions may be present. More mesic examples have relatively thin soils (to 50 cm) above clay, while xeric examples occupy deep (>130 cm) well-drained sands. Dominant plant taxa of mesic examples are *Quercus virginiana* and *Quercus hemisphaerica*, along with *Diospyros virginiana*, *Campsis radicans* and *Smilax* spp. dominate the sparse ground cover. In xeric examples, dominants include *Quercus geminata*, *Pinus palustris*, *Quercus virginiana*, *Aristida stricta*, and *Stylisma humistrata*. This system is low in plant species diversity compared to most other habitats in the region.

Classification Comments: More diverse stands of upland hardwoods occurring in the same ecoregions should generally be treated under Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560). The core range of this system lies farther south than CES203.560. Closely related stands of vegetation may also occur in near-coastal environments where they are more obviously influenced by maritime disturbances; these are treated under different ecological systems. In Alabama examples of this system are of very limited extent, but occur inland as far as 60 miles or so from the coast; it is also known from bluffs along the Mobile-Tensas (A. Schotz pers. comm.).

Similar Ecological Systems:

- Southern Coastal Plain Dry Upland Hardwood Forest (CES203.560)

Related Concepts:

- Mesic Hammock (FNAI 1990) Finer
- Xeric Hammock (FNAI 1990) Finer

DESCRIPTION

Environment: As currently defined this system includes examples across a moisture gradient from mesic to xeric, ranging across 3 different TNC ecoregions. In Georgia, more mesic examples of this system have relatively thin soils (to 50 cm) above clay, while xeric examples occupy deep (>130 cm) well-drained sands (Drew et al. 1998). There is also a tendency for examples found in central Florida to be somewhat more mesic than those found in north Florida (A. Johnson pers. comm.).

Vegetation: According to Drew et al. (1998) the dominant taxa of mesic examples are *Quercus virginiana*, *Quercus nigra*, and *Quercus hemisphaerica*, along with *Diospyros virginiana*, *Campsis radicans* and *Smilax* spp. dominate the sparse ground cover. In xeric examples dominants include *Quercus geminata*, *Pinus palustris*, *Quercus virginiana*, *Aristida stricta*, and *Stylisma humistrata*. Examples of this system are low in plant species diversity compared to other habitats in the region. Cabbage palms are a diagnostic component of examples of this system in central Florida (A. Johnson pers. comm.).

Dynamics: Myers (1990) postulated that winter-burning regimes have allowed the expansion of this type.

MEMBERSHIP

Associations:

- *Quercus geminata* / *Sabal etonia* Forest (CEGL008599, G2G3)
- *Quercus geminata* / *Vaccinium arboreum* Forest (CEGL003564, G3)
- *Quercus hemisphaerica* - *Carya glabra* - (*Quercus virginiana*) Forest (CEGL004506, G2G3?)
- *Quercus hemisphaerica* - *Quercus geminata* / *Persea borbonia* - *Osmanthus americanus* Forest (CEGL004787, G2G3)
- *Quercus nigra* - *Quercus geminata* / *Lyonia ferruginea* - *Serenoa repens* Forest (CEGL003665, G2?)
- *Quercus virginiana* - *Quercus (hemisphaerica, nigra)* / *Serenoa repens* Forest (CEGL004408, G3?)
- *Quercus virginiana* / *Vaccinium arboreum* - *Ilex vomitoria* Forest (CEGL007028, G2G3)

Alliances:

- *Quercus geminata* Forest Alliance (A.52)
- *Quercus hemisphaerica* - *Carya glabra* Forest Alliance (A.372)
- *Quercus hemisphaerica* Forest Alliance (A.53)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)

DISTRIBUTION

Range: This system occurs in Florida, adjacent Georgia and in very limited areas of Alabama (A. Schotz pers. comm.).

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, MS

Map Zones: 55:C, 56:C, 99:C

TNC Ecoregions: 53:C, 55:C, 56:C

SOURCES

References: Comer et al. 2003, Drew et al. 1998, Johnson pers. comm., Myers 1990, Schotz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723092#references

Description Author: R. Evans

Version: 06 Feb 2003

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1322 SOUTHERN CROWLEY'S RIDGE MESIC LOESS SLOPE FOREST (CES203.079)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Unglaciaded

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Loess; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2322; ESLF 4128; ESP 1322

CONCEPT

Summary: This system of mesic upland forests is confined to Crowley's Ridge, along the western side of the lower Mississippi River. This vegetation and the ridge itself are very distinctive from that of the adjacent alluvial plain. The ridge is a remnant loess-capped feature rising from 30 m to over 60 m (100-200 feet) above the alluvial plain surface, to about 150 m (450 feet) above sea level. The base of the ridge is comprised of Tertiary substrates overlain by Quaternary alluvial deposits and capped with up to 15 m (50 feet) of Pleistocene loess. The system is generally comprised of mesic forests that occupy ravines between narrow, "finger" ridges and slopes in a highly dissected landscape. The sites tend to be more mesic than sites elsewhere in the southeastern United States. In many cases, these slopes and ravines provide habitat for plant species that are rare or absent from other parts of the alluvial plain (e.g., *Liriodendron tulipifera*, *Tilia americana*). Canopies are dominated by *Fagus grandifolia*, *Quercus alba*, and *Liriodendron tulipifera*, with many associates.

Classification Comments: This type does not include all forests across the entire extent of southern Crowley's Ridge; excluded are dry and dry-mesic forests, typically on west-facing slopes and ridgetops. This system is best developed on southern Crowley's Ridge where loess is most pronounced, and becomes much more isolated and rare on the ridge north of approximately Jonesboro, Arkansas. Conversely, dry-mesic oak and shortleaf pine communities are rare within this system, becoming dominant on western slopes and in the northern ridge, respectively. The vegetation may share some superficial similarities with types referred to as western mesophytic forests, but it is well-separated geographically from these. A similar ecological system is East Gulf Coastal Plain Northern Loess Bluff Forest (CES203.481) which occurs farther eastward and is restricted to the loess bluffs east of the Mississippi River. The vegetation of these areas is believed to share a great deal of overlap. They are recognized as distinct for now due to geographic separation; further work may suggest that these two systems should be merged. There are a number of state parks and small natural areas on Crowley's Ridge, including Village Creek State Park, Crowley's Ridge State Park, Wittsburg Natural Area and Chalk Bluff Natural Area (which is toward the northern end of the ridge). All of these have moderate to high-quality examples of this system.

Similar Ecological Systems:

- Mississippi River Alluvial Plain Dry-Mesic Loess Slope Forest (CES203.071)

Related Concepts:

- Mesic Loess/Glacial Till Forest (Nelson 2005) Broader

DESCRIPTION

Environment: These diverse-canopy forests occur in ravines in a highly dissected environment. The system is best expressed on southern Crowley's Ridge, Arkansas (Cross County south through Phillips County), with additional limited occurrences to the north, in undisturbed valleys and coves. Loess soil is the most characteristic and diagnostic component of the environment of this system.

Vegetation: This system consists of forests that are typically dominated by beech, oaks and other hardwoods. Due to the apparent richness of the loessal soils, *Ostrya virginiana* is a particularly common species across many of the component community types.

Dynamics: These are stable, generally fire-sheltered forests, with relatively low fire frequency and intensity. There is presumably some natural disturbance from the effects of windstorms and collapse of the fragile loess.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Quercus* (*alba*, *rubra*) / *Acer barbatum* / *Asimina triloba* Forest (CEGL004072, G2G3)
- *Quercus* (*rubra*, *alba*, *velutina*) / *Acer barbatum* / *Asimina triloba* Forest (CEGL004069, G1G2)
- *Quercus alba* - *Quercus falcata* - *Quercus velutina* / *Ostrya virginiana* Forest (CEGL004068, G1G2)
- *Quercus alba* - *Quercus rubra* - *Acer saccharum* - *Carya cordiformis* / *Lindera benzoin* Forest (CEGL002058, G3?)

Alliances:

- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus* (*falcata*, *stellata*) Forest Alliance (A.241)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

SPATIAL CHARACTERISTICS

Spatial Summary: Small patch to large patch.

DISTRIBUTION

Range: This system is endemic to Crowley's Ridge (Arkansas, Missouri) in the Mississippi River Alluvial Plain.

Divisions: 203:C

Nations: US

Subnations: AR, MO

Map Zones: 45:C

TNC Ecoregions: 42:C

SOURCES

References: Clark 1974, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 2005, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.798100#references

Description Author: T. Foti, D. Zollner, M. Pyne

Version: 02 Feb 2007

Concept Author: T. Foti, D. Zollner, M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1305 SOUTHERN INTERIOR LOW PLATEAU DRY-MESIC OAK FOREST (CES202.898)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2305; ESLF 4111; ESP 1305

CONCEPT

Summary: This system of upland hardwood-dominated forests occurs in the Interior Low Plateau region of the southeastern United States along ridgetops and slopes of various aspects. The system includes essentially all upland hardwood stands of the region except for mesic hardwood forests (which are accommodated by South-Central Interior Mesophytic Forest (CES202.887)). The floristic expression of different stands included in this system varies considerably with aspect and soil type. Included here are a variety of associations ranging along a moisture gradient from submesic to drier ones. The submesic to dry-mesic expressions tend to be found on midslopes with northerly to easterly aspects, and the drier ones on southerly to westerly aspects and on broad ridges. Parent material can range from calcareous to acidic with very shallow, well- to excessively well-drained soils in the drier expressions and moderately well-drained soils in the submesic to dry-mesic ones. The canopy closure of this system ranges from closed to somewhat open in the drier examples. Historically, these examples may have been more open under conditions of more frequent fire.

A number of different *Quercus* species may dominate stands of this system, with *Carya* species also prominent. In the drier examples, *Quercus prinus* is typical over most of the range, reflecting relations with other Appalachian systems to the east. In addition, *Quercus stellata*, *Quercus marilandica*, and *Quercus coccinea* will also share dominance or be prominent in many of the drier examples. *Quercus shumardii* may appear in drier examples with high base status. *Quercus alba* may also be present but not typically dominant. In the submesic to dry-mesic examples, *Quercus alba* will typically exhibit dominance, possibly with *Quercus rubra* or *Quercus falcata*. The understories are typically shrub- and small tree-dominated, with the typical species varying with aspect, soil, and moisture relations.

Classification Comments: The range of this system is consistent with the non-coastal plain portion of the "Western Mesophytic" Forest region of Braun (1950), Keever (1971), and Greller (1988). To the glaciated north, it is replaced by North-Central Interior Dry-Mesic Oak Forest and Woodland (CES202.046) or North-Central Interior Dry Oak Forest and Woodland (CES202.047).

Similar Ecological Systems:

- North-Central Interior Dry-Mesic Oak Forest and Woodland (CES202.046)--is found to the (glaciated) north.

Related Concepts:

- Calcareous Xeric Forest (Evans 1991) Finer
- Xeric Acidic Forest (Evans 1991) Finer

DESCRIPTION

Environment: This system encompasses a variety of associations ranging along a moisture gradient from submesic to drier ones. The submesic to dry-mesic expressions tend to be found on midslopes with northerly to easterly aspects, the drier ones on southerly to westerly aspects and on broad ridges. Parent material can range from calcareous to acidic with very shallow, well- to excessively well-drained soils in the drier expressions and moderately well-drained soils in the submesic to dry-mesic ones.

Vegetation: A number of different *Quercus* species may dominate stands of this system, with *Carya* species also prominent. In the drier examples, *Quercus prinus* is typical over most of the range, reflecting relations with other Appalachian systems to the east. In addition, *Quercus stellata*, *Quercus marilandica*, and *Quercus coccinea* will also share dominance or be prominent in many of the drier examples. *Quercus shumardii* may appear in drier examples with high base status. *Quercus alba* may also be present but not typically dominant. In the submesic to dry-mesic examples, *Quercus alba* will typically exhibit dominance, possibly with *Quercus rubra* or *Quercus falcata*. The understories are typically shrub- and small tree-dominated, with the typical species varying with aspect, soil, and moisture relations. Some typical species include *Cornus florida*, *Cercis canadensis*, *Oxydendrum arboreum*, *Vaccinium pallidum*, *Vaccinium stamineum*, *Vaccinium arboreum*, other highbush *Vaccinium* species, *Kalmia latifolia*, *Viburnum acerifolium*, *Styrax americanus*, and others. Some more open and drier stands may exhibit an understory of grassland species such as *Schizachyrium scoparium*, *Danthonia spicata*, and others. Forbs of the Fabaceae (e.g., *Desmodium*) and Asteraceae (e.g., *Helianthus*) will be prominent in many examples.

MEMBERSHIP

Associations:

- *Juglans nigra* / *Verbesina alternifolia* Forest (CEGL007879, GNA)
- *Juniperus virginiana* var. *virginiana* - (*Quercus* spp.) Forest (CEGL007124, GNA)
- *Liquidambar styraciflua* - *Quercus* (*alba*, *falcata*) Forest (CEGL007217, GNA)
- *Liriodendron tulipifera* - *Quercus* spp. Forest (CEGL007221, GNA)
- *Liriodendron tulipifera* / (*Cercis canadensis*) / (*Lindera benzoin*) Forest (CEGL007220, GNA)

- *Prunus serotina* - *Sassafras albidum* - (*Fraxinus americana*) / *Juniperus virginiana* Forest (CEGL004133, GNA)
- *Quercus alba* - *Carya alba* - (*Quercus velutina*) / *Desmodium nudiflorum* - (*Carex picta*) Forest (CEGL007795, G4)
- *Quercus alba* - *Quercus (falcata, stellata)* / *Chasmanthium laxum* Forest (CEGL007746, G3G4Q)
- *Quercus alba* - *Quercus rubra* - *Carya (alba, ovata)* / *Cornus florida* Acid Forest (CEGL002067, G3)
- *Quercus alba* - *Quercus rubra* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL002070, G4G5)
- *Quercus alba* / *Cornus florida* Unglaciated Forest (CEGL002066, G4?)
- *Quercus falcata* - *Quercus (coccinea, stellata)* / *Schizachyrium scoparium* Woodland (CEGL004214, GNA)
- *Quercus falcata* - *Quercus (coccinea, stellata)* / *Vaccinium (pallidum, stamineum)* Forest (CEGL007247, G4)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244, G4G5)
- *Quercus falcata* - *Quercus alba* - *Quercus stellata* - *Quercus velutina* Forest (CEGL005018, G3G5)
- *Quercus imbricaria* - *Quercus shumardii* - *Quercus muehlenbergii* / *Celtis occidentalis* / *Urtica chamaedryoides* Forest (CEGL003876, G3?)
- *Quercus muehlenbergii* - *Quercus (falcata, shumardii, stellata)* / *Cercis canadensis* / *Viburnum rufidulum* Forest (CEGL007699, G3)
- *Quercus muehlenbergii* - *Quercus shumardii* - *Carya (carolinae-septentrionalis, ovata)* Forest (CEGL007808, G3)
- *Quercus pagoda* - (*Quercus falcata*) / *Ostrya virginiana* Forest (CEGL003871, G3?)
- *Quercus prinus* - *Carya ovata* - *Quercus rubra* / *Acer saccharum* Forest (CEGL007268, G4?)
- *Quercus prinus* - *Quercus spp.* / *Vaccinium arboreum* - (*Kalmia latifolia*, *Styrax grandifolius*) Forest (CEGL007700, G4)
- *Quercus prinus* / *Smilax spp.* Forest (CEGL005022, G3G5)
- *Quercus rubra* - (*Acer saccharum*, *Quercus alba*) Forest (CEGL005017, GNRQ)
- *Quercus shumardii* - *Quercus muehlenbergii* - *Acer (barbatum, leucoderme, saccharum)* / *Ostrya virginiana* Forest (CEGL008442, G2G3)
- *Quercus stellata* - *Quercus marilandica* - *Carya (glabra, texana)* / *Vaccinium arboreum* Forest (CEGL002075, G4)
- *Quercus stellata* / *Viburnum rufidulum* / *Schizachyrium scoparium* - (*Sorghastrum nutans*, *Helianthus eggertii*) Woodland (CEGL004686, G2G3)
- *Quercus velutina* - *Carya (alba, glabra)* / *Vaccinium arboreum* Forest (CEGL004987, G2G3Q)
- *Quercus velutina* - *Quercus alba* - *Carya (glabra, ovata)* Forest (CEGL002076, G4?)
- *Robinia pseudoacacia* Forest (CEGL007279, GNA)

Alliances:

- *Juglans nigra* Forest Alliance (A.1932)
- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Liquidambar styraciflua* Forest Alliance (A.234)
- *Liriodendron tulipifera* Forest Alliance (A.236)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus spp.* Forest Alliance (A.237)
- *Quercus alba* - (*Quercus rubra*, *Carya spp.*) Forest Alliance (A.239)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)
- *Quercus shumardii* - *Quercus pagoda* Forest Alliance (A.252)
- *Quercus stellata* - *Quercus marilandica* Forest Alliance (A.253)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Quercus velutina* - *Quercus alba* - (*Quercus coccinea*) Forest Alliance (A.1911)
- *Robinia pseudoacacia* Forest Alliance (A.256)

SPATIAL CHARACTERISTICS

Spatial Summary: This is the matrix forest in large parts of the Interior Low Plateau region.

Adjacent Ecological Systems:

- Nashville Basin Limestone Glade and Woodland (CES202.334)
- South-Central Interior Mesophytic Forest (CES202.887)

DISTRIBUTION

Range: This system occurs in the southeastern Interior Highlands of the Interior Low Plateau region, including southern Indiana and a small part of southeastern Ohio.

Divisions: 202:C

Nations: US

Subnations: AL, IL, IN, KY, OH, TN

Map Zones: 47:C, 48:C, 49:C, 53:C

TNC Ecoregions: 44:C

SOURCES

References: Braun 1950, Comer et al. 2003, Greller 1988, Keever 1971

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722783#references

Description Author: M. Pyne

Version: 17 Apr 2006

Concept Author: M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

1368 SOUTHERN PIEDMONT DRY OAK-(PINE) FOREST (CES202.339)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Needle-Leaved Tree; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2368; ESLF 4311; ESP 1368

CONCEPT

Summary: This system encompasses the prevailing upland forests of the southern Piedmont. High-quality and historic examples are typically dominated by combinations of upland oaks, sometimes with pines as a significant component, especially in the southern portions of the region. These forests occur in a variety of habitats and, under natural conditions, were the matrix vegetation type covering most of the landscape. Much of this system is currently composed of successional forests that have arisen after repeated cutting, clearing, and cultivation of original oak-hickory forests.

Classification Comments: Although these forests have often been called "oak-hickory" (Braun 1950) or "oak-pine-hickory" (Kuchler 1964, Greller 1989, Skeen et al. 1993), Monk et al. (1990) concluded there was insufficient abundance of hickory to justify including this genus in the name of such forests. There are fairly dramatic differences in the amount of pine present across the modern day Piedmont landscape, with it being especially prevalent in South Carolina, Georgia, and Alabama (USGS 1992). To some extent, the prevalence of pine in these southern portions of the region may represent natural conditions (Nelson 1957). It is possible that the more heavily mixed or pine-dominated forests of the southern Piedmont should be recognized as a different system, but distinguishing natural examples is difficult given a long history of land-use impacts and resulting vegetational changes in the region (Brender 1974). In addition, Skeen et al. (1993) assert that "the oak-hickory-pine designation may be reflective of past land use and disturbance history and that the steady-state typical forest of the southeastern Piedmont is in reality oak-hickory-yellow poplar."

There are fairly clear variations within this system between dry and dry-mesic forests and also between those on acidic or basic soils. These might warrant separate systems, but the similar canopy composition and similar dynamics tie them together, and those distinctions may best be made at the association level. Large areas once dominated by oak-hickory forests now have successional pine forest. This may be regarded as a distinct phase of this system for mapping purposes.

Similar Ecological Systems:

- Central Appalachian Dry Oak-Pine Forest (CES202.591)--occurs to the north and is more Appalachian in character.
- Southeastern Interior Longleaf Pine Woodland (CES202.319)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Piedmont Mesic Forest (CES202.342)

Related Concepts:

- Dry Oak-Hickory Forest (Schafale and Weakley 1990) Broader
- Dry-Mesic Oak-Hickory Forest (Schafale and Weakley 1990) Broader

DESCRIPTION

Environment: Occurs on upland ridges and upper to mid slopes, occupying most of the uplands where soils are not rocky or otherwise extreme. Moisture conditions, determined by topography, are dry to dry-mesic. This system may occur on any kind of rock type, with rock chemistry being an important determinant of variation. Soils include almost the full range of upland soils, with only the shallowest rocky soils and those with extreme clay hardpans excluded.

Vegetation: Vegetation consists of forests dominated by combinations of upland oaks, particularly *Quercus alba*, *Quercus rubra*, *Quercus velutina*, *Quercus stellata*, *Quercus coccinea*, and *Quercus falcata*, along with *Carya glabra*, *Carya alba*, and other *Carya* spp. Other common tree species include *Pinus taeda*, *Pinus echinata*, *Pinus virginiana*, *Acer rubrum*, and *Liriodendron tulipifera*. In successional forests, recovering from clearcutting or cultivation, the pines dominate for a number of decades, with oaks and hickories gradually invading the understory. A well-developed understory and shrub layer is generally present, with species varying with soil chemistry. The herb layer is sparse to at most moderate in density. Before natural fires were suppressed, the forests presumably had less understory and shrub component and probably a grassy herb layer.

Dynamics: Fire was probably an important natural factor in this system, affecting vegetation structure and composition of the lower strata. It may have been important in favoring oaks and pines over other trees in the canopy. Fires were likely almost always low-intensity surface fires. These forests appear to occur naturally as predominantly old-growth, with canopy dynamics dominated by gap-phase regeneration. Small to medium-sized canopy gaps created by wind are the primary natural disturbance at present, and probably were in the past as well. Fire likely created some small to medium-sized gaps in the past also, and likely caused all canopy gaps to persist longer. The dominant trees are capable of living for several centuries. Most of the canopy species are only moderately tolerant of shade. In recent years, more shade-tolerant species appear to be increasing in many of these forests, particularly *Acer rubrum*. This may be a result of loss of regular fire in the system.

MEMBERSHIP

Associations:

- *Carya glabra* - *Fraxinus americana* / *Acer leucoderme* / *Piptochaetium avenaceum* Woodland (CEGL008489, G2G3Q)
- *Pinus echinata* - (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* - *Salvia urticifolia* Woodland (CEGL008492, G2?)
- *Pinus echinata* - *Quercus (prinus, stellata)* Piedmont Forest [Provisional] (CEGL004148, G3?)
- *Pinus echinata* - *Quercus marilandica* / *Kalmia latifolia* - *Symplocos tinctoria* Woodland (CEGL004446, G2?)
- *Quercus alba* - *Carya glabra* - *Fraxinus americana* / *Acer leucoderme* / *Vitis rotundifolia* Forest (CEGL004541, G2?)
- *Quercus alba* - *Carya glabra* / *Schizachyrium scoparium* - *Helianthus divaricatus* - *Salvia urticifolia* - *Parthenium auriculatum* Woodland (CEGL003721, G1?)
- *Quercus alba* - *Quercus rubra* - *Carya (ovata, carolinae-septentrionalis)* / *Cercis canadensis* Forest (CEGL007232, G3G4)
- *Quercus alba* - *Quercus rubra* - *Carya alba* / *Cornus florida* / *Vaccinium stamineum* / *Desmodium nudiflorum* Piedmont Forest (CEGL008475, G4G5)
- *Quercus alba* - *Quercus stellata* - *Carya carolinae-septentrionalis* / *Acer leucoderme* - *Cercis canadensis* Forest (CEGL007773, G2G3)
- *Quercus alba* - *Quercus velutina* - *Quercus stellata* / *Schizachyrium scoparium* - *Desmodium* spp. Woodland (CEGL003722, G1?)
- *Quercus falcata* - *Quercus alba* - *Carya alba* / *Oxydendrum arboreum* / *Vaccinium stamineum* Forest (CEGL007244, G4G5)
- *Quercus prinus* - (*Quercus coccinea*) / *Carya pallida* / *Vaccinium arboreum* - *Vaccinium pallidum* Forest (CEGL008431, G4G5)
- *Quercus prinus* - *Carya* spp. - *Quercus velutina* / *Vaccinium arboreum* / *Iris verna* var. *smalliana* Forest (CEGL007261, G3G4)
- *Quercus prinus* - *Quercus alba* / *Oxydendrum arboreum* / *Kalmia latifolia* Forest (CEGL004415, G3)
- *Quercus prinus* - *Quercus alba* / *Oxydendrum arboreum* / *Vitis rotundifolia* Forest (CEGL006281, G3G4)
- *Quercus prinus* - *Quercus marilandica* Piedmont Woodland (CEGL003708, G2G3)
- *Quercus prinus* - *Quercus stellata* - *Carya glabra* / *Vaccinium arboreum* - *Viburnum rufidulum* Forest (CEGL004416, G2?)

Alliances:

- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Pinus echinata* - *Quercus (coccinea, prinus)* Forest Alliance (A.395)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.680)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248)
- *Quercus prinus* - *Quercus (alba, falcata, rubra, velutina)* Forest Alliance (A.249)
- *Quercus prinus* - *Quercus marilandica* Woodland Alliance (A.623)

SPATIAL CHARACTERISTICS

Spatial Summary: Naturally a matrix system, dominating most of the upland landscape in the Piedmont. Remnants are mostly large patch, but some large expanses remain.

Size: Once occurred as the matrix system, with contiguous patches covering many thousands of acres. Mature patches are now mostly reduced to large-patch remnants, some of hundreds of acres. A few areas have substantially forested landscapes in which oak-hickory forests in some condition cover thousands of acres in nearly contiguous patches.

Adjacent Ecological Systems:

- Piedmont Hardpan Woodland and Forest (CES202.268)
- Piedmont Seepage Wetland (CES202.298)
- Piedmont Upland Depression Swamp (CES202.336)
- Southeastern Interior Longleaf Pine Woodland (CES202.319)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Glade and Barrens (CES202.328)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)
- Southern Piedmont Mesic Forest (CES202.342)

Adjacent Ecological System Comments: Most commonly associated with Southern Piedmont Mesic Forest (CES202.342). Various rock outcrops, Piedmont Hardpan Woodland and Forest (CES202.268), Piedmont Upland Depression Swamp (CES202.336), and other small-patch systems may be embedded.

DISTRIBUTION

Range: This system ranges throughout the Piedmont from Alabama to Virginia. In Virginia, it is primarily central and southern, but extends into a narrow portion of northern Virginia in the Piedmont ecoregion.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 59:C, 60:C, 61:C

USFS Ecomap Regions: 231A:CC, 231I:CC

TNC Ecoregions: 52:C

SOURCES

References: Braun 1950, Brender 1974, Comer et al. 2003, Greller 1989, Kuchler 1964, Monk et al. 1990, Nelson 1957, Skeen et al. 1993, USGS 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723166#references

Description Author: M. Schafale, R. Evans, M. Pyne, mod. S. Gawler

Version: 23 Jul 2007

Concept Author: M. Schafale, R. Evans, M. Pyne

Stakeholders: East, Southeast

ClassifResp: Southeast

1316 SOUTHERN PIEDMONT MESIC FOREST (CES202.342)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Very Long Disturbance Interval; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2316; ESLF 4122; ESP 1316

CONCEPT

Summary: This system encompasses mixed deciduous hardwood or occasionally hardwood-pine forests of mesic sites in the Piedmont (TNC Ecoregion 52) of the southeastern United States. Most examples occur on lower or north-facing slopes where topography creates mesic moisture conditions. A mix of a small number of mesophytic trees is usually dominant, with *Fagus grandifolia* most prominent. Both acidic and basic substrates are currently included in this concept, as are certain heath bluffs, where dense shrub layers of mesophytic ericaceous shrubs may occur beneath an open tree canopy. Fire is naturally infrequent in this system, due to the slopes and moist conditions. If fire does penetrate, it is likely to be low in intensity and may not have significant ecological effects.

Classification Comments: This system is distinguished from Southern Piedmont Dry Oak-(Pine) Forest (CES202.339) by the significant component of mesophytic tree species, particularly *Fagus grandifolia*, as well as by occurrence on mesic topographic sites. Some oaks may also be present. It is distinguished from Southern Piedmont Small Floodplain and Riparian Forest (CES202.323) and Southern Piedmont Large Floodplain Forest (CES202.324) by the absence of characteristic alluvial or bottomland species, along with upland position. This boundary can be somewhat difficult to place, as some alluvial species will occur upslope in basic soils, and some mesic forests will extend onto higher terraces in bottomlands. This system is closely related to Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242) and in the northern part of the range may be very similar except for the geologic substrate. Farther south, there is a greater floristic difference between the two. This system is related to the cove forest systems of the southern Appalachians but lacks a number of species characteristic of those regions. These species are present in increasing numbers as one goes west in the Piedmont. The westernmost Piedmont has some examples of well-developed Southern and Central Appalachian Cove Forest (CES202.373) in the more mountainous portions. Distinct subsets of this system, which could be recognized as different systems, are the basic/circumneutral and acidic examples, and also the shrubby heath bluffs.

Similar Ecological Systems:

- Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)
- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

Related Concepts:

- Basic Mesic Forest (Fleming et al. 2005) Undetermined

DESCRIPTION

Environment: Examples occur on lower slopes or on north-facing slopes, where topography creates mesic moisture conditions. This system may occur on any kind of rock type, with rock chemistry being an important determinant of variation. Most soils are acidic, but those formed on mafic rocks often are circumneutral to basic. The moist conditions and slope limit natural fire intensity and frequency.

Vegetation: Vegetation consists of forests dominated by combinations of trees that include a significant component of mesophytic species. *Fagus grandifolia* is almost always abundant and is often strongly dominant. *Quercus rubra*, *Liriodendron tulipifera*, and *Acer rubrum* may be abundant. In basic soil examples, *Fraxinus americana* and *Acer barbatum* are also abundant. A well-developed understory is usually present. Shrubs are generally sparse to moderate in density, except in heath bluffs. Herbs range from fairly dense in basic examples to sparse in acidic examples, and may be nearly absent in a few. The composition of all lower strata varies substantially with soil acidity. Basic examples have a fairly diverse suite, especially of herbs, which may include a number of species shared with Southern and Central Appalachian Cove Forest (CES202.373). The more common acidic examples have fewer species, though generally they have a higher species richness than the drier systems.

Dynamics: Fire is naturally infrequent in this system, due to the slopes and moist conditions. If fire does penetrate, it is likely to be low in intensity and may not have significant ecological effects. These forests generally exist naturally as old-growth forests, with canopy dynamics dominated by gap phase regeneration. Small to occasional medium sized canopy gaps created by wind are likely the primary form of natural disturbance, though occasional fires might create gaps. Most of the prevailing species are shade tolerant. Most are not very fire-tolerant.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - (*Liquidambar styraciflua*) / *Oxydendrum arboreum* / *Kalmia latifolia* Forest (CEGL004636, G3?)
- *Fagus grandifolia* - *Liriodendron tulipifera* / *Euonymus americanus* / *Athyrium filix-femina* ssp. *asplenioides* Forest (CEGL007201, G4)
- *Fagus grandifolia* - *Quercus alba* / *Kalmia latifolia* - (*Symplocos tinctoria*, *Rhododendron catawbiense*) / *Galax urceolata* Forest (CEGL004539, G2G3)
- *Fagus grandifolia* - *Quercus rubra* / *Acer barbatum* - *Aesculus sylvatica* / *Actaea racemosa* - *Adiantum pedatum* Forest (CEGL008466, G3G4)
- *Fagus grandifolia* - *Quercus rubra* / *Cornus florida* / *Polystichum acrostichoides* - *Hexastylis virginica* Forest (CEGL008465, G3G4)
- *Quercus alba* - *Carya alba* / *Euonymus americanus* / *Hexastylis arifolia* Forest (CEGL006227, G4G5)
- *Quercus alba* - *Quercus rubra* - *Quercus prinus* - *Tilia americana* var. *caroliniana* / *Ostrya virginiana* Forest (CEGL004542, G2G3Q)
- *Quercus alba* - *Quercus rubra* - *Quercus prinus* / *Collinsonia canadensis* - *Podophyllum peltatum* - *Amphicarpaea bracteata* Forest (CEGL007692, G3)
- *Quercus rubra* - *Quercus alba* - *Carya glabra* / *Geranium maculatum* Forest (CEGL007237, G4Q)
- *Quercus rubra* / *Magnolia tripetala* - *Cercis canadensis* / *Actaea racemosa* - *Tiarella cordifolia* Forest (CEGL003949, G3?)
- *Tilia americana* var. *heterophylla* - *Fraxinus americana* - (*Ulmus rubra*) / *Sanguinaria canadensis* - (*Aquilegia canadensis*, *Asplenium rhizophyllum*) Forest (CEGL007711, G2G3)

Alliances:

- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Liriodendron tulipifera* - *Tilia americana* var. *heterophylla* - *Aesculus flava* - *Acer saccharum* Forest Alliance (A.235)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)

SPATIAL CHARACTERISTICS

Spatial Summary: Large- to small-patch system occurring as a regular part of the landscape mosaic in most of the Piedmont.

Size: Generally occurs as large to small patches, often in convoluted bodies following slopes in the dissected lands along streams and rivers. Contiguous convoluted patches or closely associated sets of patches may once have covered thousands of acres and perhaps could have been connected along miles of river bluffs. However, the effect of past fire on the extent of this system is uncertain, and it may have been confined to a more limited range of topography and to smaller, discontinuous patches than it now appears. Most remnants at present are several tens to hundreds of acres.

Adjacent Ecological Systems:

- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)
- Southern Piedmont Glade and Barrens (CES202.328)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

Adjacent Ecological System Comments: Most commonly associated with Southern Piedmont Dry Oak-(Pine) Forest (CES202.339), Southern Piedmont Small Floodplain and Riparian Forest (CES202.323), and Southern Piedmont Large Floodplain Forest (CES202.324). May contain embedded Southern Piedmont Cliff (CES202.386) or Southern Piedmont Glade and Barrens (CES202.328).

DISTRIBUTION

Range: Ranges throughout the southern Piedmont, from Virginia to Alabama.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 59:C, 60:C, 61:C

USFS Ecomap Regions: 231A:CC

TNC Ecoregions: 52:C

SOURCES

References: Anderson 1999a, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723165#references

Description Author: M. Schafale and R. Evans

Version: 13 Dec 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1376 SOUTHERN RIDGE AND VALLEY / CUMBERLAND DRY CALCAREOUS FOREST (CES202.457)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Large patch, Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Circumneutral Soil; Broad-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Mixed evergreen-deciduous closed tree canopy

National Mapping Codes: EVT 2376; ESLF 4319; ESP 1376

CONCEPT

Summary: This system includes dry to dry-mesic calcareous forests of the Southern Ridge and Valley region of Alabama and Georgia, extending north into Tennessee, Kentucky, Virginia and adjacent West Virginia. It includes calcareous forests on lower escarpments of the Cumberland Plateau and other related areas. Examples occur on a variety of different landscape positions and occur on generally deeper soils than glade systems of the same regions. This system is distinguished from those farther north in the Ridge and Valley because of its southerly location in the region, an area which is transitional to the "Oak-Pine-Hickory" region. High-quality and historic examples are typically dominated by combinations of *Quercus* species and *Carya* species, sometimes with *Pinus* species and/or *Juniperus virginiana* as a significant component in certain landscape positions and with particular successional histories. These forests occur in a variety of habitats and are the matrix vegetation type that covers most of the landscape under natural conditions. Examples can occur on a variety of topographic and landscape positions including ridgetops and upper and midslopes. Fire frequency and intensity are factors determining the relative mixture of deciduous hardwood versus evergreen trees in this system. Much of this system is currently composed of successional forests that have arisen after repeated cutting, clearing, and cultivation of the original forests. The range of this system is primarily composed of circumneutral substrates, which exert an expected influence on the composition of the vegetation.

Classification Comments: This system is defined as distinct because of its location in the portion of the Ridge and Valley region which is transitional to the "Oak-Pine-Hickory" region (Greller 1988). Most of the zone of occurrence is attributed to the "Southern Limestone/Dolomite Valleys and Low Rolling Hills" (67f) and the "Southern Shale Valleys" (67g) of Griffith et al. (2001), as well as calcareous parts of 68b and 68c (where it is more limited in extent). In addition, the system could be found in drier, more exposed portions of 66f, "Limestone Valleys and Coves" (Griffith et al. 2001), but most of this terrain is probably more mesic and concave. This ecoregion and "Southern Sedimentary Ridges" (66e) are part of the "Blue Ridge" but are clearly transitional to the Ridge and Valley region. Ecoregion 66e is more likely too acidic to support this system. It is also likely in the "Carter Hills" (EPA Ecoregion 70h of Woods et al. (2002)) of Kentucky and in limited portions of related parts of Ecoregion 70 (Western Allegheny Plateau) in Kentucky.

Similar Ecological Systems:

- Allegheny-Cumberland Dry Oak Forest and Woodland (CES202.359)--is found in some similar landscapes but on more acidic and nutrient-poor substrates, which usually correspond to different landform positions.
- Central Appalachian Alkaline Glade and Woodland (CES202.602)--of central Appalachians, mainly Virginia and north; need to clarify ranges; generally more open stands, not closed canopy.
- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)--is related and overlapping in range, with more open physiognomy.
- Southern Ridge and Valley Calcareous Glade and Woodland (CES202.024)--is more open, with an overlapping range.

Related Concepts:

- Xeric Calcareous Forest (Evans 1991) Intersecting

DESCRIPTION

Environment: Examples can occur on a variety of topographic and landscape positions including ridgetops and upper and mid slopes, where soils are influenced by calcareous/circumneutral geology. Fire frequency and intensity is a factor determining the relative mixture of deciduous hardwood versus evergreen trees in this system.

Vegetation: Natural vegetation consists of forests (or woodlands) dominated most typically by *Quercus alba*, *Quercus muehlenbergii*, and *Quercus shumardii*, with varying amounts of *Carya* spp., *Acer saccharum*, *Acer barbatum*, *Acer leucoderme*, *Acer rubrum*, and other species. This system concept also includes successional communities that have been impacted by logging or agriculture, including upland forest types dominated by *Liriodendron tulipifera*, *Pinus* spp., *Juniperus virginiana*, and *Robinia pseudoacacia*.

MEMBERSHIP

Associations:

- *Juniperus virginiana* var. *virginiana* - (*Quercus* spp.) Forest (CEGL007124, GNA)
- *Quercus alba* - *Quercus rubra* - *Carya ovata* / *Cercis canadensis* - *Juniperus virginiana* var. *virginiana* Forest (CEGL007240, G4)
- *Quercus alba* - *Quercus rubra* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL002070, G4G5)
- *Quercus alba* - *Quercus stellata* / *Ostrya virginiana* - *Acer barbatum* / *Chasmanthium sessiliflorum* Forest (CEGL008443, G3G4)

- *Quercus muehlenbergii* - *Quercus shumardii* - *Carya (carolinae-septentrionalis, ovata)* Forest (CEGL007808, G3)
- *Quercus shumardii* - *Quercus muehlenbergii* - *Acer (barbatum, leucoderme, saccharum)* / *Ostrya virginiana* Forest (CEGL008442, G2G3)
- *Quercus stellata* - *Juniperus virginiana* var. *virginiana* / *Ulmus alata* - (*Cotinus obovatus*) Woodland (CEGL004583, G3)
- *Robinia pseudoacacia* - *Celtis occidentalis* - (*Fraxinus americana, Liriodendron tulipifera*) Forest (CEGL007281, GNA)

Alliances:

- *Juniperus virginiana* Semi-natural Forest Alliance (A.137)
- *Quercus alba* - (*Quercus rubra, Carya* spp.) Forest Alliance (A.239)
- *Quercus alba* - *Quercus (falcata, stellata)* Forest Alliance (A.241)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Robinia pseudoacacia* Forest Alliance (A.256)

SPATIAL CHARACTERISTICS

Spatial Summary: This system can be large patch in some areas and matrix in others, depending on the arrangement of geological strata and relative degree of erosion of the landscape. If erosion has exposed extensive areas of calcareous materials, the extent is likely to be matrix rather than large patch.

DISTRIBUTION

Range: This systems is endemic to the Southern Ridge and Valley and the Cumberland Plateau escarpment in Alabama, Georgia, Tennessee, Kentucky, Virginia and adjacent West Virginia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, TN, VA, WV

Map Zones: 48:C, 53:C, 57:C, 61:C

USFS Ecomap Regions: 221Jb:CCC, 222J:CC, 231Cc:CCC, 231D:CC

TNC Ecoregions: 50:C, 59:C

SOURCES

References: Comer et al. 2003, Greller 1988, Griffith et al. 2001, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723128#references

Description Author: R. Evans and M. Pyne

Version: 29 Sep 2006

Concept Author: R. Evans and M. Pyne

Stakeholders: East, Southeast

ClassifResp: Southeast

1336 SOUTHWEST FLORIDA COASTAL STRAND AND MARITIME HAMMOCK (CES411.368)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Forest and Woodland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Forest and Woodland (Treed); Coast

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: EVT 2336; ESLF 4142; ESP 1336

CONCEPT

Summary: This ecological system occurs as a narrow band of hardwood forest lying just inland of the coastal dune system in southwestern Florida. It is found on stabilized, old, coastal dunes, often with substantial shell components. The vegetation is characterized by hardwood species with tropical affinities. As such, the northern extent of this type is limited by periodic freezes and cold tolerance of tropical constituent species, such as *Piscidia piscipula* and *Eugenia axillaris* (Johnson and Muller 1993a). This system is closely related to both inland tropical hammocks and southeast Florida maritime hammocks, and may share some species overlap with each.

Classification Comments: This system may be distinguished from southeast Florida maritime hammocks by geographic location, presence/absence of certain indicator species, and relatively less harsh coastal exposure. It is distinguished from maritime hammocks further north which contain temperate species including *Persea borbonia*, *Quercus virginiana*, *Magnolia grandiflora*, and *Juniperus virginiana* var. *silicicola* (Johnson and Muller 1993a).

Similar Ecological Systems:

- Southeast Florida Coastal Strand and Maritime Hammock (CES411.369)

Related Concepts:

- Coastal Berm (FNAI 1990) Undetermined
- Coastal Strand (FNAI 1990) Intersecting
- Maritime Hammock (FNAI 1990) Intersecting
- Shell Mound (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- *Ernodea littoralis* - *Forestiera segregata* var. *segregata* - *Coccoloba uvifera* - *Jacquinia keyensis* Shrubland (CEGL003785, G1)
- *Ficus aurea* - *Sideroxylon foetidissimum* - *Bursera simaruba* / *Eugenia foetida* - *Piscidia piscipula* / *Hymenocallis latifolia* Forest (CEGL007002, G1)
- *Quercus virginiana* - *Sabal palmetto* / *Eugenia axillaris* - *Myrsine floridana* - *Coccoloba uvifera* Forest (CEGL007035, G1)
- *Sabal palmetto* - *Coccoloba uvifera* - *Piscidia piscipula* / *Myrsine floridana* / *Hymenocallis latifolia* Forest (CEGL007011, G1)
- *Swietenia mahagoni* - *Piscidia piscipula* - *Colubrina arborescens* Forest (CEGL004710, G1Q)

Alliances:

- *Bursera simaruba* - *Coccoloba diversifolia* - *Nectandra coriacea* - *Eugenia axillaris* Forest Alliance (A.33)
- *Coccoloba uvifera* Shrubland Alliance (A.715)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Sabal palmetto* - *Coccoloba uvifera* Forest Alliance (A.43)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Johnson and Muller 1993a

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723148#references

Description Author: R. Evans, after Johnson and Muller

Version: 16 Dec 2002

Concept Author: R. Evans, after Johnson and Muller (1993a)

Stakeholders: Southeast

ClassifResp: Southeast

SAVANNA AND SHRUB-STEPPE

1408 ALABAMA KETONA GLADE AND WOODLAND (CES202.338)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2408; ESLF 5424; ESP 1408

CONCEPT

Summary: This system consists of open glades and related vegetation on Ketona dolomite slopes found in Bibb County, Alabama, in the vicinity of the Little Cahaba River. The vegetation includes herbaceous, shrubland, and open woodlands, which occur on thin soils or outcrops of Ketona dolomite. *Juniperus virginiana*, *Quercus muehlenbergii*, *Pinus palustris*, *Croton alabamensis*, *Sabal minor*, and *Leptopus phyllanthoides* are the dominant woody plants of the woodlands. The system supports eight endemic and numerous disjunct plant taxa and has very high conservation value based on rare plants.

Classification Comments: As TNC ecoregions are officially defined, examples of this system are found in the Cumberland and Southern Ridge and Valley (Ecoregion 50), as well as in the Upper East Gulf Coastal Plain (Ecoregion 43). However, the occurrence in the latter ecoregion may be due to inaccurate boundaries; the system is fundamentally associated with the Cumberland and Southern Ridge and Valley due to its fidelity to ancient dolomites not more recent sediments. It appears to be restricted to EPA level III Ecoregion 67 (Ridge and Valley) not 65 ("Southeastern Plains") (EPA 2004) and the corresponding MRLC mapzones (i.e., 48 not 46), and the attributions reflect this determination.

Similar Ecological Systems:

- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)

DESCRIPTION

Environment: This system consists of open glades and related vegetation on Ketona dolomite slopes found in Bibb County, Alabama, in the vicinity of the Little Cahaba River.

Vegetation: The vegetation of the system includes a mixture of herbaceous, shrubland, and open woodlands, which occur on thin soils or outcrops of Ketona dolomite. *Juniperus virginiana*, *Quercus muehlenbergii*, *Pinus palustris*, *Croton alabamensis*, *Sabal minor*, and *Leptopus phyllanthoides* are the dominant woody plants of the woodlands.

MEMBERSHIP

Associations:

- *Juniperus virginiana* var. *virginiana* - *Croton alabamensis* - *Leptopus phyllanthoides* / *Carex eburnea* Shrubland (CEGL003937, G1)
- *Quercus muehlenbergii* - *Carya carolinae-septentrionalis* / *Acer (barbatum, leucoderme)* - *Juniperus virginiana* var. *virginiana* / *Croton alabamensis* Woodland (CEGL003758, G1)
- *Schizachyrium scoparium* - *Sporobolus junceus* - *Rudbeckia triloba* var. *pinnatifida* - *Onosmodium decipiens* Wooded Herbaceous Vegetation (CEGL004080, G1)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- *Quercus muehlenbergii* Woodland Alliance (A.621)

DISTRIBUTION

Range: This small-patch system is restricted to Ketona dolomite slopes found in Bibb County, Alabama, in the vicinity of the Little Cahaba River.

Divisions: 202:C

Nations: US

Subnations: AL

Map Zones: 48:C

TNC Ecoregions: 43:C, 50:C

SOURCES

References: Comer et al. 2003, EPA 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723167#references

Description Author: M. Pyne, R. Evans, C. Nordman
Version: 25 Aug 2004
Concept Author: M. Pyne, R. Evans, C. Nordman

Stakeholders: Southeast
ClassifResp: Southeast

1400 CENTRAL APPALACHIAN ALKALINE GLADE AND WOODLAND (CES202.602)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Ridge/Summit/Upper Slope; Unglaciated; Alkaline Soil; Shallow Soil

Non-Diagnostic Classifiers: Lowland; Forest and Woodland (Treed); Temperate; Mesotrophic Soil; Circumneutral Soil; Ustic; Intermediate Disturbance Interval; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2400; ESLF 5416; ESP 1400

CONCEPT

Summary: This system occurs at low to moderate elevations from the Central Appalachians down into the Ridge and Valley. It consists of woodlands and open glades on thin soils over limestone, dolostone or similar calcareous rock. In some cases, the woodlands grade into closed-canopy forests. *Juniperus virginiana* is a common tree, filling in the absence of fire, and *Quercus muehlenbergii* is indicative of the limestone substrate. *Rhus aromatica*, *Cercis canadensis*, and *Ostrya virginiana* may occur. Prairie grasses are the dominant herbs (*Andropogon gerardii*, *Schizachyrium scoparium*, *Bouteloua* spp.); forb richness is often high. Characteristic forbs include *Asclepias verticillata*, *Monarda fistulosa*, *Salvia lyrata*, *Symphyotrichum oblongifolium*, and *Brickellia eupatorioides* (Braun 1950). Fire is an important natural disturbance vector.

Similar Ecological Systems:

- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)--is a related system to the south and west of CES202.602.
- Laurentian-Acadian Calcareous Rocky Outcrop (CES201.572)
- North-Central Appalachian Circumneutral Cliff and Talus (CES202.603)
- Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457)--has a more closed canopy.
- Southern Ridge and Valley Calcareous Glade and Woodland (CES202.024)--has a possibly overlapping range.

DESCRIPTION

Environment: This system occupies mid-elevation rocky ridges, slopes, and outcrops with thin soils and calcareous bedrock. Large amounts of exposed mineral soils and/or gravel are characteristic. Soils are high in pH and rich in calcium and magnesium. Although these areas are subject to prolonged droughts, local areas of ephemeral vernal seepage occur in microtopographic concavities, and they may have distinctive vegetation (e.g., colonies of *Dodecatheon meadia*). A series of glades in western Virginia is somewhat distinctive because of the dolostone, which contains a high magnesium content. These glades are located on low dolomite knobs and foothills of Elbrook dolomite that occupy middle to upper slopes and crests of south- or southwest-facing spur ridges at relatively low elevations.

Vegetation: In some cases, the woodlands grade into closed-canopy forests. *Juniperus virginiana* is a common tree, filling in the absence of fire, and *Quercus muehlenbergii* is indicative of the limestone substrate. *Rhus aromatica*, *Cercis canadensis*, and *Ostrya virginiana* may occur. Prairie grasses are the dominant herbs (*Andropogon gerardii*, *Schizachyrium scoparium*, *Bouteloua* spp.); forb richness is often high. Characteristic forbs include *Asclepias verticillata*, *Monarda fistulosa*, *Salvia lyrata*, *Symphyotrichum oblongifolium*, and *Brickellia eupatorioides* (Braun 1950).

Dynamics: Fire is an important natural disturbance vector.

MEMBERSHIP

Associations:

- *Acer saccharum* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL006017, G4?)
- *Ailanthus altissima* Forest (CEGL007191, GNA)
- *Fraxinus americana* - *Carya ovata* / *Frangula caroliniana* / *Helianthus hirsutus* Woodland (CEGL008458, G1?)
- *Juniperus virginiana* / *Bouteloua curtipendula* - *Carex eburnea* Wooded Herbaceous Vegetation (CEGL006047, G1G2)
- *Quercus alba* - *Quercus rubra* - *Carya (alba, ovata)* / *Cornus florida* Acid Forest (CEGL002067, G3)
- *Quercus muehlenbergii* - *Cercis canadensis* / *Packera obovata* - *Lithospermum canescens* Woodland (CEGL006231, G3G4)
- *Quercus muehlenbergii* - *Juniperus virginiana* / *Schizachyrium scoparium* - *Manfreda virginica* Wooded Herbaceous Vegetation (CEGL005131, G2G3)
- *Quercus muehlenbergii* - *Quercus (alba, rubra)* - *Carya cordiformis* / *Viburnum prunifolium* Forest (CEGL004793, G3G4)
- *Quercus muehlenbergii* / *Packera plattensis* - *Parthenium auriculatum* - *Schizachyrium scoparium* Woodland (CEGL006030, G2)
- *Quercus muehlenbergii* / *Salix humilis* / *Eryngium yuccifolium* Woodland (CEGL006239, G1Q)
- *Quercus rubra* - *Carya (glabra, ovata)* / *Ostrya virginiana* / *Carex lucorum* Forest (CEGL006301, G4?)
- *Rhus aromatica* - *Celtis tenuifolia* / *Carex eburnea* Shrubland (CEGL004393, G3)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Ailanthus altissima* Forest Alliance (A.221)
- *Carya (glabra, ovata)* - *Fraxinus americana* - *Quercus (alba, rubra)* Forest Alliance (A.258)

- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus muehlenbergii* Woodland Alliance (A.621)

DISTRIBUTION

Range: This system is known from Pennsylvania south through the Ridge and Valley to western Virginia, possibly extending to southeastern Kentucky and northeastern Tennessee.

Divisions: 202:C

Nations: US

Subnations: KY?, MD, NJ, OH, PA, TN?, VA, WV

Map Zones: 60:C, 61:C, 62:C

USFS Ecomap Regions: 221:C

TNC Ecoregions: 49:P, 50:C, 51:C, 59:C, 61:P

SOURCES

References: Braun 1950, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723007#references

Description Author: S.C. Gawler, G. Fleming, R. Evans, mod. M. Pyne

Version: 23 Jul 2007

Concept Author: S.C. Gawler, G. Fleming, R. Evans

Stakeholders: East, Midwest, Southeast

ClassifResp: East

1401 CENTRAL INTERIOR HIGHLANDS CALCAREOUS GLADE AND BARRENS (CES202.691)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Alkaline Soil

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Sedimentary Rock; F-Patch/Medium Intensity

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2401; ESLF 5417; ESP 1401

CONCEPT

Summary: This system is found primarily in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions with scattered occurrences in northern Missouri. It occurs along moderate to steep slopes and steep valleys on primarily southerly to westerly facing slopes. Limestone and/or dolomite bedrock typify this system with shallow, moderately to well-drained soils interspersed with rocks. These soils often dry out during the summer and autumn, and then become saturated during the winter and spring. *Schizachyrium scoparium* dominates this system and is commonly associated with *Andropogon gerardii*, *Bouteloua curtipendula*, and calcium-loving plant species. Stunted woodlands primarily dominated by *Quercus muehlenbergii* interspersed with *Juniperus virginiana* occur on variable-depth-to-bedrock soils. Fire is the primary natural dynamic, and prescribed fires help manage this system by restricting woody growth and maintaining the more open glade structure.

Classification Comments: In Alabama, this system is found in the Moulton Valley region, which is technically part of TNC Ecoregion 50, but ambiguously placed there. This region is included in the Interior Plateau (71) of EPA (2004). Also included here, somewhat uncomfortably, is an unusual series of flatrock glades on Silurian dolomite in Bullitt County, Kentucky (71d of Woods et al. (2002)).

Similar Ecological Systems:

- Alabama Ketona Glade and Woodland (CES202.338)--a similar concept on a very specialized substrate.
- Bluegrass Savanna and Woodland (CES202.888)
- Central Appalachian Alkaline Glade and Woodland (CES202.602)--of central Appalachians, mainly Virginia and north; need to clarify ranges.
- Nashville Basin Limestone Glade and Woodland (CES202.334)
- Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457)--has a more closed canopy.
- Southern Ridge and Valley Calcareous Glade and Woodland (CES202.024)--has a possible overlapping range.

Related Concepts:

- Dolomite Glade (Evans 1991) Finer
- Limestone Glade (Evans 1991) Finer
- Xeric Calcareous Forest (Evans 1991) Finer

DESCRIPTION

Environment: This system is found primarily along moderate to steep slopes and steep valleys on primarily southerly to westerly facing slopes. Limestone and/or dolomite bedrock typify this system with shallow, moderately to well-drained soils interspersed with rocks. Soils are affected by the bedrock chemistry and tend to have high levels of calcium and potassium and a relatively high pH. Due to seasonal rainfall patterns and the extremely thin soils, these soils dry out during the summer and autumn and become saturated during the winter and spring. In northern Alabama (Moulton Valley), the stratum on which the system is found is a type of "marl." Seeps may occur where impervious rock strata meet relatively permeable limestone.

Vegetation: *Schizachyrium scoparium* dominates this system and is commonly associated with *Andropogon gerardii*, *Bouteloua curtipendula*, and calcium-loving plant species. Stunted woodlands primarily dominated by *Quercus muehlenbergii* interspersed with *Juniperus virginiana* occur on variable-depth-to-bedrock soils. The trees typically occur as islands in a wider herbaceous or rocky area. The islands are found in microenvironments where the soil depth and available water are sufficient to support trees (e.g., depressions in the bedrock). Other woody plants associated with this system (within their ranges) include *Quercus shumardii*, *Cercis canadensis*, *Ulmus alata*, *Fraxinus quadrangulata*, *Juniperus ashei*, *Acer saccharum*, and *Frangula caroliniana*. Other herbaceous taxa include *Silphium trifoliatum*, *Silphium terebinthinaceum*, *Liatris* spp., *Symphytotrichum oblongifolium*, *Castilleja coccinea*, *Hedyotis nigricans*, *Talinum* spp., *Sedum* spp., and *Panicum flexile*. Small-scale stands of annual *Sporobolus* spp. may be prominent in some examples. In some examples, small-scale seepage areas may contain *Eleocharis compressa*, *Nothoscordum bivalve*, *Isoetes butleri*, and *Hypoxis hirsuta*.

Dynamics: Fire is the primary natural dynamic, and prescribed fires help manage this system by restricting woody growth and maintaining the more open glade structure.

MEMBERSHIP

Associations:

- (*Quercus stellata*, *Ulmus alata*) / *Schizachyrium scoparium* - *Symphytotrichum patens* var. *patentissimum* Wooded Herbaceous

Vegetation (CEGL007824, G2?)

- *Acer saccharum* - *Quercus muehlenbergii* / *Cercis canadensis* Forest (CEGL006017, G4?)
- *Eleocharis compressa* - *Nothoscordum bivalve* Herbaceous Vegetation (CEGL004669, GNR)
- *Fraxinus quadrangulata* - *Juniperus virginiana* var. *virginiana* / *Schizachyrium scoparium* - *Lithospermum canescens* Woodland (CEGL007994, G2)
- *Juniperus ashei* / *Cotinus obovatus* / *Carex eburnea* - *Rudbeckia missouriensis* Woodland (CEGL007833, G2?)
- *Juniperus ashei* Dry Chalk Outcrop Woodland (CEGL007967, G1)
- *Juniperus ashei* Ozark Cliff-top Woodland (CEGL004672, G2?)
- *Juniperus virginiana* / *Schizachyrium scoparium* - (*Andropogon gerardii*, *Sorghastrum nutans*) - *Silphium (trifoliatum, terebinthinaceum)* Wooded Herbaceous Vegetation (CEGL004738, G2)
- *Juniperus virginiana* / *Schizachyrium scoparium* - *Silphium terebinthinaceum* var. *luciae-brauniae* - *Carex juniperorum* - *Castilleja coccinea* Wooded Herbaceous Vegetation (CEGL004464, G1Q)
- *Juniperus virginiana* Alkaline Bluff Woodland (CEGL002426, G3)
- *Juniperus virginiana* var. *virginiana* - *Fraxinus quadrangulata* / *Symphotrichum oblongifolium* - *Panicum flexile* - *Sedum pulchellum* Woodland (CEGL004271, G2)
- Limestone - Dolostone Midwest Dry Cliff Sparse Vegetation (CEGL002291, G4G5)
- Limestone - Dolostone Midwest Moist Cliff Sparse Vegetation (CEGL002292, G4G5)
- Limestone - Dolostone Talus Sparse Vegetation (CEGL002308, G4G5)
- *Quercus marilandica* - (*Juniperus virginiana*) / *Schizachyrium scoparium* - *Danthonia spicata* Wooded Herbaceous Vegetation (CEGL002428, G2)
- *Quercus muehlenbergii* - *Fraxinus (quadrangulata, americana)* / *Schizachyrium scoparium* Woodland (CEGL002143, G3G4)
- *Quercus muehlenbergii* - *Juniperus virginiana* / *Schizachyrium scoparium* - *Manfreda virginica* Wooded Herbaceous Vegetation (CEGL005131, G2G3)
- *Quercus muehlenbergii* - *Quercus shumardii* Forest (CEGL004602, G2G4)
- *Quercus muehlenbergii* / *Schizachyrium scoparium* - *Bouteloua curtipendula* Wooded Herbaceous Vegetation (CEGL005284, G2G3)
- *Quercus stellata* - *Quercus alba* - (*Quercus falcata*) / *Schizachyrium scoparium* Woodland (CEGL004217, G1)
- *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* Wooded Herbaceous Vegetation (CEGL002391, G2G3)
- *Rhus aromatica* - *Celtis tenuifolia* / *Carex eburnea* Shrubland (CEGL004393, G3)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* - *Rudbeckia missouriensis* - *Mentzelia oligosperma* Wooded Herbaceous Vegetation (CEGL002251, G2)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Bouteloua curtipendula* - *Rudbeckia missouriensis* - *Hedyotis nigricans* Wooded Herbaceous Vegetation (CEGL002398, G3G4)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Tradescantia bracteata* Alkaline Bedrock Herbaceous Vegetation (CEGL005280, G1G2)
- *Schizachyrium scoparium* - *Sporobolus compositus* var. *compositus* - *Rudbeckia fulgida* var. *fulgida* Wooded Herbaceous Vegetation (CEGL004078, G2)
- *Sedum pulchellum* - *Talinum calcaricum* - *Leavenworthia* spp. / *Nostoc commune* Herbaceous Vegetation (CEGL004346, G3)
- *Sedum pulchellum* - *Talinum calycinum* - *Oenothera linifolia* Shale Herbaceous Vegetation (CEGL004347, G2G3)
- *Sporobolus (neglectus, vaginiflorus)* - *Leavenworthia exigua* var. *laciniata* - *Viola egglesonii* Herbaceous Vegetation (CEGL007772, G1Q)
- *Sporobolus vaginiflorus* var. *ozarkanus* Ozark Herbaceous Vegetation (CEGL008563, G3?)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Eleocharis compressa* - *Nothoscordum bivalve* Saturated Herbaceous Alliance (A.1458)
- *Fraxinus quadrangulata* - (*Juniperus virginiana*) Woodland Alliance (A.1913)
- *Juniperus ashei* Woodland Alliance (A.501)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- *Juniperus virginiana* Woodland Alliance (A.545)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus muehlenbergii* Woodland Alliance (A.621)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)
- *Sedum pulchellum* Saturated Herbaceous Alliance (A.1820)
- *Sporobolus (neglectus, vaginiflorus)* Herbaceous Alliance (A.1815)

DISTRIBUTION

Range: This system is found primarily in the Interior Highlands of the Ozark, Ouachita, and the Interior Low Plateau regions ranging east to southern Ohio and including the Knobs region and Cliff section of Kentucky, the Cumberland Plateau escarpment of Tennessee, and the Moulton Valley of northern Alabama.

Divisions: 202:C; 203:C

Nations: US

Subnations: AL, AR, IL, IN, KY, MO, OH, OK, TN

Map Zones: 43:P, 44:C, 47:C, 48:C, 49:C, 53:C

TNC Ecoregions: 36:C, 38:C, 39:C, 43:C, 44:C, 50:C

SOURCES

References: Comer et al. 2003, Delcourt and Delcourt 1997, DeSelm and Murdock 1993, EPA 2004, Erickson et al. 1942, Evans 1991, Nelson 1985, USFWS 1974, Webb et al. 1997, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722968#references

Description Author: S. Menard, T. Nigh, M. Pyne, mod. J. Drake

Version: 18 Jul 2006

Concept Author: S. Menard, T. Nigh, M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Midwest

1398 CUMBERLAND SANDSTONE GLADE AND BARRENS (CES202.337)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Acidic Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2398; ESLF 5414; ESP 1398

CONCEPT

Summary: This system encompasses a complex of sparsely vegetated rock outcrops, perennial grasslands, and woodlands on shallow soils on the Cumberland Plateau of Kentucky, Tennessee, Alabama, and Georgia. Herbaceous plants, including *Diamorpha smallii* and *Minuartia glabra*, are typical of the outcrops in Tennessee. In Alabama, *Bigelovia nuttallii* and *Schizachyrium scoparium* are important. *Pinus virginiana* and *Acer rubrum* are typical of the woodlands surrounding these outcrops on the Cumberland Plateau. Scattered shrubs, such as *Vaccinium arboreum* and *Chionanthus virginicus*, occur on the margins in patches of deeper soil. Fruticose lichens such as *Cladonia* spp. and *Cladina* spp. may be prominent in some examples. To the west, in the Interior Highlands (Ozark, Ouachita, and Interior Low Plateau regions), this system is replaced by Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692) (both are found in Kentucky, with the latter in the Shawnee Hills of the Interior Low Plateau).

Similar Ecological Systems:

- Central Interior Highlands Dry Acidic Glade and Barrens (CES202.692)

Related Concepts:

- Cumberland Mountains xeric pine woodland (Evans 1991) Finer

DESCRIPTION

Environment: Some examples of this system may occur adjacent to sandstone cliff faces.

Vegetation: Herbaceous plants, including *Diamorpha smallii* and *Minuartia glabra*, are typical of the outcrops in Tennessee. In Alabama, *Bigelovia nuttallii* and *Schizachyrium scoparium* are important (A. Schotz pers. comm.). *Pinus virginiana* and *Acer rubrum* are typical of the woodlands surrounding these outcrops on the Cumberland Plateau (Perkins 1981). Other herbaceous plants which may be found include *Danthonia sericea*, *Liatris microcephala*, *Eurybia surculosa* (= *Aster surculosus*), *Hypericum gentianoides*, *Talinum mengesii*, *Nuttallanthus canadensis* (= *Linaria canadensis*), *Opuntia humifusa* var. *humifusa*, *Sporobolus vaginiflorus*, *Erigeron strigosus*, *Grimmia* spp., and fruticose lichens such as *Cladonia* spp. and *Cladina* spp. Scattered shrubs, such as *Vaccinium arboreum* and *Chionanthus virginicus*, occur on the margins of more open areas, in patches of deeper soil.

MEMBERSHIP

Associations:

- *Bigelovia nuttallii* - *Coreopsis pulchra* - *Liatris microcephala* Herbaceous Vegetation (CEGL004622, G2)
- *Diamorpha smallii* - *Minuartia glabra* Sandstone Herbaceous Vegetation (CEGL004343, G2G3)
- *Kalmia latifolia* - *Gaylussacia (baccata, brachycera)* Cumberland Shrubland (CEGL008470, G3)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Schizachyrium scoparium* - *Andropogon (gyrans, ternarius, virginicus)* Herbaceous Vegetation (CEGL007707, G3?)
- *Schizachyrium scoparium* - *Danthonia sericea* - *Liatris microcephala* - (*Eurybia surculosa*) Wooded Herbaceous Vegetation (CEGL004061, G3)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Bigelovia nuttallii* Herbaceous Alliance (A.1617)
- *Kalmia latifolia* - *Gaylussacia baccata* Shrubland Alliance (A.1050)
- *Minuartia glabra* - *Talinum* spp. - *Diamorpha smallii* Saturated Herbaceous Alliance (A.1819)
- *Pinus virginiana* Forest Alliance (A.131)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found in the Cumberland Plateau of Kentucky, Tennessee, Virginia, Alabama, and Georgia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, TN, VA

Map Zones: 48:C, 53:C

USFS Ecomap Regions: 221H:CC

TNC Ecoregions: 50:C

SOURCES

References: Comer et al. 2003, Perkins 1981, Schotz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723168#references

Description Author: M. Pyne, R. Evans, C. Nordman

Version: 12 Dec 2002

Concept Author: M. Pyne, R. Evans, C. Nordman

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

1397 NASHVILLE BASIN LIMESTONE GLADE AND WOODLAND (CES202.334)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Alkaline Soil; Graminoid

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: EVT 2397; ESLF 5413; ESP 1397

CONCEPT

Summary: This system encompasses a range of plant communities associated with thin soils on flat areas of Ordovician limestone in the Inner Nashville Basin of Tennessee (Ecoregion 71i of Griffith et al. (1998), EPA (2004); Subsection 222Ed of Keys et al. (1995)), with a few disjunct occurrences in Kentucky. The vegetation of this system includes sparsely vegetated rock outcrops, annual *Sporobolus* spp.-dominated grasslands, *Schizachyrium scoparium*-dominated perennial grasslands, seasonally wet herbaceous washes and seeps, shrublands, as well as woodlands dominated by *Juniperus virginiana* and oaks. *Echinacea tennesseensis* and *Astragalus bibullatus* are completely endemic to this system. There are numerous other disjunct and near-endemic plants.

Classification Comments: This system occupies a small portion of the landscape but many associations are only found in this system. The most closely related system is Central Interior Highlands Calcareous Glade and Barrens (CES202.691). Also included here are related disjunct examples in Kentucky on Mississippian limestones (EPA ecoregions 71a, 71e of Woods et al. (2002)).

Similar Ecological Systems:

- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)--is typically found on sloping surfaces, not flatrocks, and has a broader distribution.

Related Concepts:

- Limestone Flat-Rock Glade (Evans 1991) Finer

DESCRIPTION

Vegetation: The vegetation of this system includes sparsely vegetated rock outcrops, annual *Sporobolus* spp.-dominated grasslands, *Schizachyrium scoparium*-dominated perennial grasslands, seasonally wet herbaceous washes and seeps, shrublands, as well as woodlands dominated by *Juniperus virginiana* and oaks. Other woody plants associated with this system include *Quercus shumardii*, *Cercis canadensis*, *Ulmus alata*, *Fraxinus quadrangulata*, and *Acer saccharum*. Characteristic shrubs include *Forestiera ligustrina*, *Rhus aromatica*, *Hypericum frondosum*, and *Frangula caroliniana*. Other herbaceous taxa include *Andropogon gerardii*, *Bouteloua curtipendula*, *Silphium trifoliatum*, *Silphium terebinthinaceum*, *Helianthus mollis*, *Grindelia lanceolata*, *Liatris* spp., *Hedyotis nigricans*, *Croton capitatus*, *Heliotropium tenellum*, *Isanthus brachiatus*, *Manfreda virginica*, *Ruellia humilis*, *Talinum calcaricum*, *Sedum pulchellum*, and *Panicum flexile*. *Echinacea tennesseensis* and *Astragalus bibullatus* are completely endemic to this system. There are numerous other disjunct and near-endemic plants, including *Astragalus tennesseensis*, *Dalea gattereri*, and *Pediomelum subacaule* (Somers et al. 1986). Small-scale seepage areas and washes may contain *Eleocharis compressa*, *Nothoscordum bivalve*, *Isoetes butleri*, and *Hypoxis hirsuta*.

MEMBERSHIP

Associations:

- *Dalea foliosa* - *Mecardonia acuminata* - *Mitreola petiolata* Herbaceous Vegetation (CEGL004292, G2?)
- *Eleocharis compressa* - *Schoenolirion croceum* - *Carex crawei* - *Allium cernuum* Herbaceous Vegetation (CEGL004169, G2?)
- *Juniperus virginiana* var. *virginiana* - *Forestiera ligustrina* - *Rhus aromatica* - *Hypericum frondosum* Shrubland (CEGL003938, G3G4)
- *Juniperus virginiana* var. *virginiana* - *Fraxinus quadrangulata* / *Polymnia canadensis* - (*Astranthium integrifolium*) Woodland (CEGL003754, G3)
- *Quercus muehlenbergii* - *Juniperus virginiana* / *Schizachyrium scoparium* - *Manfreda virginica* Wooded Herbaceous Vegetation (CEGL005131, G2G3)
- *Quercus stellata* / *Viburnum rufidulum* - *Forestiera ligustrina* / *Andropogon gerardii* Woodland (CEGL003712, G2?)
- *Sedum pulchellum* - *Talinum calcaricum* - *Leavenworthia* spp. / *Nostoc commune* Herbaceous Vegetation (CEGL004346, G3)
- *Sporobolus* (*neglectus*, *vaginiflorus*) - *Aristida longispica* - *Panicum flexile* - *Panicum capillare* Herbaceous Vegetation (CEGL004340, G3)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Dalea foliosa* - *Mecardonia acuminata* Saturated Herbaceous Alliance (A.1686)
- *Eleocharis compressa* - *Nothoscordum bivalve* Saturated Herbaceous Alliance (A.1458)
- *Fraxinus quadrangulata* - (*Juniperus virginiana*) Woodland Alliance (A.1913)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)

- *Sedum pulchellum* Saturated Herbaceous Alliance (A.1820)
- *Sporobolus (neglectus, vaginiflorus)* Herbaceous Alliance (A.1815)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Southern Interior Low Plateau Dry-Mesic Oak Forest (CES202.898)

DISTRIBUTION

Range: This system is restricted to flat areas of Ordovician limestone in the Inner Nashville Basin of Tennessee, as well as limited and disjunct examples on flat Mississippian limestones in Kentucky.

Divisions: 202:C

Nations: US

Subnations: KY, TN

Map Zones: 47:C, 48:C

TNC Ecoregions: 44:C

SOURCES

References: Comer et al. 2003, EPA 2004, Griffith et al. 1998, Keys et al. 1995, Somers et al. 1986, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723170#references

Description Author: M. Pyne, R. Evans, C. Nordman

Version: 05 Jul 2006

Concept Author: M. Pyne, R. Evans, C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

PANHANDLE FLORIDA LIMESTONE GLADE (CES203.534)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: ESLF 5422

CONCEPT

Summary: This small-patch limestone glade system is endemic to the Panhandle of Florida (primarily Jackson County). It includes a range of limestone outcrops on hillsides and hill crests where soils are either non-existent or only shallowly present (FNAI 1990).

Related Concepts:

- Upland Glade (FNAI 1990) Equivalent

MEMBERSHIP

Associations:

- *Aquilegia canadensis* - *Asplenium heterochroum* - *Polymnia laevigata* - *Urtica chamaedryoides* Herbaceous Vegetation (CEGL004268, G1?)

Alliances:

- *Aquilegia canadensis* - *Asplenium (heterochroum, X heteroresiliens)* Herbaceous Alliance (A.1615)

DISTRIBUTION

Range: Endemic to the Panhandle of Florida (primarily Jackson County).

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:?, 99:C

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, FNAI 1990, Hardin pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723068#references

Description Author: R. Evans

Version: 06 Feb 2003

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH-CENTRAL SALINE GLADE (CES203.291)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Very Shallow Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: ESLF 5418

CONCEPT

Summary: This system occurs in portions of the Coastal Plain west of the Mississippi River on soils with high saline content, which in the most extreme examples are generally not conducive to woody plant growth. Thus, the vegetation forms a mosaic primarily consisting of open herbaceous or shrubby plant communities. This type is most common, and best documented in Arkansas and western Louisiana, but also occurs in eastern Texas. At least one high-ranked plant species, *Geocarpon minimum*, occurs in this system. In Arkansas, the forested examples of this system are called "Alkali Post Oak Flat," and the herbaceous examples are called "Alkali Wet Prairie" (Arkansas Multi-Agency Wetland Planning Team 2001).

DESCRIPTION

Environment: This system occurs on soils with high saline content, which in the most extreme examples are generally not conducive to woody plant growth. The soils on which this system is found have high pH and high levels of sodium or magnesium salts in or near the surface layer. They typically have very poor drainage and a shallow hardpan. The combination of impeded drainage and unusual soil chemistry restricts the potential plant communities and provides habitat for certain rare species. The forested community apparently occurs on soils with deeper hardpans than the prairie communities. Most sites with alkali soils are believed to be former (Pleistocene) lakebeds (Arkansas Multi-Agency Wetland Planning Team 2001).

Vegetation: Some characteristic plants in examples of this system include (in stands with trees) *Quercus stellata*, *Quercus marilandica*, *Quercus similis*, as well as shrubs *Baccharis halimifolia*, *Crataegus berberifolia*, *Iva angustifolia*; grasses and graminoids include *Aristida dichotoma*, *Aristida longispica*, *Aristida oligantha*, *Aristida purpurascens*, *Distichlis spicata*, *Eleocharis* spp., *Fimbristylis* spp., *Juncus* spp., *Muhlenbergia capillaris*, *Schoenoplectus* spp., *Schizachyrium scoparium*, *Tridens strictus*, and forbs *Krigia occidentalis*, *Houstonia rosea*, *Ambrosia artemisiifolia*, *Diodia teres*, *Euthamia leptoccephala*, and *Bigelovia nuttallii*.

MEMBERSHIP

Associations:

- *Aristida (longispica, purpurascens, oligantha) - Krigia occidentalis - Ambrosia artemisiifolia* Xero-Hydric Saline Soil Prairie [Provisional] (CEGL007979, GNR)
- *Aristida longispica - Schizachyrium scoparium - Diodia teres* Saline Herbaceous Vegetation (CEGL008419, G1G2)
- *Baccharis halimifolia - Crataegus berberifolia / Eleocharis sp. - Tridens strictus - Euthamia leptoccephala* Shrubland (CEGL003904, G1)
- *Bigelovia nuttallii - Aristida dichotoma - Houstonia rosea / Cladonia* spp. Herbaceous Vegetation (CEGL004274, G1)
- *Eleocharis sp. - Iva angustifolia - Distichlis spicata* Herbaceous Vegetation (CEGL004171, G1)
- *Eleocharis* spp. - *Schoenoplectus* spp. - *Fimbristylis* spp. - *Juncus* spp. Southeastern Coastal Plain Inland Salt Flat Sparse Vegetation (CEGL007803, G1?)
- *Muhlenbergia capillaris* Herbaceous Vegetation (CEGL004607, G1G2)
- *Quercus stellata - Quercus similis - Quercus marilandica* Saline Woodland (CEGL008418, G2G3)

Alliances:

- (*Quercus stellata, Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Baccharis halimifolia* Saturated Shrubland Alliance (A.1015)
- *Bigelovia nuttallii* Herbaceous Alliance (A.1617)
- *Eleocharis* sp. - *Iva angustifolia* Saturated Herbaceous Alliance (A.1459)
- *Eleocharis* spp. - *Schoenoplectus* spp. - *Fimbristylis* spp. - *Juncus* spp. Temporarily Flooded Sparsely Vegetated Alliance (A.1924)
- *Muhlenbergia capillaris* Herbaceous Alliance (A.1216)
- *Quercus stellata - Quercus marilandica* Woodland Alliance (A.625)

DISTRIBUTION

Range: This system is found in isolated areas of the Upper West and West Gulf Coastal Plain ecoregions, and along the boundary of the Gulf Coast Prairies and Marshes. It is also known from the Mississippi River Alluvial Plain (T. Foti pers. comm. 2005). It does not occur in Oklahoma.

Divisions: 203:C

Nations: US

Subnations: AR, LA, TX

Map Zones: 36:?, 37:C, 44:C, 45:C

TNC Ecoregions: 31:C, 39:C, 40:C, 41:C, 42:C

SOURCES

References: Arkansas Multi-Agency Wetland Planning Team 2001, Comer et al. 2003, Foti pers. comm., Pittman 1988

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723197#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Jun 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN AND CENTRAL APPALACHIAN MAFIC GLADE AND BARRENS (CES202.348)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades; Shallow Soil

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: ESLF 5415

CONCEPT

Summary: This southern and central Appalachian system consists of vegetation associated with shallow soils over predominantly mafic bedrock, usually with significant areas of rock outcrop. Bedrock includes a variety of igneous and metamorphic rock types such as greenstone and amphibolite. These areas support a patchy mosaic of open woodland and grassy herbaceous vegetation sometimes with a predominant woody short-shrub community present.

Classification Comments: These glades and barrens are intermediate between other rock outcrop and forest systems, with less dense vegetation than the closed forests supported by the region's climate but with more vegetation than bare rock cover. They may grade very gradually into both kinds of systems. Systems of similar physiognomy and setting but on acidic substrates are generally included in Central Appalachian Pine-Oak Rocky Woodland (CES202.600).

Similar Ecological Systems:

- Appalachian Shale Barrens (CES202.598)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Glade and Barrens (CES202.328)

DESCRIPTION

Environment: Occurs on upper to mid slopes, usually on gentle to moderate slopes but occasionally steeper. The ground is mostly shallow soil over bedrock, usually with significant areas of rock outcrop. The rock usually has few fractures but may have a pitted or irregular surface. This rock structure supports more extensive and deeper soil development than in Southern Appalachian Granitic Dome (CES202.297), but has few of the crevices and deeper rooting sites available in Southern Appalachian Rocky Summit (CES202.327). Micro-scale soil depth and presence of seepage are important factors in determining the vegetation patterns. Shallow soil, unable to support a closed tree canopy, separates this system from forest systems. Bedrock includes a variety of igneous and metamorphic rock types. Some examples are on mafic substrates such as amphibolite, some are on felsic rock such as granitic gneiss but have flora that suggests a basic influence, and a few occur on felsic rocks and are clearly acidic. Rock or soil chemistry appears to be the most important factor affecting different associations on sites that have the physical structure to belong to this system. Elevation may also be an important factor causing variation.

Vegetation: Vegetation is a fine mosaic of different physiognomies, with open woodland and grassy herbaceous vegetation or short shrubs predominating. Some instances may have closed canopies of small trees or large shrubs, but no examples have large canopy trees with a closed canopy. Bare rock outcrops are usually present in a minority of the area. The canopy species are species tolerant of dry, shallow soils, most commonly *Quercus prinus*, *Pinus* spp., and *Juniperus virginiana*. Basic examples may also have *Carya glabra*, *Fraxinus americana*, and other species abundant. Shrubs may be dense, with species determined by soil chemistry. The herb layer is usually fairly dense and dominated by grasses, both in treeless areas and beneath open canopy. An abundant forb component is also usually present, especially in the more basic examples. The forbs include species characteristic of other rock outcrops and grassland species, with a smaller number of forest species present.

Dynamics: The dynamics of this system are not well known. The occurrence of the system appears to be primarily determined by site physical properties, with physical and chemical properties determining vegetational variation. Fire may be an important influence on vegetation, and may in the long run be important for keeping the vegetation structure open, though the patchy distribution of vegetation might limit fire intensity. Periodic drought and wind storms may also be an important factor limiting canopy density and stature. The shallow soil would make these sites particularly prone to all three. These glades do not appear to be undergoing the kind of cyclic succession that has been described for granitic domes, but some balance of soil accumulation and destruction may be occurring on a longer term or coarser scale. It is possible that the slightly irregular curved surface of some examples represents a late stage in the weathering of old exfoliation surfaces that once supported granitic domes, but most known examples are not spatially associated with existing granitic domes.

MEMBERSHIP

Associations:

- *Carya (glabra, alba)* - *Fraxinus americana* - (*Juniperus virginiana* var. *virginiana*) Woodland (CEGL003752, G2)
- *Carya glabra* - *Fraxinus americana* - *Quercus prinus* / *Ostrya virginiana* / *Philadelphus hirsutus* Woodland (CEGL004995, G2)
- *Diervilla lonicera* - *Solidago simplex* var. *randii* - *Deschampsia flexuosa* - *Hylotelephium telephoides* - *Saxifraga michauxii*

- Herbaceous Vegetation (CEGL008536, G1)
- *Fraxinus americana* - *Carya glabra* / *Muhlenbergia sobolifera* - *Helianthus divaricatus* - *Solidago ulmifolia* Woodland (CEGL003683, G2)
 - *Fraxinus americana* / *Physocarpus opulifolius* / *Carex pensylvanica* - *Allium cernuum* - (*Phacelia dubia*) Wooded Herbaceous Vegetation (CEGL008529, G2)
 - *Kalmia latifolia* / *Schizachyrium scoparium* / *Cladonia* spp. Shrub Herbaceous Vegetation (CEGL004238, G1)
 - *Photinia melanocarpa* - *Gaylussacia baccata* / *Carex pensylvanica* Shrubland (CEGL008508, G1?)
 - *Quercus stellata* / *Schizachyrium scoparium* - *Sorghastrum nutans* - *Pycnanthemum tenuifolium* - *Packera paupercula* Wooded Herbaceous Vegetation (CEGL006215, G1)
 - *Schizachyrium scoparium* - *Sorghastrum nutans* - *Aletris farinosa* - *Packera paupercula* Herbaceous Vegetation (CEGL004999, G1)
 - *Selaginella rupestris* - *Croton willdenowii* - *Cheilanthes tomentosa* - (*Allium cuthbertii*) Herbaceous Vegetation (CEGL004992, G1)
 - *Selaginella rupestris* - *Schizachyrium scoparium* - *Hylotelephium telephioides* - *Allium cernuum* Herbaceous Vegetation (CEGL004991, G2)

Alliances:

- (*Fraxinus americana*, *Juniperus virginiana*) / *Carex pensylvanica* - *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.3014)
- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Kalmia latifolia* - *Gaylussacia baccata* Shrubland Alliance (A.1050)
- *Saxifraga michauxii* Herbaceous Alliance (A.1621)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)
- *Schizachyrium scoparium* Shrub Herbaceous Alliance (A.1520)
- *Selaginella (tortipila, rupestris)* Herbaceous Alliance (A.1985)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering a few acres.

Size: Most examples naturally cover a few acres, with a few examples up to 10 or more acres.

Adjacent Ecological Systems:

- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Oak Forest (CES202.886)
- Southern Appalachian Rocky Summit (CES202.327)

Adjacent Ecological System Comments: This system is surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Appalachian Oak Forest (CES202.886). It is rarely associated with Southern Appalachian Granitic Dome (CES202.297) or Southern Appalachian Rocky Summit (CES202.327).

DISTRIBUTION

Range: This system occurs scattered in clusters in the Southern Blue Ridge and adjacent portions of the upper Piedmont and central Appalachians.

Divisions: 202:C

Nations: US

Subnations: GA?, MD, NC, PA, SC?, TN, VA

Map Zones: 54:C, 57:C, 59:C, 61:C

USFS Ecomap Regions: 221D:CC, M221D:CC

TNC Ecoregions: 51:C, 52:C, 59:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723162#references

Description Author: M. Schafale, R. Evans, M. Pyne, S.C. Gawler

Version: 11 Oct 2004

Concept Author: M. Schafale, R. Evans, M. Pyne, S.C. Gawler

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN PIEDMONT GLADE AND BARRENS (CES202.328)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades

FGDC Crosswalk: Vegetated, Tree-dominated, Sparse tree canopy, Mixed evergreen-deciduous sparse tree canopy

National Mapping Codes: ESLF 5412

CONCEPT

Summary: This system of the southern Piedmont consists of gently to moderately sloping complexes of mostly shallow soil over bedrock, usually with significant areas of exposed rock evident. Bedrock potentially includes a variety of igneous and metamorphic rock types, including shale. Examples support open vegetation of patchy, mixed physiognomy with a significant woody component. Shallow soils which impede tree growth, help distinguish this system from forest systems of the Piedmont. This system is structurally intermediate between other rock outcrop systems and forest systems.

Classification Comments: The southern Piedmont as defined here consists of TNC Ecoregion 52 (ECOMAP 231A, EPA 45), but within this region, this system is not expected to occur north of about the James River in Virginia. This system is intermediate between other rock outcrops and forest systems, with less dense vegetation than the closed forests supported by the region's climate but with more vegetation than bare rock cover. They may grade very gradually into both kinds of systems. They are analogous to Southern and Central Appalachian Mafic Glade and Barrens (CES202.348), but are distinguished by their climate, flora, and landscape setting. Southern and Central Appalachian Mafic Glade and Barrens (CES202.348) occurs in the hilly upper Piedmont, whereas this system is confined to the eastern and central Piedmont.

This system represents a collection of several different kinds of communities related primarily by structure, and could be further subdivided. The rare diabase glades are flat and have a very distinctive flora. The examples on meta-mudstone are less well known. Other kinds may occur.

Similar Ecological Systems:

- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)

DESCRIPTION

Environment: This system occurs on upper to midslopes, usually on moderate slopes but occasionally flat. The ground is mostly shallow soil over bedrock, usually with significant areas of rock outcrop. The rock usually has few fractures but may have a pitted or irregular surface. This rock structure supports more extensive and deeper soil development than in Southern Piedmont Granite Flatrock and Outcrop (CES202.329) or Southern Piedmont Cliff (CES202.386), but has few of the crevices and deeper rooting sites available in Southern Appalachian Rocky Summit (CES202.327). Micro-scale soil depth and presence of seepage are important factors in determining the vegetation patterns. Shallow soil, unable to support a closed tree canopy, separates this system from forest systems. Bedrock potentially includes a variety of igneous and metamorphic rock types. Rock or soil chemistry appears to be the most important factor affecting different associations on sites that have the physical structure to belong to this system.

Vegetation: Vegetation is a fine mosaic of different physiognomies, with open woodland and grassy herbaceous vegetation or short shrubs predominating. Bare rock outcrops are usually present in a minority of the area. The canopy species are species tolerant of dry, shallow soils, most commonly *Juniperus virginiana* and various oaks and pines, but also including *Fraxinus americana*, *Ulmus alata*, and *Cercis canadensis* on basic examples. Shrubs may be dense, with species determined by soil chemistry. The herb layer is usually fairly dense and may be dominated by grasses or by a mix of grasses and forbs, both in treeless areas and beneath open canopy. The forbs include species characteristic of other rock outcrops and grassland species, with a smaller number of forest species present. Plant species richness may be fairly high in communities of this system.

Dynamics: The dynamics of this system are not well known. The occurrence of the system appears to be primarily determined by site physical properties, with physical and chemical properties determining vegetational variation. Fire may be an important influence on vegetation, and may in the long run be important for keeping the vegetation structure open, though the patchy distribution of vegetation might limit fire intensity. It is possible that fire would have allowed glade structure and vegetation to extend onto slightly deeper soils and therefore allowed for more extensive glades. Periodic drought and wind storms may also be an important factor limiting canopy density and stature. The shallow soil would make these sites particularly prone to all three. These glades do not appear to be undergoing the kind of cyclic succession that has been described for granitic flatrocks, but some balance of soil accumulation and destruction may be occurring on a longer term or coarser scale.

MEMBERSHIP

Associations:

- *Fraxinus americana* - *Carya glabra* / *Symphoricarpos orbiculatus* - *Rhus aromatica* / *Piptochaetium avenaceum* Woodland

(CEGL003684, G2)

- *Juniperus virginiana* - *Celtis tenuifolia* - *Quercus (prinus, stellata)* / *Sporobolus compositus* - *Talinum teretifolium* - *Tragia urticifolia* Wooded Herbaceous Vegetation (CEGL008485, G1)
- *Juniperus virginiana* var. *virginiana* - *Celtis tenuifolia* - *Cercis canadensis* / *Sporobolus clandestinus* - *Danthonia sericea* Woodland (CEGL008499, G2G3Q)
- *Juniperus virginiana* var. *virginiana* - *Ulmus alata* / *Schizachyrium scoparium* Woodland (CEGL004443, G2?)
- *Pinus echinata* - *Pinus virginiana* / *Rhododendron minus* - *Kalmia latifolia* Woodland (CEGL003563, G1)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* / *Andropogon gyrans* - *Chrysopsis mariana* Woodland (CEGL004447, G1?)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Pinus echinata* - *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.680)
- *Pinus echinata* Woodland Alliance (A.515)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering no more than a couple of acres.

Size: Most examples naturally cover a few acres at most, with some less than one acre.

Adjacent Ecological Systems:

- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)
- Southern Piedmont Mesic Forest (CES202.342)

Adjacent Ecological System Comments: Surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Piedmont Dry Oak-(Pine) Forest (CES202.339).

DISTRIBUTION

Range: This system is found scattered in clusters in the southern Piedmont, possibly extending north to about the James River in Virginia. However, the overall distribution in this region is not well-known.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA?

Map Zones: 54:C, 59:C, 61:P

TNC Ecoregions: 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723175#references

Description Author: M. Schafale and R. Evans

Version: 12 Dec 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN RIDGE AND VALLEY CALCAREOUS GLADE AND WOODLAND (CES202.024)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Steppe/Savanna

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Woody-Herbaceous; Rock Outcrops/Barrens/Glades

National Mapping Codes: ESLF 5464

CONCEPT

Summary: This system consists of open glades and surrounding woodlands on shallow, high pH, rich soils of the Ridge and Valley region from Virginia southward. These glades occur in broad valley bottoms, rolling basins, and adjacent slopes where soils are shallow over flat-lying limestone strata. The flat to rolling terrain and locally xeric soils may have been especially susceptible to periodic fires that helped maintain the prairie-like openings and savanna-like woodlands. Today, much of the system is currently somewhat more closed and brushy, suggesting fire suppression. *Quercus muehlenbergii* (chinquapin oak) is typical where there is canopy.

Classification Comments: This system formerly embodied a narrower concept, being restricted to glades of "valley bottoms," and thereby, at least by implication, not those of slopes. The current concept includes glades in the southern Ridge and Valley on a variety of landforms and slope positions, as they are all sufficiently similar in floristic components and ecological processes to be grouped together. These processes and factors include erosional processes, zonal vegetation patterns, and general ecological dynamics.

Similar Ecological Systems:

- Central Appalachian Alkaline Glade and Woodland (CES202.602)--of central Appalachians, mainly Virginia and north.
- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)--is related, generally to the west in the Interior Low Plateau.
- Southern Ridge and Valley / Cumberland Dry Calcareous Forest (CES202.457)--is a more closed-canopy system with a similar range.

Related Concepts:

- Limestone and Dolomite Barrens (Fleming et al. 2005) Undetermined

DESCRIPTION

Environment: Examples occur on shallow, high pH soils, in broad valley bottoms, rolling basins, and adjacent slopes over limestone strata.

Vegetation: The vegetation of typical examples could range from open woodlands of *Quercus muehlenbergii* and *Juniperus virginiana*, with interspersed grasslands dominated by perennial *Schizachyrium scoparium*, to patches dominated by annual grasses such as varieties of *Sporobolus vaginiflorus* (e.g., var. *ozarkanus*, var. *vaginiflorus*). Some other trees that may occur in stands include *Quercus falcata*, *Quercus shumardii*, *Quercus stellata*, as well as the understory woody plants *Cercis canadensis*, *Salix humilis*, and *Viburnum rufidulum*. Some characteristic herbs include *Eryngium yuccifolium*, *Manfreda virginica*, and *Hypericum dolabriforme*.

MEMBERSHIP

Associations:

- *Quercus muehlenbergii* - *Juniperus virginiana* / *Schizachyrium scoparium* - *Manfreda virginica* Wooded Herbaceous Vegetation (CEGL005131, G2G3)
- *Quercus muehlenbergii* - *Quercus (falcata, shumardii, stellata)* / *Cercis canadensis* / *Viburnum rufidulum* Forest (CEGL007699, G3)
- *Quercus muehlenbergii* / *Salix humilis* / *Eryngium yuccifolium* Woodland (CEGL006239, G1Q)
- *Sporobolus vaginiflorus* (var. *ozarkanus*, var. *vaginiflorus*) - *Hypericum dolabriforme* Herbaceous Vegetation (CEGL004339, G2G3)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Quercus muehlenbergii* Woodland Alliance (A.621)
- *Sporobolus (neglectus, vaginiflorus)* Herbaceous Alliance (A.1815)

DISTRIBUTION

Range: According to Gary Fleming, this type may be restricted to the Southern Ridge and Valley section of Keys et al. (1995). The range needs review and reconciliation with Central Appalachian Alkaline Glade and Woodland (CES202.602), which occurs to the north.

Divisions: 202:C

Nations: US

Subnations: GA, TN, VA

Map Zones: 48:C, 53:C, 57:C, 61:?
TNC Ecoregions: 50:C, 59:?

SOURCES

References: Comer et al. 2003, Keys et al. 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722681#references

Description Author: M. Pyne, G. Fleming, R. Evans

Version: 09 Feb 2007

Concept Author: M. Pyne, G. Fleming, R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

UPLAND GRASSLAND AND HERBACEOUS

1413 BLUEGRASS SAVANNA AND WOODLAND (CES202.888)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Deep Soil; Very Short Disturbance Interval; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2413; ESLF 7126; ESP 1413

CONCEPT

Summary: This system represents deep soil savannas and woodlands of the Inner Bluegrass Basin of Kentucky (Ecoregion 711 and "S. Fork Licking River arm" of Ecoregion 71d of EPA (2004) and Woods et al. (2002)). Only remnants or stands in restoration remain. The understory is composed of cool-season grasses, as far as known (e.g., *Elymus*, *Dichanthelium*) with *Arundinaria gigantea* (extensive canebrakes). Settlers referred to a "buffalo grass" of unknown identity (possibly *Dichanthelium clandestinum* or *Dichanthelium scoparium*). The fire regime is unknown. Characteristic remnant trees (e.g., *Fraxinus quadrangulata*, *Quercus macrocarpa*) are fire-tolerant.

Classification Comments: This system may, in part, be related to mesic woodland variants of Central Interior Highlands Calcareous Glade and Barrens (CES202.691). The mesic barrens and woodlands in the Interior Low Plateau have all but disappeared from the landscape, making regional assessments difficult. For information elsewhere on mesic barrens/woodlands in the Interior Highlands, see description for *Quercus stellata* - *Quercus alba* - (*Quercus falcata*) / *Schizachyrium scoparium* Woodland (CEGL004217).

Similar Ecological Systems:

- Central Interior Highlands Calcareous Glade and Barrens (CES202.691)

Related Concepts:

- Bluegrass Mesophytic Cane Forest (Evans 1991) Finer
- Bluegrass Savanna-Woodland (Evans 1991) Finer

DESCRIPTION

Environment: These savannas or woodlands occur on deep fertile soils of the Inner Bluegrass Basin of Kentucky (Ecoregion 711 and "S. Fork Licking River arm" of Ecoregion 71d of EPA (2004) and Woods et al. (2002)).

Vegetation: The understory is composed of cool-season grasses, as far as known (e.g., *Elymus*, *Dichanthelium*) with *Arundinaria gigantea* (extensive canebrakes). Settlers referred to a "buffalo grass" of unknown identity (possibly *Dichanthelium clandestinum* or *Dichanthelium scoparium*).

Dynamics: The fire regime is unknown. Characteristic remnant trees (e.g., *Fraxinus quadrangulata*, *Quercus macrocarpa*) are fire-tolerant.

MEMBERSHIP

Associations:

- *Acer (nigrum, saccharum)* - *Carya cordiformis* Forest (CEGL004411, G1)
- *Fraxinus quadrangulata* - *Quercus macrocarpa* - *Quercus muehlenbergii* / *Arundinaria gigantea* ssp. *gigantea* / *Elymus* spp. Woodland (CEGL004436, G1)
- *Juglans nigra* - *Aesculus glabra* var. *glabra* - *Gymnocladus dioica* / *Arundinaria gigantea* ssp. *gigantea* - (*Asimina triloba*) Forest (CEGL004437, G1)
- *Juglans nigra* - *Celtis occidentalis* Forest (CEGL004693, GNA)

Alliances:

- *Fraxinus quadrangulata* - *Quercus macrocarpa* - *Quercus muehlenbergii* Woodland Alliance (A.605)
- *Juglans nigra* - *Aesculus glabra* - *Celtis (laevigata, occidentalis)* Forest Alliance (A.232)
- *Quercus rubra* - (*Acer saccharum*) Forest Alliance (A.251)

DISTRIBUTION

Range: This system is restricted to the Inner Bluegrass Basin of Kentucky. Only remnants or stands in restoration remain.

Divisions: 202:C

Nations: US

Subnations: KY

Map Zones: 47:C

TNC Ecoregions: 44:C

SOURCES

References: Comer et al. 2003, EPA 2004, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722790#references

Description Author: M. Pyne and R. Evans

Version: 17 Apr 2006

Concept Author: M. Pyne and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CUMBERLAND WET-MESIC MEADOW AND SAVANNA (CES202.053)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 7165

CONCEPT

Summary: This system consists of open, prairie-like vegetation of the undissected portions of the Cumberland Plateau of Kentucky and adjacent Tennessee (Ecoregion 68a [Cumberland Plateau] of Griffith et al. (1998) and Woods et al. (2002); part of Subsection 221Hc of Keys et al. (1995)). Stands are dominated by grasses and forbs with scattered shrubby vegetation and, occasionally, trees. The scattered trees are mainly *Quercus bicolor*, *Quercus falcata*, *Quercus palustris*, *Nyssa sylvatica*, *Liquidambar styraciflua*, and *Acer rubrum* var. *trilobum* (Braun 1937). The primary dominant grass in the wetter phase is *Chasmanthium laxum* (Braun 1937). This vegetation was the predominant type here in the early 1800s and earlier and probably was maintained from burning by Native Americans.

Similar Ecological Systems:

- Eastern Highland Rim Prairie and Barrens (CES202.354)
- North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)
- Pennyroyal Karst Plain Prairie and Barrens (CES202.355)
- Western Highland Rim Prairie and Barrens (CES202.352)

DESCRIPTION

Environment: This system is found in an open, flat to gently rolling landscape which easily carries fire if maintained in a grassy condition.

Vegetation: Common grasses include *Andropogon glomeratus*, *Calamagrostis coarctata* (= *Calamagrostis cinnoides*) (southern), *Dichanthelium sphaerocarpon* var. *isophyllum* (= *Panicum polyanthes*), and *Dichanthelium scoparium* (= *Panicum scoparium*), plus, in drier transitions, *Panicum anceps*, *Schizachyrium scoparium*, *Sorghastrum nutans*, and locally *Andropogon gerardii*. Sedges are common, especially *Carex atlantica* (with var. *capillacea*), *Carex debilis* (with vars.), *Carex lurida* (with var. *gracilis*), *Rhynchospora capitellata*, *Rhynchospora glomerata*, *Scirpus cyperinus*, *Scirpus polyphyllus*, etc. Rushes are also common, especially *Juncus canadensis* and *Juncus marginatus* on drier sites (?); *Juncus effusus* (with var. *pylaei*) and *Juncus coriaceus* on wetter sites (?). Common ferns are *Lygodium palmatum*, *Thelypteris noveboracensis* and, in wetter places, *Athyrium filix-femina* ssp. *asplenioides* (= *Athyrium asplenioides*) and *Osmunda cinnamomea*. The most abundant herbs often include *Eupatorium fistulosum* and *Solidago rugosa*. Other typical species include *Agalinis purpurea*, *Aletris farinosa*, *Apios americana*, *Symphotrichum dumosum* (= *Aster dumosus*), *Doellingeria umbellata* (= *Aster umbellatus*), *Eupatorium pilosum*, *Eupatorium rotundifolium*, *Eupatorium perfoliatum* (richer soil?), *Linum striatum*, *Lobelia puberula*, *Lycopus virginicus*, *Platanthera ciliaris* (often in drier sites), *Potentilla simplex*, *Rhexia mariana* (less *Rhexia virginica*), *Viola primulifolia*, and *Vernonia noveboracensis* (southern). The subshrubby vine *Rubus hispidus* is also common. Regionally rare species (mostly increasing to the south) include *Bartonia paniculata*, *Gratiola pilosa*, *Helianthus angustifolius*, *Hypericum crux-andreae*, *Lobelia nuttallii*, *Dichanthelium dichotomum* var. *ensifolium* (= *Panicum ensifolium*), *Panicum rigidulum* var. *pubescens* (= *Panicum longifolium*) (locally abundant on finer soils), *Platanthera cristata* (typically in boggy forest transitions), *Polygala cruciata*, *Pycnanthemum verticillatum*?, *Rhynchospora globularis*, *Sabatia campanulata*?, *Stenanthium gramineum*, *Xyris torta*, etc. The most abundant woody species include *Acer rubrum* var. *trilobum* and *Rhus copallinum*; others include *Alnus serrulata*, *Photinia* spp. (*Photinia pyrifolia* (= *Aronia arbutifolia*), *Photinia melanocarpa* (= *Aronia melanocarpa*)), *Ilex opaca*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Lyonia ligustrina*, *Nyssa sylvatica*, *Oxydendrum arboreum*, *Pinus echinata*, *Quercus alba*, *Rhododendron* sp. (*Rhododendron cumberlandense*? (= *Rhododendron bakeri*?)), *Rubus* spp. (*Arguti* group), *Salix* spp. (*Salix humilis*, *Salix nigra*, *Salix sericea*), *Spiraea tomentosa* (local on finer textured soil?), and *Smilax glauca* (J. Campbell unpubl. data).

MEMBERSHIP

Associations:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Kentucky Herbaceous Vegetation (CEGL004677, G1G2)

Alliances:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)

DISTRIBUTION

Range: This system is found in the Cumberland Plateau of Kentucky and adjacent Tennessee.

Divisions: 202:C

Nations: US

Subnations: KY, TN

Map Zones: 47:C
TNC Ecoregions: 50:C

SOURCES

References: Braun 1937, Campbell pers. comm., Griffith et al. 1998, Keys et al. 1995, Southeastern Ecology Working Group n.d., Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.792682#references

Description Author: M. Pyne, M. Evans, C. Nordman

Version: 17 Apr 2006

Concept Author: M. Pyne, M. Evans, C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1430 EAST GULF COASTAL PLAIN BLACK BELT CALCAREOUS PRAIRIE AND WOODLAND (CES203.478)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Graminoid

Non-Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2430; ESLF 7143; ESP 1430

CONCEPT

Summary: This system includes natural grassland vegetation and associated wooded vegetation in a relatively small natural region (approximately 480 km (300 miles) long and 40-50 km (25-30 miles) wide) of Mississippi and Alabama extending north to a small part of southern Tennessee (Black Belt Subsection 231Ba of Keys et al. 1995; Blackland Prairie Ecoregion 65a of Griffith et al. 2001) and east into a limited portion of Georgia. This region, which generally derives its name from the nearly black, rich topsoil that developed over Selma Chalk, has long been noted as a distinct topographic region in the state of Mississippi (Lowe 1921). In Alabama, the formations on which this system primarily occurs are the Demopolis Chalk and the Mooreville Chalk (members of the Selma Group). In Tennessee, only Demopolis Chalk is mapped (Hardeman 1966). Examples occur over relatively deep soils (as opposed to "glades and barrens"), with circumneutral surface soil pH. Vegetation of this ecological system includes evergreen *Juniperus virginiana*-dominated forests and deciduous *Quercus*-dominated woodlands of varying densities, interspersed with native prairie-like grasslands. Much of the natural vegetation of the region has been converted to pasture and agricultural uses, but even old-field vegetation reflects the distinctive composition of the flora and ecological dynamics. In most cases individual prairie openings are small and isolated from one another, but were formerly more extensive prior to European settlement, forming a mosaic of grasslands and woodlands under frequent fire regimes. The flora has much in common with other prairies of the East Gulf Coastal Plains as well as the classic Midwestern prairies. Within this natural region, there are pockets of acidic soils which produce more typical pine-oak woodland or forest vegetation.

Classification Comments: "Blackland Prairies" occur in two discrete areas of the East Gulf Coastal Plain, the Jackson Prairie and the Black Belt. Of the approximately 100,000 acres of Blackland Prairies mapped during the general land surveys of the early and mid 1800s in Mississippi, probably less than 500 acres of prairie vegetation exists today, even if one considers grazed areas and vacant agricultural lands with a semblance of prairie species (R. Wieland pers. comm.). Almost all of the lands were converted to agriculture. Some of the lands are now reverting back to prairie after being abandoned. More recently, lands are being converted to fescue pasture; other abandoned lands have become cedar glades. The number of acres in good condition is probably less than 100.

DESCRIPTION

Environment: This system generally occurs on Cretaceous age chalk, marl and calcareous clay. This includes calcareous soils of the Sumter, Binnsville, and Demopolis series, described as beds of marly clay over Selma Chalk (including the Demopolis and Mooreville formations). The area has an average annual precipitation of 130-140 cm and a frost-free period of 200-250 days.

Vegetation: Vegetation of this ecological system includes evergreen *Juniperus virginiana*-dominated forests and deciduous *Quercus*-dominated woodlands of varying densities, interspersed with native prairie-like grasslands. Much of the natural vegetation of the region has been converted to pasture and agricultural uses, but even old-field vegetation reflects the distinctive composition of the flora and ecological dynamics. The oak woodlands typically contain *Quercus stellata*, *Quercus muehlenbergii*, and *Quercus marilandica*. Other woody components include *Quercus falcata*, *Carya alba*, *Carya glabra*, *Fraxinus americana*, *Celtis laevigata*, *Cercis canadensis* var. *canadensis*, *Crataegus engelmannii*, *Diospyros virginiana*, *Ilex decidua*, *Prunus angustifolia*, *Frangula caroliniana*, *Sideroxylon lycioides*, and *Ulmus alata*. Prairie forbs and grasses may persist in small openings and in edge situations in the more heavily forested areas. The presence of *Juniperus virginiana*-dominated zones may represent invasion by this species in the absence of sufficiently frequent or intense fire (DeSelm and Murdock 1993). Pines are generally absent, being inhibited by the higher surface soil pH. In the grass-dominated areas, *Schizachyrium scoparium* and *Sorghastrum nutans* are the principal herbs. Other herbaceous taxa include *Andropogon glomeratus*, *Andropogon virginicus*, *Bouteloua curtipendula*, *Panicum virgatum*, and *Schizachyrium scoparium*, with lesser amounts of *Paspalum floridanum*, *Setaria parviflora*, and *Sporobolus indicus* (exotic). Other common species include *Arnoglossum plantagineum*, *Symphyotrichum dumosum* (= *Aster dumosus*), *Symphyotrichum patens* (= *Aster patens*), *Crotalaria sagittalis*, *Dalea candida*, *Dalea purpurea*, *Desmanthus illinoensis*, *Desmodium ciliare*, *Dracopis amplexicaulis*, *Liatris aspera*, *Liatris squarrosa*, *Liatris squarrolosa*, *Neptunia lutea*, *Ratibida pinnata*, *Ruellia humilis*, *Silphium terebinthinaceum*, *Silphium trifoliatum* var. *latifolium*, and *Solidago nemoralis*. In depressions and drainages, *Andropogon gerardii* and/or *Panicum virgatum* will have greater importance (DeSelm and Murdock 1993). At this more mesic end of the continuum, invasion by woody plants is a more serious threat to the system. Moist, seepy inclusions within this system are often dominated by *Rhynchospora colorata* and *Scleria verticillata*; *Rhynchospora divergens*, *Lythrum alatum* var. *lanceolatum*, *Mitreola petiolata*, and *Mecardonia acuminata* also occur but much less frequently (A. Schotz pers. comm.).

Dynamics: In the presettlement landscape and throughout the nineteenth century, a combination of fire and grazing (first by native

ungulates and then by free-ranging cattle) kept these sites open and grass-dominated. The Black Belt was one of the South's most important agricultural areas before the American Civil War (Smith 1911). A long history of cultivation and disturbance has left few large, intact prairies remaining. With range enclosure and fire suppression increasing during the twentieth century, the dynamics of the landscape changed, and the coverage of fire-intolerant woody species increased. The formerly extensive system is now reduced to patches or its flora persists in pastures which are under more continuous grazing pressure than the former processes would have allowed. This has probably led to more uniformity of the vegetation and would favor some taxa over others. More study is needed.

MEMBERSHIP

Associations:

- *Juniperus virginiana* var. *virginiana* - (*Celtis laevigata*, *Prunus angustifolia*, *Sideroxylon lycioides*) Woodland (CEGL007747, G2)
- *Quercus stellata* - *Quercus muehlenbergii* / *Schizachyrium scoparium* - *Sorghastrum nutans* Black Belt Woodland (CEGL004670, G2G3)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Dalea candida* - *Liatris squarrosa* - (*Silphium terebinthinaceum*) Black Belt Herbaceous Vegetation (CEGL004664, G1)

Alliances:

- *Juniperus virginiana* Woodland Alliance (A.545)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is primarily restricted to the Black Belt (Subsection 231Ba) (Keys et al. 1995) or Blackland Prairie area (Ecoregion 65a) (Griffith et al. 2001). This region is primarily in Alabama and Mississippi, ranging north in a depauperate form to southern Tennessee (McNairy County), and east into limited parts of Georgia. There are also outlying occurrences southwards in the Chunnenugee Hills and Red Hills (both of these parts of the Southern Hilly Coastal Plain - Ecoregion 65d), and Buhrstone/Lime Hills (Ecoregion 65q) of southern Alabama (in Washington, Wilcox, Monroe, and Clark counties). There are some limited examples in Ecoregion 65i (Fall Line Hills; e.g. Jones Bluff in Alabama) Apparently related vegetation in the Fort Valley Plateau of Houston and Bleckley(?) counties in the South Atlantic Coastal Plain of Georgia is not included here.

Divisions: 203:C

Nations: US

Subnations: AL, GA, MS, TN

Map Zones: 46:C

TNC Ecoregions: 43:C

SOURCES

References: Comer et al. 2003, DeSelm and Murdock 1993, Griffith et al. 2001, Hardeman 1966, Keys et al. 1995, Lowe 1921

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723108#references

Description Author: A. Schotz, R. Evans, M. Pyne

Version: 17 Jan 2006

Concept Author: A. Schotz, R. Evans, M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1427 EAST GULF COASTAL PLAIN JACKSON PLAIN PRAIRIE AND BARRENS (CES203.353)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2427; ESLF 7140; ESP 1427

CONCEPT

Summary: This ecological system was locally dominant in the Jackson Purchase area of western Kentucky, extending into limited areas of adjacent Tennessee. This central region, called "the Barrens," has been historically subdivided from the rest of the Coastal Plain region of Kentucky (Davis 1923, Bryant and Martin 1988). A number of early reports mentioned extensive prairies in this region and also emphasized the importance of annual fires in maintaining these grasslands [see references in Bryant and Martin (1988)]. Interspersed among the extensive grasslands were likely scattered groves of oaks, especially those tolerant of frequent fires (M. Evans pers. comm.). Among the most frequent trees historically present in the entire region were *Quercus stellata*, *Quercus velutina*, and *Quercus marilandica* (Bryant and Martin 1988). With fire suppression, groves of trees rapidly expanded and largely replaced the prairies. In general, this system was found on "poorly consolidated Tertiary deposits" (Evans 1991), which are capped by loess, in the northern part of the Upper East Gulf ecoregion. High-quality examples would support a dense herbaceous layer dominated by tall grasses such as *Andropogon gerardii* and *Schizachyrium scoparium*, but the floristic composition of this type is poorly known since so few extant examples remain (M. Evans pers. comm.).

Classification Comments: The component associations of this system are poorly known since so few extant examples remain. The best remaining examples may be found in the West Kentucky Wildlife Management Area (M. Evans pers. comm.). This system extends, at least historically, into adjacent Henry County, TN, interpreted from the occurrence of several barrens plant species (M. Pyne pers. obs.). Related systems are known from Cretaceous gravels in the Western Highland Rim of Tennessee and from flat uplands of the Southeastern Highland Rim (this latter one includes wetter (xerohydric) barrens).

Similar Ecological Systems:

- Western Highland Rim Prairie and Barrens (CES202.352)

Related Concepts:

- Tallgrass Prairie (Evans 1991) Intersecting
- Wet Prairie (Evans 1991) Intersecting

DESCRIPTION

Environment: Soils are predominantly thin, well-drained, and gravelly. This system likely did not develop on the deeper loess soils of the region.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - (*Andropogon glomeratus*, *Panicum virgatum*, *Sorghastrum nutans*) Herbaceous Vegetation (CEGL007705, G2?)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Kentucky Herbaceous Vegetation (CEGL004677, G1G2)
- *Panicum virgatum* Seasonally Flooded Herbaceous Vegetation (CEGL004128, GNR)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* / *Schizachyrium scoparium* Woodland (CEGL002150, G2G3)
- *Quercus marilandica* / *Vaccinium arboreum* / *Danthonia spicata* Scrub Woodland (CEGL002425, G3G4)
- *Quercus stellata* - *Quercus alba* - (*Quercus falcata*) / *Schizachyrium scoparium* Woodland (CEGL004217, G1)
- *Quercus stellata* - *Quercus marilandica* - *Quercus velutina* - *Carya texana* / *Schizachyrium scoparium* Woodland (CEGL002149, G2G3)
- *Quercus stellata* - *Quercus marilandica* / *Schizachyrium scoparium* Wooded Herbaceous Vegetation (CEGL002391, G2G3)
- *Spartina pectinata* Western Kentucky Herbaceous Vegetation (CEGL004118, G1Q)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Panicum virgatum* Seasonally Flooded Herbaceous Alliance (A.1362)
- *Quercus alba* - *Quercus stellata* - *Quercus velutina* - (*Quercus falcata*) Woodland Alliance (A.613)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)

DISTRIBUTION

Range: This system occurs in the Jackson Purchase area of western Kentucky, extending into limited areas of adjacent Tennessee.

Divisions: 203:C

Nations: US

Subnations: KY, TN?

Map Zones: 47:C

TNC Ecoregions: 43:C

SOURCES

References: Bryant and Martin 1988, Comer et al. 2003, Davis 1923, Evans 1991

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723159#references

Description Author: R. Evans and M. Evans, mod. M. Pyne

Version: 18 Apr 2006

Concept Author: R. Evans and M. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1433 EAST GULF COASTAL PLAIN JACKSON PRAIRIE AND WOODLAND (CES203.555)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; Circumneutral Soil; Deep Soil; Clay Soil Texture

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2433; ESLF 7146; ESP 1433

CONCEPT

Summary: This Jackson Prairie system includes natural grassland vegetation and associated wooded vegetation in a relatively small natural region of Mississippi, the Jackson Hills Subsection (231Bj) (Keys et al. 1995) also called the Jackson Prairie Ecoregion (65r) of Omernik (EPA 2004). This system occurs on montmorillonitic Vertisols, which are deep, slowly permeable soils formed in residuum weathered from marl of chalk. Examples occur in a larger matrix of primarily acidic soils and of generally *Pinus taeda*-dominated forest vegetation. In most cases individual prairie openings are small and isolated from one another but were formerly more extensive prior to European settlement, forming a mosaic of grassland and woodland under frequent fire regimes. Much of the natural vegetation of the region has been converted to pasture and agricultural uses, with concomitant destruction of most prairie remnants. The flora has much in common with other prairies of the Mississippi Embayment as well as the classic Midwestern prairies.

Classification Comments: Much of the natural vegetation of the region has been converted to pasture and agricultural uses, with concomitant destruction of most prairie remnants (DeSelm and Murdock 1993). The flora has much in common with other prairies of the East Gulf Coastal Plains as well as the classic Midwestern prairies.

DESCRIPTION

Environment: The soils of these prairie openings are presently mapped as the Maytag Series, a fine montmorillonitic, thermic Entic Chromudert; this deep slowly permeable soil has formed in residuum weathered from marl of chalk of the Blackland Prairies (Wieland 1995). Examples occur in a larger matrix of primarily acidic soils, and of generally *Pinus taeda*-dominated forest vegetation (Jones 1971).

Vegetation: The most prominent tall grasses of this Mississippi blackland prairie system are *Andropogon gerardii*, *Schizachyrium scoparium*, *Sorghastrum nutans*, and *Panicum virgatum*. Additional tall grasses include *Tripsacum dactyloides*, *Andropogon glomeratus*, and *Paspalum floridanum*. Along with *Schizachyrium scoparium*, two other species provide over 50% cover in prairie openings; these are *Carex cherokeensis* and *Helenium autumnale*. Other plants closely affiliated with less disturbed prairie openings include *Dalea purpurea*, *Dalea candida*, *Sporobolus compositus* var. *macer*, *Muhlenbergia capillaris*, *Penstemon laxiflorus* (= *Penstemon australis* ssp. *laxiflorus*), *Symphytotrichum novae-angliae* (= *Aster novae-angliae*), *Echinacea purpurea*, *Manfreda virginica*, *Ruellia purshiana*, *Desmanthus illinoensis*, and *Spiranthes magnicamporum* (Wieland 1995). The higher surface soil pH would presumably inhibit the growth of pine trees.

MEMBERSHIP

Associations:

- *Andropogon virginicus* var. *virginicus* Herbaceous Vegetation (CEGL004044, GNA)
- *Crataegus crus-galli* - *Ilex decidua* - *Crataegus viridis* Shrubland (CEGL004532, GNR)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Dalea purpurea* - *Silphium integrifolium* Jackson Prairie Herbaceous Vegetation (CEGL004020, G1)

Alliances:

- *Andropogon virginicus* Herbaceous Alliance (A.1208)
- *Crataegus (crus-galli, marshallii)* Shrubland Alliance (A.899)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This Jackson Prairie system is found in a relatively small natural region of Mississippi (Jackson Hills Subsection 231Bj (Keys et al. 1995); Jackson Prairie Ecoregion 65r (EPA 2004)).

Divisions: 203:C

Nations: US

Subnations: MS

Map Zones: 46:C

TNC Ecoregions: 43:C, 53:?

SOURCES

References: Comer et al. 2003, DeSelm and Murdock 1993, EPA 2004, Johnson and Muller 1993a, Jones 1971, Keys et al. 1995, Tanner 1960, Wieland 1995

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723049#references

Description Author: R. Wieland, R. Evans, A. Schotz, M. Pyne

Version: 17 Jan 2006

Concept Author: R. Wieland, R. Evans, A. Schotz, M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

1417 EASTERN HIGHLAND RIM PRAIRIE AND BARRENS (CES202.354)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; Very Short Disturbance Interval; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2417; ESLF 7130; ESP 1417

CONCEPT

Summary: This system represents "The Barrens" of the Southeast Highland Rim of Tennessee. This is a distinctive part of the state and ecoregion (the "Dickson-Mountview-Guthrie" Soil Association of Elder and Springer 1978, Springer and Elder 1980). It includes a series of plant communities with open canopies, ranging from herbaceous-dominated barrens (some of which are maintained today by mowing instead of fire and grazing) through savanna and woodland types. Open ponds and other wetlands are scattered throughout the landscape. The variety of relatively open habitats which are present here include prairie-like areas, as well as savanna woodlands and upland depression ponds.

Classification Comments: Western Highland Rim Prairie and Barrens (CES202.352), Eastern Highland Rim Prairie and Barrens (CES202.354), Pennyroyal Karst Plain Prairie and Barrens (CES202.355), and Southern Ridge and Valley Patch Prairie (CES202.453) form a series of similar systems in the eastern Interior Highlands and adjacent Ridge and Valley.

Similar Ecological Systems:

- Cumberland Wet-Mesic Meadow and Savanna (CES202.053)
- Pennyroyal Karst Plain Prairie and Barrens (CES202.355)
- Southern Ridge and Valley Patch Prairie (CES202.453)
- Western Highland Rim Prairie and Barrens (CES202.352)

DESCRIPTION

Environment: These various barren communities occur on Fragiudult soils formed in Pleistocene loess over karstic Mississippian Limestone. Their topography is flat to gently sloping. Some proposed factors which have functioned to maintain their openness include the hardpan soils and fire (as well as natural and managed grazing, and modern anthropogenic factors such as mowing for hay, etc.). These barrens include a variety of systems whose primary presettlement environmental factors were specialized soils and extremes of hydrology, as influenced by fire and grazing. The prevalent soils within the polygon labeled "Dickson-Mountview-Guthrie" (D32 of Elder and Springer 1978, Springer and Elder 1980) are generally flatter, wetter, and more likely to have fragipans than adjoining units. Average conditions in the area of The Barrens can be summarized as follows (Wolfe 1996): January is typically the coldest month, with average high and low temperatures of 8.8Â° C (47.8Â° F) and 1.9Â° C (35.4Â° F), respectively. July is the warmest month, with average high and low temperatures of 31.3Â° C (88.3Â° F) and 18.9Â° C (66.0Â° F), respectively. Monthly mean temperatures range from 3.5Â° C (38.3Â° F) in January to 25.11Â° C (77.2Â° F) in July. The mean annual precipitation is 1438 mm (56.6 inches; Wolfe 1996, Pyne 2000). Precipitation is heaviest from November through May, averaging between 113 and 171 mm (4.4 to 6.7 in) per month. Rainfall is lightest during the months of June through October, with averages ranging from 83 mm (3.3 in) per month to a minor peak of 122 mm (4.8 in) in July.

Vegetation: Typical mesic grassland vegetation of the barrens of the southeastern Highland Rim of Tennessee is dominated by *Andropogon gerardii* along with *Schizachyrium scoparium*. Other graminoid species present include *Andropogon glomeratus*, *Calamagrostis coarctata*, *Panicum virgatum*, *Sorghastrum nutans*, and *Pteridium aquilinum*. Other dominants may include *Eurybia hemispherica* (= *Aster paludosus* ssp. *hemisphericus*), *Symphotrichum dumosum* (= *Aster dumosus*), *Helianthus angustifolius*, *Potentilla simplex*, *Solidago odora*, *Solidago rugosa*, and *Polytrichum commune*; found to a lesser extent are *Aristida purpurascens* var. *virgata* (= *Aristida virgata*), *Chasmanthium laxum*, *Dichanthelium aciculare* (= *Dichanthelium angustifolium*), *Dichanthelium dichotomum*, *Gymnopogon brevifolius*, *Panicum anceps*, *Panicum rigidulum*, and *Panicum verrucosum*. Woody species may include *Acer rubrum*, *Rhus copallinum*, *Rubus argutus*, and *Smilax glauca*. The Barrens contains a variety of natural, semi-natural, and managed openings which provide habitat for plants and animals which are unusual in the ecoregion, rare in the state, or globally rare. These include a variety of plants more at home in other ecoregions, most notably the Coastal Plain and the western prairies, including carnivorous plants and other specialized plants of ponds and other wetlands. In addition, globally rare endemic fish and disjunct amphibians and invertebrates call The Barrens their home.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - (*Andropogon glomeratus*, *Panicum virgatum*, *Sorghastrum nutans*) Herbaceous Vegetation (CEGL007705, G2?)
- *Andropogon gerardii* - *Schizachyrium scoparium* - (*Calamagrostis coarctata*, *Panicum virgatum*) Herbaceous Vegetation (CEGL007706, G2?)
- *Andropogon gerardii* - *Schizachyrium scoparium* - *Dichanthelium scoparium* - *Rhynchospora glomerata* Herbaceous Vegetation

(CEGL004006, G1)

- *Juniperus virginiana* var. *virginiana* / *Rhus copallinum* / *Schizachyrium scoparium* Woodland (CEGL007704, GNA)
- *Quercus (falcata, stellata)* / *Quercus marilandica* / *Gaylussacia (baccata, dumosa)* Woodland (CEGL004922, G2G3)
- *Quercus phellos* - *Quercus alba* / *Vaccinium fuscatum* - (*Viburnum nudum*) / *Carex (barrattii, intumescens)* Forest (CEGL007364, G2)
- *Quercus stellata* - (*Quercus coccinea*) / *Quercus marilandica* / *Vaccinium pallidum* - (*Vaccinium stamineum*) Woodland (CEGL004709, G2G3)
- *Schizachyrium scoparium* - *Andropogon (gyrans, ternarius, virginicus)* Herbaceous Vegetation (CEGL007707, G3?)
- *Schizachyrium scoparium* - *Calamagrostis coarctata* Herbaceous Vegetation (CEGL007708, GNRQ)
- *Schizachyrium scoparium* - *Panicum anceps* - *Panicum virgatum* - *Lespedeza capitata* - *Scleria* spp. Herbaceous Vegetation (CEGL004063, G1)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis, Panicum virgatum*) Herbaceous Alliance (A.1191)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

SPATIAL CHARACTERISTICS

Spatial Summary: This system was the historic matrix system in a large region of five Tennessee counties of the southeastern Highland Rim. It is classed as a "large patch" system primarily due to its fragmentation by fire suppression, tree plantations, agriculture, and suburban development.

Adjacent Ecological Systems:

- Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018)

Adjacent Ecological System Comments: The depression ponds which occur within the landscape of Eastern Highland Rim Prairie and Barrens (CES202.354) are examples of the Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018); several depression pond associations particular to the Eastern Highland Rim are described. Small wet depressions in the Eastern Highland Rim Prairie and Barrens (CES202.354), which are not distinguished physiognomically or by canopy species, are included in the concept of Eastern Highland Rim Prairie and Barrens (CES202.354). These are akin to vernal pools or wet streamheads.

DISTRIBUTION

Range: This system is restricted to "The Barrens" of the southeastern Highland Rim of Tennessee (today primarily extant in Coffee, Franklin, and Warren counties, Tennessee).

Divisions: 202:C

Nations: US

Subnations: TN

Map Zones: 48:C, 53:P

TNC Ecoregions: 44:C

SOURCES

References: Comer et al. 2003, Elder and Springer 1978, Pyne 2000, Springer and Elder 1980, Wolfe 1996

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723158#references

Description Author: M. Pyne, R. Evans, C. Nordman

Version: 27 Sep 2005

Concept Author: M. Pyne, R. Evans, C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1425 FLORIDA DRY PRAIRIE (CES203.380)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Short Disturbance Interval; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2425; ESLF 7138; ESP 1425

CONCEPT

Summary: This system, which is endemic to subtropical Florida, is characterized by nearly treeless plains with dense cover of grasses and low shrubs, primarily *Serenoa repens*. Examples occur on flat, low-lying terrain over moderately to poorly drained soils with sandy surfaces overlying organic hardpans or clayey subsoil (FNAI 1990). This type was historically expansive in several regions of Florida (Harper 1927). Early surveyors noted large expanses of this system on the plains near the Kissimmee River, north from Lake Okeechobee, and in the area west of Lake Okeechobee (Fisheating Creek) (Huffman and Judd 1998). The original extent has been heavily reduced by clearing for agriculture and conversion for forage production. Intact examples have been further altered by fire suppression which changes the proportion of grasses and shrubs and may further alter species composition. Frequent fires were an important natural process in this system, with an estimated frequency of 1-4 years (FNAI 1990).

Classification Comments: This system grades into mesic pine flatwoods and may have nearly identical composition except for the absent or nearly absent overstory layer (Abrahamson and Hartnett 1990, FNAI 1990, Huffman and Judd 1998).

The Florida Gap program recognizes a single map unit which is apparently analogous to this type.

Similar Ecological Systems:

- South Florida Pine Flatwoods (CES411.381)

Related Concepts:

- Dry Prairie (FNAI 1990) Equivalent

DESCRIPTION

Environment: The climate where this system occurs is subtropical, characterized by hot, wet summers and mild, dry winters. Annual rainfall is about 127 cm and occurs mostly in June through September. It occurs on flat, moderately to poorly drained sandy sites. These areas are seldom inundated but may flood with several centimeters of water for short periods after heavy summer rains. The normal water table is several centimeters (in summer and fall) to several meters (in winter and spring) below the ground surface (Duever and Brinson 1984a, Hardin 1990, Abrahamson and Hartnett 1990). Soils consist of 0.1-0.9 m of undifferentiated quartz sand with a spodic horizon or clayey subsoil 30-107 cm below the surface. These acidic, nutrient-poor sands have few weatherable minerals and low clay nutrients in the surface soil (Abrahamson and Hartnett 1990). Soils supporting these sparse shrublands are classified as Arenic Haplaquods and include such series as Smyrna; types are Myakka (sandy, siliceous, hyperthermic Aeric Alaquod), Wabasso (sandy, siliceous, hyperthermic Alfic Alaquod), Oldsmar (sandy, siliceous, hyperthermic Alfic Arenic Alaquod), Immokalee (sandy, siliceous, hyperthermic Arenic Alaquod), Leon, Adamsville, and Keri sands (Moore and Swindel 1981, Duever and Brinson 1984a).

Vegetation: Intact examples of this system are generally open and essentially treeless areas dominated by *Serenoa repens* and low shrubs (*Quercus minima*, *Lyonia lucida*, *Lyonia fruticosa*, *Vaccinium darrowii*, *Vaccinium myrsinites*, *Ilex glabra*, and *Befaria racemosa*), as well as a variety of grasses (*Aristida beyrichiana*, *Schizachyrium scoparium* var. *stoloniferum*, *Sorghastrum secundum*, *Andropogon ternarius*, *Aristida spiciformis*, *Dichantherium dichotomum* var. *ensifolium*, *Dichantherium strigosum*, *Paspalum setaceum*, and others) (Huffman and Judd 1998). At least 5 fairly discrete phases or "states" of this system can be identified (Huffman and Werner 2000): good conditions are typified by abundant herbaceous cover and relatively low (<40%) cover of shrubs, especially *Serenoa repens*, degraded conditions resulting from long fire-free intervals result in reduced herbaceous cover and increased shrub coverage, to the eventual exclusion of all herbaceous cover.

Dynamics: Like the floristically and ecologically related pine flatwoods, the open structure and species composition of dry prairies is maintained by frequent fire. However, the natural fire frequency is thought to be greater than in the surrounding mesic pine flatwoods (Duever et al. 1982, Abrahamson and Hartnett 1990, Hardin 1990). Dry prairie is readily invaded by woody vegetation in the absence of fire, especially in the absence of fires which occur during the dry portions of early spring. In "good condition" this system has abundant herbaceous cover and relatively low cover (<40%) of *Serenoa repens*; degraded conditions are indicated by reduced herbaceous cover and increased cover of *Serenoa repens* (Huffman and Werner 2000). Outright replacement of dry prairies by oak - palmetto stands has been well documented at Myakka River State Park (Huffman and Blanchard 1990). Some sources suggest that examples of this system may be the result of anthropogenic factors that provided an unnaturally high fire frequency or removed vegetation through logging or grazing (Hardin 1990).

MEMBERSHIP

Associations:

- *Serenoa repens* / *Aristida beyrichiana* Shrubland (CEGL004236, G2)

Alliances:

- *Serenoa repens* / *Aristida beyrichiana* Saturated Shrubland Alliance (A.1519)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central Florida Herbaceous Pondshore (CES203.890)
- Central Florida Wet Prairie and Herbaceous Seep (CES203.491)
- South Florida Depression Pondshore (CES411.054)

DISTRIBUTION

Range: This system occurs in southern Florida mainly north of the Everglades and Big Cypress area. For instance, it is found on the plains near the Myakka River, Kissimmee River, as well as north of Lake Okeechobee and near Fisheating Creek (west of Lake Okeechobee).

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 55:C

SOURCES

References: Abrahamson and Hartnett 1990, Bridges 2006, Comer et al. 2003, Duever and Brinson 1984a, Duever et al. 1982, FNAI 1990, Hardin 1990, Harper 1927, Huffman and Blanchard 1990, Huffman and Judd 1998, Huffman and Werner 2000, Huffman pers. comm., Moore and Swindel 1981

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723136#references

Description Author: R. Evans

Version: 11 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1432 LOWER MISSISSIPPI ALLUVIAL PLAIN GRAND PRAIRIE (CES203.549)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Deep Soil

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2432; ESLF 7145; ESP 1432

CONCEPT

Summary: This system of prairies and woodlands occurs on the oldest land surfaces in the Mississippi River Alluvial Valley and the highest land surface in the river deposited portions of the ecoregion (TNC Ecoregion 42) (T. Foti pers. comm.). It occupies a very flat region up to 20 miles wide and 60 miles long bounded by present day rivers, especially the Arkansas and White, which are much lower in elevation than the Grand Prairie terrace. This terrace is covered with thin soils underlain by deep layers of impervious clay. The surface soils have been considered to be loess by some sources but are more likely silts and silty clays (T. Foti pers. comm.). Although productive, these soils are droughty due to the impervious clay subsoils. The combination of droughty soils, very flat topography, and the lack of major stream corridors in the region create conditions suitable to the ignition and spread of fires. Almost annual fires would have been necessary to maintain these prairies, and anthropogenic influences have been critical for probably 5000 years. Typical examples are dominated by *Panicum virgatum* and *Andropogon gerardii*. The vegetation includes both wet and dry prairies as well as "slashes" dominated by *Fraxinus pennsylvanica* and *Crataegus* spp.

Classification Comments: There is little floristic and environmental overlap between the Grand Prairie and calcareous prairies of southern Arkansas and the Arkansas River Valley (Ecoregion 39) manifestations of Southeastern Great Plains Tallgrass Prairie (CES205.685).

Similar Ecological Systems:

- Lower Mississippi River Flatwoods (CES203.193)
- Southeastern Great Plains Tallgrass Prairie (CES205.685)

DESCRIPTION

Environment: This system occupies a very flat region up to 20 miles wide and 60 miles long bounded by present day rivers, especially the Arkansas and White, which are much lower in elevation than the Grand Prairie terrace. This terrace is covered with thin soils underlain by deep layers of impervious clay. The surface soils have been considered to be loess by some sources but are more likely silts and silty clays (T. Foti pers. comm.). Although productive, these soils are droughty due to the impervious clay subsoils. It occurs on the oldest land surfaces in the Mississippi River Alluvial Valley and the highest land surface in the river deposited portions of the ecoregion (TNC Ecoregion 42) (T. Foti pers. comm.).

Vegetation: Typical examples are dominated by *Panicum virgatum* and *Andropogon gerardii*. The vegetation includes both wet and dry prairies, as well as "slashes" dominated by *Fraxinus pennsylvanica* and *Crataegus* spp.

Dynamics: The combination of droughty soils, very flat topography, and the lack of major stream corridors in the region create conditions suitable to the ignition and spread of fires. Almost annual fires would have been necessary to maintain these prairies, and anthropogenic influences have been critical for probably 5000 years.

MEMBERSHIP

Associations:

- *Panicum virgatum* - *Andropogon gerardii* Grand Prairie Herbaceous Vegetation (CEGL007911, G2)

Alliances:

- *Andropogon gerardii* - (*Calamagrostis canadensis*, *Panicum virgatum*) Herbaceous Alliance (A.1191)

DISTRIBUTION

Range: Examples of this system occur on the oldest land surfaces in the Mississippi River Alluvial Valley and the highest land surface in the river deposited portions of the ecoregion (TNC Ecoregion 42) (T. Foti pers. comm.).

Divisions: 203:C

Nations: US

Subnations: AR

Map Zones: 37:C, 45:C

TNC Ecoregions: 42:C

SOURCES

References: Comer et al. 2003, DeSelm and Murdock 1993, Foti pers. comm., LNHP 2004

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723053#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Jan 2006
Concept Author: R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

1418 PENNYROYAL KARST PLAIN PRAIRIE AND BARRENS (CES202.355)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2418; ESLF 7131; ESP 1418

CONCEPT

Summary: This system consists of open, prairie-like vegetation of the northwestern Highland Rim (Pennyroyal Plateau) of Tennessee and adjacent Kentucky (Ecoregion 71e [Western Pennyroyal Karst Plain] of Griffith et al. (1998) and Woods et al. (2002); part of Subsection 222Eh of Keys et al. (1995)). Stands are dominated by grasses and forbs with scattered shrubby vegetation and, occasionally, trees. The scattered trees are mainly *Quercus falcata* and *Quercus imbricaria*. The primary dominant grass is *Schizachyrium scoparium*, with some *Sorghastrum nutans* present. Other more mesic grasses (*Andropogon gerardii*, *Tripsacum dactyloides*) are restricted to ditches. The largest extant examples are presently found on Fort Campbell Military Reservation, Tennessee, where ecological burning and fires from live munitions use result in open herbaceous-dominated landscapes. This vegetation was the predominant type here in the early 1800s and probably originated from burning by Native Americans.

Classification Comments: Western Highland Rim Prairie and Barrens (CES202.352), Eastern Highland Rim Prairie and Barrens (CES202.354), Pennyroyal Karst Plain Prairie and Barrens (CES202.355), and Southern Ridge and Valley Patch Prairie (CES202.453) form a series of similar systems in the eastern Interior Highlands and adjacent Ridge and Valley.

Similar Ecological Systems:

- Cumberland Wet-Mesic Meadow and Savanna (CES202.053)
- Eastern Highland Rim Prairie and Barrens (CES202.354)
- Southern Ridge and Valley Patch Prairie (CES202.453)
- Western Highland Rim Prairie and Barrens (CES202.352)

Related Concepts:

- Limestone Prairie (Evans 1991) Finer
- Tallgrass Prairie (Evans 1991) Finer
- Wet Prairie (Evans 1991) Finer

DESCRIPTION

Environment: This system is found in an open rolling landscape which easily carries fire if maintained in a grassy condition.

Vegetation: Stands of this system are dominated by grasses and forbs with scattered shrubby vegetation trees. The scattered trees are mainly *Quercus falcata* and *Quercus imbricaria*. The primary dominant grass is *Schizachyrium scoparium*, with some *Sorghastrum nutans* present. Other more mesic grasses (*Andropogon gerardii*, *Tripsacum dactyloides*) are restricted to ditches. Other herbaceous components may include *Andropogon gyrans*, *Andropogon ternarius*, *Lespedeza capitata*, *Lespedeza virginica*, *Symphytotrichum novae-angliae* (= *Aster novae-angliae*), *Sericocarpus linifolius* (= *Aster solidagineus*), *Coreopsis major*, *Coreopsis tripteris*, *Helianthus angustifolius*, *Helianthus hirsutus*, *Solidago juncea*, *Pycnanthemum tenuifolium*, *Pycnanthemum verticillatum* var. *pilosum* (= *Pycnanthemum pilosum*), and *Lobelia puberula*. In addition, *Rudbeckia subtomentosa*, *Prenanthes barbata*, and *Agalinis auriculata* (= *Tomanthera auriculata*) are rare plants found in some examples. Other typical woody species include *Cornus florida*, *Cercis canadensis*, *Prunus angustifolia*, *Ilex decidua*, *Rhus copallinum*, *Rosa carolina*, and *Symphoricarpos orbiculatus*.

MEMBERSHIP

Associations:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Kentucky Herbaceous Vegetation (CEGL004677, G1G2)
- *Schizachyrium scoparium* - (*Helianthus mollis*, *Helianthus occidentalis*, *Silphium trifoliatum*) Herbaceous Vegetation (CEGL007805, G2G3)

Alliances:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system is found in the northern Highland Rim (Pennyroyal Plateau) of Tennessee and adjacent Kentucky.

Divisions: 202:C

Nations: US

Subnations: KY, TN

Map Zones: 47:C

TNC Ecoregions: 44:C

SOURCES

References: Comer et al. 2003, Griffith et al. 1998, Keys et al. 1995, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723157#references

Description Author: M. Pyne, R. Evans, C. Nordman

Version: 17 Apr 2006

Concept Author: M. Pyne, R. Evans, C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1414 SOUTHERN APPALACHIAN GRASS AND SHRUB BALD (CES202.294)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Montane; Herbaceous; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2414; ESLF 7127; ESP 1414

CONCEPT

Summary: This ecological system consists of dense herbaceous and shrubland communities in the highest elevational zone of the southern Appalachians, generally above 1524 m (5000 feet) but occasionally to 1220 m (4000 feet), and at slightly lower elevations at its northern limit in Virginia and West Virginia, and in the Cumberland Mountains along the Virginia-Kentucky border. Vegetation consists either of dense shrub-dominated areas (heath balds) or dense herbaceous cover dominated by grasses or sedges (grassy balds). The combination of high-elevation, non-wetland sites and dense herbaceous or shrub vegetation without appreciable rock outcrop conceptually distinguishes this system from all others in the southern Appalachians. However, the widespread areas of degraded spruce-fir with grass and shrub cover and the invasion of grassy balds by trees blur the distinction somewhat. The presence of species characteristic of the southern Appalachians, such as *Menziesia pilosa*, *Saxifraga michauxii*, and *Paronychia argyrocoma*, distinguish this system from outcrop systems to the north (e.g., Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571)).

Classification Comments: Grassy balds and heath balds differ in a number of ways and are often recognized as distinct entities. Whether these need to be split out at the system level, rather than just at the association level, has been questioned (M. Schafale pers. comm.). This system occurs in settings similar to Southern Appalachian Rocky Summit (CES202.327) and might be broadened to encompass that system.

DESCRIPTION

Environment: This system generally occurs at elevations above 1524 m (5000 feet) but may range as low as 1220 m (4000 feet) in the Southern Blue Ridge. It is also of limited extent above 1035 m (3400 feet) in the Cumberland Mountains along the Virginia-Kentucky border. It occurs on broad ridgetops and narrow spur ridges. Elevation and orographic effects (winds cooling as they rise to create increased condensation) make the climate cool and wet, with heavy moisture input from fog as well as high rainfall. Convex slopes and exposure to wind offset the moisture input to some extent. Concentration of air pollutants has been implicated as an important anthropogenic stress in this elevational range in recent years. Soils range from shallow and rocky to fairly deep residual soils. Any kind of bedrock may be present, but most sites have erosion-resistant felsic igneous or metamorphic rocks, with slate and quartzite particularly frequent. The sites that support balds are not obviously different from similar sites that support spruce-fir forests, so the origin of these communities continues to be fodder for debate. Fire may be an important factor in some examples, whereas grazing and/or exposure to the elements may help maintain others.

Vegetation: Vegetation consists either of dense shrubs (heath balds or blackberry) or dense herbaceous cover dominated by grasses or sedges (grassy balds). Heath balds are most often dominated by *Rhododendron catawbiense*, but substantial examples are also dominated by *Rhododendron carolinianum*, *Kalmia latifolia*, or a mixture of shrubs. One large example, dominated by *Alnus viridis* ssp. *crispa*, is generally also regarded as related to the heath balds. Grassy balds are characteristically dominated by *Danthonia compressa* or *Carex* spp. Large areas have also become dominated by *Rubus allegheniensis* and by mixtures of native grasses with exotic pasture grasses. Most examples of grassy balds have some invading shrubs and trees, often dense enough to threaten the herbaceous vegetation. Heath balds may contain sparse stunted trees barely larger than the shrub canopy.

Dynamics: The dynamics that maintain and that created the communities in this system have been a major topic of debate, so far without resolution. Most grassy bald occurrences show a strong tendency to succeed to shrub or forest vegetation under present conditions, suggesting that some important maintenance process has been lost. Grazing by native herbivores (elk and bison) and periodic fire have both been suggested as natural mechanisms to keep out woody vegetation. Others have suggested that all grassy balds are of anthropogenic origin and were never ecologically stable. The most definitive grassy balds have been documented as present at the time of the first European settlement, making documentation of their origin impossible. The presence of shade-intolerant disjunct herb species in some suggests even greater age. Some areas of the spruce-fir system degraded by a combination of logging, slash fires, and grazing resemble grassy balds, but most do not. The universal cattle grazing in grassy balds by early settlers has further obscured their original character and evidence of processes.

Heath balds are more widely regarded as being created or maintained by fire. However, heavy organic accumulations in the soil suggest great age for some. Most show very limited tendency to succeed to forest, suggesting that the dense shrub layer is highly competitive and that only infrequent fire would be needed to maintain them. As with the grassy balds, spruce-fir forests burned in historical times do not usually develop vegetation identical to heath balds.

MEMBERSHIP

Associations:

- *Alnus viridis* ssp. *crispa* / *Carex pensylvanica* Shrubland (CEGL003891, G1)

- *Carex pensylvanica* Herbaceous Vegetation (CEGL004094, G1)
- *Danthonia compressa* - (*Sibbaldiopsis tridentata*) Herbaceous Vegetation (CEGL004242, G1)
- *Danthonia spicata* - *Solidago rugosa* ssp. *aspera* Herbaceous Vegetation (CEGL004760, GNA)
- *Kalmia latifolia* - *Gaylussacia (baccata, brachycera)* Cumberland Shrubland (CEGL008470, G3)
- *Kalmia latifolia* - *Rhododendron catawbiense* - (*Gaylussacia baccata, Pieris floribunda, Vaccinium corymbosum*) Shrubland (CEGL003814, G2G3)
- *Leiophyllum buxifolium* Dwarf-shrubland (CEGL003951, G1)
- *Minuartia groenlandica* - *Paronychia argyrocoma* - *Saxifraga michauxii* Herbaceous Vegetation (CEGL008509, G1)
- *Photinia melanocarpa* - *Gaylussacia baccata* / *Carex pensylvanica* Shrubland (CEGL008508, G1?)
- *Rhododendron carolinianum* - *Rhododendron catawbiense* - *Leiophyllum buxifolium* Shrubland (CEGL007876, G1)
- *Rhododendron carolinianum* Shrubland (CEGL003816, G2)
- *Rhododendron catawbiense* - *Pieris floribunda* Shrubland (CEGL004516, G1)
- *Rhododendron catawbiense* Shrubland (CEGL003818, G2)
- *Rubus allegheniensis* - *Rubus canadensis* / *Carex pensylvanica* Shrubland (CEGL003892, GNA)
- *Rubus canadensis* - (*Rubus idaeus* ssp. *strigosus*) / *Athyrium filix-femina* - *Solidago glomerata* Shrubland (CEGL003893, GNA)

Alliances:

- *Alnus viridis* Shrubland Alliance (A.929)
- *Carex pensylvanica* Herbaceous Alliance (A.1278)
- *Danthonia compressa* Herbaceous Alliance (A.1280)
- *Danthonia spicata* Herbaceous Alliance (A.1281)
- *Kalmia latifolia* - *Gaylussacia baccata* Shrubland Alliance (A.1050)
- *Leiophyllum buxifolium* Dwarf-shrubland Alliance (A.1063)
- *Rhododendron (catawbiense, carolinianum)* - *Kalmia latifolia* Shrubland Alliance (A.744)
- *Rubus allegheniensis* - *Rubus canadensis* Shrubland Alliance (A.930)
- *Saxifraga michauxii* Herbaceous Alliance (A.1621)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch to large-patch system, sometimes occurring as single patches, sometimes as complexes of small patches.

Size: Individual patches of both grassy bald and heath bald range from 10 acres or less, to occasional expanses of hundreds of acres. Heath balds sometimes occur as complexes of small patches on spur ridges. Separation rules will have a strong effect on the aggregate acreage of defined occurrences in these situations, but the largest occurrences are fairly contiguous.

Adjacent Ecological Systems:

- Central and Southern Appalachian Spruce-Fir Forest (CES202.028)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Appalachian Northern Hardwood Forest (CES202.029)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Appalachian Seepage Wetland (CES202.317)

Adjacent Ecological System Comments: This system is virtually always bordered by Southern Appalachian Northern Hardwood Forest (CES202.029) or Central and Southern Appalachian Spruce-Fir Forest (CES202.028). It may also contain embedded small patches of Southern Appalachian Rocky Summit (CES202.327) and Southern Appalachian Seepage Wetland (CES202.317).

DISTRIBUTION

Range: This system ranges from the Balsam Mountains and Great Smoky Mountains of North Carolina and Tennessee northward to Virginia and West Virginia. The system is also of limited extent in the Cumberland Mountains along the Virginia-Kentucky border. The current status in Georgia is open to question and was apparently never extensive in any case.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, TN, VA, WV

Map Zones: 57:C, 61:C

USFS Ecomap Regions: M221A:CC, M221B:CC

TNC Ecoregions: 50:C, 51:C, 59:C

SOURCES

References: Comer et al. 2003, DeSelm and Murdock 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723195#references

Description Author: M. Schafale and R. Evans, mod. S.C. Gawler and M. Pyne

Version: 17 Apr 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1426 SOUTHERN ATLANTIC COASTAL PLAIN DUNE AND MARITIME GRASSLAND (CES203.273)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; Graminoid; Coast

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2426; ESLF 7139; ESP 1426

CONCEPT

Summary: This system consists primarily of grasslands and related shrublands of Atlantic Coastal Plain barrier islands and related near-coastal areas from North Carolina southward to northern Florida. For the remainder of the Florida Coast, south of Cape Canaveral to the sandy portions of the Florida Keys, this system occurs in a more attenuated fashion. A distinct system could be recognized, but this does not seem necessary. Upland plant communities and non-flooded wetlands (including "maritime wet grasslands") are included in this system as embedded or "inclusional" shrublands. The environment of this system is highly dynamic. Reworking of sand by storms or by slower eolian processes may completely change the local environment in a short time, and portions of the system may occupy sites fairly early in the process of primary succession. The combined effects of chronic and extreme salt spray and ocean overwash prevent or dramatically inhibit woody plant growth.

Classification Comments: This system was separated from Northern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.264) to parallel broad-scale biogeographic and climatic differences believed to be important in this environment. The northern part of this broad transition was labeled by Cowardin et al. (1979) as the Virginian Province and the southern region as the Carolinian Province, although the demarcated boundary differs somewhat from that used here. A primary indicator of this transition is the shift in vegetation dominance on the dunes from *Uniola paniculata* in the south to *Ammophila breviligulata* in the north. Although the location of this shift itself is somewhat imprecise because of widespread planting of both species on artificially enhanced dunes, this boundary appears to be well approximated by Omernik Ecoregion 63g vs. 63d (EPA 2004).

This system is distinguished from Southern Atlantic Coastal Plain Maritime Forest (CES203.537) by the lack of dominant woody vegetation. This distinction becomes blurred where dunes have been artificially enhanced and an unnatural succession to woody vegetation is occurring. The boundary on the southern end is based on a broad change in biogeography and climate, and a change in barrier island form, with many barrier islands to the south being perched on limestone platforms.

Southeastern Coastal Plain Interdunal Wetland (CES203.258) is distinguished from this system by the presence of standing water for a significant part of the growing season. This corresponds to a break between open water and tall-graminoid marsh vegetation in the ponds and low-graminoid- or forb-dominated vegetation in the grasslands.

Within this system, there are three distinct groups of associations that could be considered for elevation to full system types: dune grass communities of more recent dunes, dry grasslands of older dunes and higher overwash flats, and wetland communities of lower overwash flats and wet dune swales.

Similar Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)
- Northern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.264)--occurs to the north.
- Southeastern Coastal Plain Interdunal Wetland (CES203.258)
- Southern Atlantic Coastal Plain Maritime Forest (CES203.537)
- Southwest Florida Dune and Coastal Grassland (CES203.539)

Related Concepts:

- Beach Dune (FNAI 1990) Intersecting
- Coastal Grassland (FNAI 1990) Intersecting
- Coastal Strand (FNAI 1992b) Intersecting

DESCRIPTION

Environment: Occurs on barrier islands and similar coastal strands, on sand dunes and sand flats. Strong salt spray is an important influence on vegetation in many parts. Overwash by sea water during storms is important on sand flats not protected by continuous dunes. On dunes, present or recent sand movement is an important factor. The combination of these factors prevents the dominance of woody vegetation. Sites may be either dry or saturated by freshwater from rainfall and local water table. Areas connected to tidal influence and areas with ponded freshwater are placed in other systems. Soils are sandy, with little organic matter and little or no horizon development. Soils may be excessively drained on the higher dunes. Soils are low in nutrient-holding capacity, but aerosol input of sea salt provides a continuous source of nutrients. There is variation in vegetation patterns and patch size with the aspect of the barrier island. Barrier islands that face south tend to have better developed dune fields, and often have extensive Maritime Forest systems. East-facing barrier islands naturally have less continuous dunes and more overwash flats.

Vegetation: Vegetation consists of a set of grassland and other herbaceous associations. *Uniola paniculata* is the characteristic

dominant on the youngest dunes and those most exposed to salt spray and less commonly *Panicum amarum* (Pinson 1973). *Spartina patens* or *Schizachyrium littorale* tend to dominate older dunes and sand flats. Component communities tend to be low in plant species richness, but have a characteristic set of forbs and occasional low shrubs associated with them. Wetter sand flats and dune swales may be dominated by a variety of herbs and sometimes have fairly high species richness. Also included in this system are patches of transition shrub communities or shrub thickets.

Dynamics: The environment of this system is one of the most dynamic in existence for terrestrial vegetation. Reworking of sand by storms or by slower eolian processes may completely change the local environment in a short time, changing one association to another or changing this system into a different system. Many of these sites are fairly early in the process of primary succession on recent surfaces. Chronic salt spray is an ongoing stress. Overwash and extreme salt spray in storms is a frequent disturbance.

Vegetation interacts strongly with geologic processes; the presence of grass is an important factor in the development of new dunes. Alteration of dynamic processes, such as artificial enhancement of dunes by planting or sand fencing, can have drastic effects on this system, causing large areas to succeed to woody vegetation. Fire is probably not a major natural factor in this system, but may have been important locally. Most vegetation is too sparse to carry fire well.

MEMBERSHIP

Associations:

- *Morella cerifera* / *Spartina patens* Shrubland (CEGL003839, G3G4)
- *Morella pensylvanica* / *Diodia teres* Shrubland (CEGL003881, G2)
- *Muhlenbergia filipes* - *Spartina patens* - *Eustachys petraea* Herbaceous Vegetation (CEGL004051, G2)
- *Quercus virginiana* - (*Ilex vomitoria*) Shrubland (CEGL003833, G3)
- *Sabal palmetto* / *Glyceria septentrionalis* - *Carex stipata* - *Woodwardia virginica* Woodland (CEGL007784, G3?)
- *Salix caroliniana* / *Sacciolepis striata* - *Boehmeria cylindrica* Woodland (CEGL004222, G2?)
- *Serenoa repens* - *Sabal palmetto* - *Ilex vomitoria* - *Sideroxylon tenax* Shrubland (CEGL003812, G1)
- *Smilax auriculata* - *Toxicodendron radicans* Vine-Shrubland (CEGL003885, GNRQ)
- *Smilax auriculata* / *Heterotheca subaxillaris* - *Strophostyles helvula* - (*Uniola paniculata*) Herbaceous Vegetation (CEGL004234, G2G3)
- *Spartina patens* - *Schoenoplectus pungens* - *Solidago sempervirens* Herbaceous Vegetation (CEGL004097, G2G3)
- *Spartina patens* - *Setaria parviflora* - *Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004257, G3)
- *Uniola paniculata* - *Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004040, G3?)
- *Uniola paniculata* - *Schizachyrium littorale* - *Panicum amarum* Herbaceous Vegetation (CEGL004039, G3)
- *Uniola paniculata* Herbaceous Vegetation (CEGL004038, G3)

Alliances:

- *Morella cerifera* Saturated Shrubland Alliance (A.1906)
- *Morella pensylvanica* - (*Prunus maritima*) Shrubland Alliance (A.902)
- *Muhlenbergia filipes* Herbaceous Alliance (A.1217)
- *Quercus virginiana* - *Ilex vomitoria* - (*Morella cerifera*) Shrubland Alliance (A.785)
- *Sabal palmetto* Saturated Woodland Alliance (A.488)
- *Salix caroliniana* Seasonally Flooded Woodland Alliance (A.1914)
- *Serenoa repens* Temperate Shrubland Alliance (A.750)
- *Smilax* spp. - *Toxicodendron radicans* Vine-Shrubland Alliance (A.909)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)
- *Uniola paniculata* Temperate Herbaceous Alliance (A.1199)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurs as a large-patch or local matrix system.

Size: Occurs in narrow to broad bands, up to several miles wide, extending along the length of barrier islands. Individual patches may cover a thousand or more acres. However, some of the best remnants are naturally small, occurring on smaller islands.

Adjacent Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)

DISTRIBUTION

Range: This system ranges from northern North Carolina (Omernik ecoregion 63g) to northern Florida. The northern limit is a transition zone from around Kitty Hawk, North Carolina, to the Virginia-North Carolina border.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC

Map Zones: 55:C, 56:?, 58:C

TNC Ecoregions: 55:?, 56:C, 57:C

SOURCES

References: Comer et al. 2003, Cowardin et al. 1979, EPA 2004, Pinson 1973

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723213#references

Description Author: R. Evans, mod. M. Pyne
Version: 02 Feb 2007
Concept Author: R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

1419 SOUTHERN RIDGE AND VALLEY PATCH PRAIRIE (CES202.453)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2419; ESLF 7132; ESP 1419

CONCEPT

Summary: This system is a collection of deep soil prairies and barrens found historically in the Coosa Valley of northwestern Georgia and adjacent Alabama and related areas including barrens at Oak Ridge, Tennessee. This system was formerly widespread, but is now found only in scattered and isolated remnants (DeSelm and Murdock 1993). Vegetation is typically prairie-like and may have supported scattered trees depending upon fire-return interval.

Classification Comments: Western Highland Rim Prairie and Barrens (CES202.352), Eastern Highland Rim Prairie and Barrens (CES202.354), Pennyroyal Karst Plain Prairie and Barrens (CES202.355), and Southern Ridge and Valley Patch Prairie (CES202.453) form a series of similar systems in the eastern Interior Highlands and adjacent Ridge and Valley.

Similar Ecological Systems:

- Eastern Highland Rim Prairie and Barrens (CES202.354)
- Pennyroyal Karst Plain Prairie and Barrens (CES202.355)
- Western Highland Rim Prairie and Barrens (CES202.352)

MEMBERSHIP

Associations:

- *Andropogon gerardii* - *Panicum (anceps, virgatum)* Herbaceous Vegetation (CEGL007931, G2?)
- *Panicum virgatum* - *Tripsacum dactyloides* Grand Prairie/Big Barrens Herbaceous Vegetation (CEGL004624, G2?)
- *Schizachyrium scoparium* - (*Helianthus mollis*, *Helianthus occidentalis*, *Silphium trifoliatum*) Herbaceous Vegetation (CEGL007805, G2G3)
- *Schizachyrium scoparium* - *Andropogon gerardii* - *Silphium terebinthinaceum* Coosa Valley Barren Herbaceous Vegetation (CEGL004757, G1)
- *Schizachyrium scoparium* - *Sorghastrum nutans* - *Silphium* spp. Herbaceous Vegetation (CEGL007932, G2?)

Alliances:

- *Andropogon gerardii* - (*Sorghastrum nutans*) Herbaceous Alliance (A.1192)
- *Panicum virgatum* - *Tripsacum dactyloides* Herbaceous Alliance (A.1194)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

DISTRIBUTION

Range: This system occurs in the Coosa River valley of northwestern Georgia, Tennessee, and northeastern Alabama, and related areas including barrens at Oak Ridge, Tennessee.

Divisions: 202:C

Nations: US

Subnations: AL, GA, TN

Map Zones: 48:C, 53:P

TNC Ecoregions: 50:C

SOURCES

References: Comer et al. 2003, DeSelm and Murdock 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723129#references

Description Author: M. Pyne and R. Evans

Version: 13 Jan 2003

Concept Author: M. Pyne and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1431 SOUTHWEST FLORIDA DUNE AND COASTAL GRASSLAND (CES203.539)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Graminoid; Coast

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2431; ESLF 7144; ESP 1431

CONCEPT

Summary: This system occurs in the Gulf of Mexico along the southwestern coast of Florida. Components of this system include herbaceous vegetation on dunes and related vegetation just inland of the dunes, often on recently deposited sands. These are generally upland plant communities and less commonly non-flooded dune swale wetlands. Although vegetation is mostly herbaceous, there are typically scattered shrubs of various heights present. Examples of this system occupy one of four distinctive coastal regions in Florida. Although a given community component of this system may overlap in species composition with those of other Florida coastal regions, there are important and sometimes considerable differences based on plant species composition, vegetation structure, and physical site characteristics (Johnson and Muller 1993a). The dune vegetation, like that of other Florida regions, includes *Uniola paniculata*, *Panicum amarum* var. *amarulum*, and *Iva imbricata*. *Scaevola plumieri*, *Chamaesyce mesembrianthemifolia*, and *Coccoloba uvifera* help distinguish this system from those to the north. However, while all other dune communities in Florida have frequently occurring distinctive species which help distinguish them, such species are lacking in this system. However, more inland coastal grassland components of this system sometimes include *Schizachyrium sanguineum* (= *Schizachyrium semiberbe*) and *Bouteloua hirsuta*, among other species not found in coastal grasslands elsewhere in Florida (Johnson and Muller 1993a).

Classification Comments: The spatial boundary between this system and Florida Panhandle Beach Vegetation (CES203.266) is clearly separated by the Big Bend region (see Tanner 1960, Johnson and Muller 1993a). Within this system, there is a large amount of variation along a north-to-south gradient. A finer distinction could be made in the future.

Similar Ecological Systems:

- Florida Panhandle Beach Vegetation (CES203.266)
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Related Concepts:

- Beach Dune (FNAI 1990) Intersecting
- Coastal Grassland (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- *Bouteloua hirsuta* - (*Muhlenbergia filipes*) Herbaceous Vegetation (CEGL004093, G1)
- *Ernodea littoralis* / *Uniola paniculata* - *Muhlenbergia filipes* Herbaceous Vegetation (CEGL004000, G1G2)
- *Schizachyrium sanguineum* var. *sanguineum* - *Muhlenbergia filipes* - *Cirsium horridulum* - (*Waltheria indica*) Herbaceous Vegetation (CEGL003964, G1)

Alliances:

- *Muhlenbergia filipes* Herbaceous Alliance (A.1217)
- *Schizachyrium sanguineum* Herbaceous Alliance (A.1151)
- *Uniola paniculata* Subtropical Herbaceous Alliance (A.1153)

DISTRIBUTION

Range: Found along the western coast of Florida south of the Big Bend region to the Florida Keys.

Divisions: 203:C; 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C, 55:C

SOURCES

References: Comer et al. 2003, Johnson and Muller 1993a, Tanner 1960

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723063#references

Description Author: R. Evans

Version: 31 Mar 2003

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1416 WESTERN HIGHLAND RIM PRAIRIE AND BARRENS (CES202.352)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Deep Soil; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2416; ESLF 7129; ESP 1416

CONCEPT

Summary: This system includes open, fire-maintained vegetation (often called "barrens") on uplands in western Tennessee. Although the region is highly dissected, extensive areas formerly supported well-burned vegetation. Haywood (1959) noted extensive prairie in the southern portion of Land Between the Lakes, and DeSelm (1988) noted the existence of barrens remnants in the region. As noted by Shanks (1958) and described by DeSelm (1989), these barrens occur, at least in part, on Cretaceous gravels which cap either Mississippian limestone strata on hills in the Tennessee counties of Dickson, Hickman, Lewis, and Lawrence (these mapped in Miller et al. (1966)), as well as overtopping unconsolidated Tertiary materials in the Kentucky counties of Trigg, Lyon, Callaway, Livingston, and Marshall (McDowell et al. 1981). The general terrain is flat to gently sloping. Shanks (1958) also specifically refers to barrens on "cherty residuum, elsewhere characterized by Planosols with impeded drainage." Some proposed factors which have functioned to maintain the openness of this system include the droughty, gravelly soils and resulting stresses to vegetation, as well as fire. The same gravels are mapped in Land Between the Lakes (LBL), and this vegetation could be expected there (if all examples have not succeeded to woody vegetation due to lack of fire).

Classification Comments: Western Highland Rim Prairie and Barrens (CES202.352), Eastern Highland Rim Prairie and Barrens (CES202.354), Pennyroyal Karst Plain Prairie and Barrens (CES202.355), and Southern Ridge and Valley Patch Prairie (CES202.453) form a series of similar systems in the eastern Interior Highlands and adjacent Ridge and Valley.

Similar Ecological Systems:

- Cumberland Wet-Mesic Meadow and Savanna (CES202.053)
- East Gulf Coastal Plain Jackson Plain Prairie and Barrens (CES203.353)
- Eastern Highland Rim Prairie and Barrens (CES202.354)
- Pennyroyal Karst Plain Prairie and Barrens (CES202.355)
- Southern Ridge and Valley Patch Prairie (CES202.453)

DESCRIPTION

Environment: These barrens are developed on "cherty residuum, elsewhere characterized by Planosols with impeded drainage" (Shanks 1958).

Vegetation: Some stands may be in a woodland or fire-suppressed forest condition, dominated by dry-site oaks such as *Quercus marilandica*, *Quercus prinus*, and/or *Quercus stellata*. These trees would become more scattered under an appropriate fire regime. In the herbaceous layer of well-managed examples of this system, *Schizachyrium scoparium* is codominant along with a variable mixture of *Andropogon gyrans*, *Andropogon ternarius*, and/or *Andropogon virginicus*. Other dominant grasses may include *Dichanthelium aciculare* (= *Dichanthelium angustifolium*), *Gymnopogon brevifolius*, and *Dichanthelium dichotomum* var. *dichotomum* (= var. *ramulosum*). Other common species may include *Symphytotrichum dumosum* (= *Aster dumosus*), *Sericocarpus linifolius* (= *Aster solidagineus*), *Coreopsis major*, *Eupatorium hyssopifolium*, *Eupatorium rotundifolium*, *Helianthus angustifolius*, *Liatris microcephala*, *Liatris spicata*, *Packera anonyma* (= *Senecio anonymus*), *Solidago juncea*, *Solidago odora*, *Chamaecrista fasciculata*, *Chamaecrista nictitans*, *Stylosanthes biflora*, *Lobelia puberula*, *Diodia teres*, *Potentilla simplex*, *Aristida longispica*, *Calamagrostis coarctata*, *Dichanthelium dichotomum*, *Sorghastrum nutans*, *Pteridium aquilinum*, and *Smilax glauca*.

Dynamics: Some proposed factors which have functioned to maintain the openness of this system include the droughty, gravelly soils and resulting stresses to vegetation, as well as fire. Fralish et al. (1999) noted that both post oak and chestnut oak woodlands are essentially the result of fire suppression in the barrens and historic savannas. In some areas, where the soils are particularly harsh (droughty, nutrient-poor, rocky), stands may retain an open aspect in the absence of fire.

MEMBERSHIP

Associations:

- *Quercus marilandica* / *Schizachyrium scoparium* - (*Helianthus mollis*, *Silphium asteriscus*, *Liatris aspera*) Woodland (CEGL004756, G2)
- *Quercus prinus* / *Smilax* spp. Forest (CEGL005022, G3G5)
- *Quercus stellata* / *Viburnum rufidulum* / *Schizachyrium scoparium* - (*Sorghastrum nutans*, *Helianthus eggertii*) Woodland (CEGL004686, G2G3)
- *Schizachyrium scoparium* - *Andropogon* (*gyrans*, *ternarius*, *virginicus*) Herbaceous Vegetation (CEGL007707, G3?)

Alliances:

- *Quercus prinus* - (*Quercus coccinea*, *Quercus velutina*) Forest Alliance (A.248)

- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Schizachyrium scoparium* - *Sorghastrum nutans* Herbaceous Alliance (A.1198)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

DISTRIBUTION

Range: This system is endemic to the western Highland Rim of Tennessee and possibly adjacent Kentucky.

Divisions: 202:C

Nations: US

Subnations: KY?, TN

Map Zones: 47:C, 48:C

TNC Ecoregions: 44:C

SOURCES

References: Comer et al. 2003, DeSelm 1988, DeSelm 1989, Fralish et al. 1999, Haywood 1959, McDowell et al. 1981, Miller 1978, Miller et al. 1966, Shanks 1958

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723160#references

Description Author: C. Nordman, R. Evans, M. Pyne

Version: 17 Apr 2006

Concept Author: C. Nordman, R. Evans, M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

WOODY WETLANDS AND RIPARIAN

ATLANTIC COASTAL PLAIN BLACKWATER STREAM FLOODPLAIN FOREST (CES203.247)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Blackwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9322

CONCEPT

Summary: This Atlantic Coastal Plain system, which is apparently most abundant in the Carolinas, occurs in floodplains of small streams that carry little mineral sediment (blackwater streams). These streams have their headwaters in sandy portions of the Coastal Plain. The water is usually strongly stained by tannins but has little suspended clay and is not turbid. Depositional landforms may be absent or present only in limited variety and of small size. Soils are usually strongly acidic. Periodicity of flooding ranges from long (semipermanent) in the wettest portions to short in higher gradient streams. Some small blackwater streams have most of their flow from sandhill seepage and have limited fluctuation in water levels. Vegetation varies from north to south, but generally consists almost entirely of forests of wetland trees, but occasional, small shrubby sloughs may also be present. A variety of tree species may be present; wetter examples (especially toward the northern range limits of this system) are often strongly dominated by *Taxodium distichum* and *Nyssa biflora*. Other examples have mixtures of these species with *Quercus* spp. and other bottomland hardwoods tolerant of blackwater conditions. Species richness ranges from low to moderate, but is lower than in comparable brownwater systems. Flooding is an important ecological factor in this system and may be the most important factor separating it from adjacent systems. Flooding brings nutrients and excludes non-flood-tolerant species. Unlike river systems, flooding tends to be variable and of shorter duration.

Classification Comments: The distinction between brownwater and blackwater streams is sometimes problematic. A number of plant species are characteristic of brownwater floodplains and not blackwater. Well-developed blackwater streams may be confined to areas with primarily sandy soils. The boundary between systems based on river/stream size is necessarily somewhat arbitrary, but is based on significant differences which correspond with river size. Small streams have small watersheds, which tend to lead to more irregular flooding. Depositional landforms are small enough that they do not differentiate communities well, and communities tend to have more of a mixture of species that are segregated on the larger floodplains. The boundary between this system and the Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252) may be somewhat gradual. It should be based on the predominance of seepage influence over flooding influence, but vegetational differences may also be partly determined by fire regime. Southern Coastal Plain Spring-run Stream Aquatic Vegetation (CES203.275) shares many characteristics with this system, but differs in having calcareous water and more steady flows.

Similar Ecological Systems:

- Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)
- Northern Atlantic Coastal Plain Stream and River (CES203.070)
- Southern Coastal Plain Spring-run Stream Aquatic Vegetation (CES203.275)

DESCRIPTION

Environment: Occurs in floodplains of small streams of the Coastal Plain that carry little mineral sediment (blackwater streams). These streams have their headwaters in sandy portions of the Coastal Plain. The water is usually strongly stained by tannins but has little suspended clay and is not turbid. Depositional landforms may be absent or may be present in limited variety and of small size. Soils are generally sandy in drier portions of the floodplain, mucky in wetter portions, or may be uniform organic soils. Soils are usually strongly acidic, but spring-fed rivers may have calcareous water and non-acid soils. Flooding ranges from semipermanent in the wettest floodplains to intermittent and short in higher gradient streams. Some small blackwater streams have most of their flow from sandhill seepage and have limited fluctuation in water levels.

Vegetation: Vegetation consists almost entirely of forests of wetland trees. Wetter examples are strongly dominated by *Taxodium distichum* and *Nyssa biflora*. Other examples have mixtures of these species with *Quercus* spp. and other bottomland hardwoods tolerant of blackwater conditions. Except in the very wet examples, understory, shrub, and herb layers are generally well-developed, and woody vines are also prominent. Species richness ranges from low to moderate but is lower than in comparable brownwater systems.

Dynamics: Flooding is an important ecological factor in this system and may be the most important factor separating it from adjacent systems. Flooding brings nutrients and excludes non-flood-tolerant species. Unlike river systems, flooding tends to be variable and of shorter duration. It is unclear how important aquatic fauna are when the system is flooded, but they may be important. The small flows, low gradient, and binding of sediment by vegetation limit channel shifts and sediment movement, but floods may cause local

disturbance by scouring. Most of these forests exist naturally as multi-aged old-growth forests driven by gap-phase regeneration. Wind throw is probably the most important cause of gaps. Fire is probably more important than in larger river systems, because distances to uplands are short and because stream channels and sloughs are smaller and less effective as firebreaks. However, most of the vegetation is not very flammable and usually will not carry fire. Some of these areas apparently were once canebrakes, which presumably were maintained by periodic fire.

MEMBERSHIP

Associations:

- *Chamaecyparis thyoides* - (*Liriodendron tulipifera*) / *Lyonia lucida* Forest (CEGL007563, G2)
- *Chamaecyparis thyoides* / *Cyrilla racemiflora* - *Cliftonia monophylla* - *Ilex coriacea* Woodland (CEGL003634, G2?)
- *Decodon verticillatus* Seasonally Flooded Shrubland (CEGL003905, G4)
- *Magnolia virginiana* - *Nyssa biflora* / *Carpinus caroliniana* / *Thelypteris noveboracensis* - *Athyrium filix-femina* Forest (CEGL004722, G3G4)
- *Nuphar lutea* ssp. *sagittifolia* Herbaceous Vegetation (CEGL004328, G3?)
- *Nyssa biflora* - (*Liquidambar styraciflua*) / *Itea virginica* / *Saururus cernuus* Forest (CEGL007847, G4?)
- *Nyssa biflora* - *Liriodendron tulipifera* - *Pinus (serotina, taeda)* / *Lyonia lucida* - *Ilex glabra* Forest (CEGL004734, G3?)
- *Nyssa biflora* - *Quercus nigra* - *Quercus laurifolia* - *Pinus taeda* / *Ilex opaca* - *Carpinus caroliniana* Forest (CEGL007350, G4?)
- *Orontium aquaticum* - *Schoenoplectus (etuberculatus, subterminalis)* - *Eriocaulon decangulare* - *Juncus trigonocarpus* Herbaceous Vegetation (CEGL007860, G2?)
- *Quercus laurifolia* / *Carpinus caroliniana* / *Justicia ovata* Forest (CEGL007348, G4?)
- *Quercus phellos* - *Quercus laurifolia* - *Nyssa biflora* - *Liquidambar styraciflua* / *Arundinaria gigantea* ssp. *tecta* - *Sabal minor* Forest (CEGL007846, G4?)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Taxodium ascendens* / (*Nyssa biflora*) / *Leucothoe racemosa* - *Lyonia lucida* - *Morella cerifera* Depression Forest (CEGL007420, G3)
- *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* / *Fraxinus caroliniana* / *Itea virginica* Forest (CEGL007432, G3G4)
- *Taxodium distichum* - *Nyssa biflora* - *Acer rubrum* - *Magnolia virginiana* Saturated Forest (CEGL003804, G2G3)
- *Taxodium distichum* - *Nyssa biflora* / *Fraxinus caroliniana* / *Lyonia lucida* Forest (CEGL004733, G3G4)
- *Taxodium distichum* - *Nyssa biflora* Chesapeake Bay Forest (CEGL006214, GNR)
- *Taxodium distichum* - *Nyssa ogeche* Forest (CEGL003841, G3G4)

Alliances:

- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Chamaecyparis thyoides* Saturated Woodland Alliance (A.575)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Nyssa biflora* - *Acer rubrum* - (*Liriodendron tulipifera*) Saturated Forest Alliance (A.351)
- *Orontium aquaticum* - (*Schoenoplectus subterminalis*) Permanently Flooded Herbaceous Alliance (A.1931)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* - *Nyssa biflora* - (*Nyssa aquatica*) Saturated Forest Alliance (A.355)

SPATIAL CHARACTERISTICS

Spatial Summary: Generally a small-patch system, with narrow bands or dendritic patches interspersed with other systems.

Size: Occurs in narrow bands, from a few hundred feet to possibly as much as a mile in width, and often several to many miles long. Natural limitations on development and conversion often result in contiguous patches that may be hundreds or even thousands of acres. However, because of relatively easy accessibility compared to larger floodplains, patches of mature vegetation are often small.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)
- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)
- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

Adjacent Ecological System Comments: May be associated with a variety of systems, especially upland or wetland longleaf pine systems and Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252). Most naturally connect downstream to Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250) or to Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240).

DISTRIBUTION

Range: This system is potentially found throughout the Atlantic Coastal Plain north to about the James River in Virginia, but it is most abundant in North Carolina and South Carolina.

Divisions: 203:C
Nations: US
Subnations: FL, GA, NC, SC, VA
Map Zones: 55:C, 58:C, 60:C
TNC Ecoregions: 55:C, 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723238#references

Description Author: M. Schafale and R. Evans

Version: 19 Dec 2005

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN BROWNWATER STREAM FLOODPLAIN FOREST (CES203.248)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9320

CONCEPT

Summary: This Atlantic Coastal Plain system ranges from southern Virginia (south of the James River) to Georgia on floodplains of smaller streams that carry significant mineral sediment (brownwater or redwater streams). These streams have their headwaters in the Piedmont, Blue Ridge, or other interior regions, or in portions of the Coastal Plain where fine-textured sediment predominates. The water generally carries substantial amounts of silt and clay. Depositional landforms, at least a natural levee, are often distinctly present but are fairly small relative to the scale of communities and help create some variation in duration of flooding and nutrient input. Soils are generally fertile and not strongly acidic. Flooding is generally seasonal but may range to nearly semipermanent. Vegetation consists almost entirely of forests of wetland trees. Wetter examples are strongly dominated by *Taxodium distichum* and *Nyssa* spp. Other examples have mixtures of these species with *Quercus* spp. and other bottomland hardwoods. Except in the very wet examples, understory, shrub and herb layers are generally well-developed and woody vines are also prominent. Flooding is an important ecological factor in this system and may be the most important factor separating it from adjacent systems. Flooding brings nutrients and excludes non-flood-tolerant species. Unlike river systems, flooding tends to be variable and of shorter duration.

Classification Comments: The distinction between brownwater and blackwater streams is sometimes problematic. A number of plant species are characteristic of brownwater floodplains and not blackwater. Well-developed blackwater streams may be confined to areas with primarily sandy soils. The boundary between systems based on river/stream size is necessarily somewhat arbitrary, but is based on significant differences which correspond with river size. Small streams have small watersheds, which tend to lead to more irregular flooding. Depositional landforms are small enough that they do not differentiate communities well, and communities tend to have more of a mixture of species that are segregated on the larger floodplains.

This system as defined covers a large geographic range. There are some significant biogeographic differences across this range, leading to a large number of associations. However, more plant species are shared across the region in this system than in most other systems in the region.

Similar Ecological Systems:

- Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
- Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)
- Northern Atlantic Coastal Plain Stream and River (CES203.070)

DESCRIPTION

Environment: Occurs on floodplains of smaller streams that carry significant mineral sediment (brownwater or redwater streams). These streams have their headwaters in the Piedmont, Blue Ridge, Interior Plateaus, or in portions of the Coastal Plain where fine-textured sediment predominates. The water generally carries substantial amounts of silt and clay. Depositional landforms, at least a natural levee, are often distinctly present but are fairly small relative to the scale of communities. They create some variation in duration of flooding and nutrient input. Soil texture varies from sandy to clayey, often in a fine mosaic. Soils are generally fertile and not strongly acidic. Flooding is generally seasonal, but may range to nearly semipermanent.

Vegetation: Vegetation consists almost entirely of forests of wetland trees. Wetter examples are strongly dominated by *Taxodium distichum* and *Nyssa* spp. Other examples have mixtures of these species with *Quercus* spp. and other bottomland hardwoods. Except in the very wet examples, understory, shrub, and herb layers are generally well-developed, and woody vines are also prominent. Some canopy trees may include *Acer rubrum*, *Acer saccharinum*, *Betula nigra*, *Carya illinoensis*, *Celtis laevigata*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Nyssa aquatica*, *Nyssa biflora*, *Pinus taeda*, *Platanus occidentalis*, *Quercus laurifolia*, *Quercus michauxii*, *Quercus phellos*, *Salix caroliniana*, and *Taxodium distichum*. Some shrubs and small trees may include *Alnus serrulata*, *Arundinaria gigantea ssp. tecta*, *Carpinus caroliniana*, *Fraxinus caroliniana*, *Ilex opaca*, *Itea virginica*, *Leucothoe racemosa*, *Sabal minor*, and *Serenoa repens*. Herbs may include *Boehmeria cylindrica*, *Commelina virginica*, *Leersia lenticularis*, and *Onoclea sensibilis*.

Dynamics: Flooding is an important ecological factor in this system and may be the most important factor separating it from adjacent systems. Flooding brings nutrients and excludes non-flood-tolerant species. Unlike river systems, flooding tends to be variable and of shorter duration. It is unclear how important aquatic fauna are when the system is flooded, but they may be important. The small flows, low gradient, and binding of sediment by vegetation limit channel shifts and sediment movement, but floods may cause local disturbance by scouring. Most of these forests exist naturally as multi-aged old-growth forests driven by gap-phase regeneration. Wind throw is probably the most important cause of gaps. Fire is probably more important than in larger river systems, because distances to uplands are short and because stream channels and sloughs are smaller and less effective as firebreaks. However, most of the

vegetation is not very flammable and usually will not carry fire. Some of these areas apparently were once canebrakes, which presumably were maintained by periodic fire.

MEMBERSHIP

Associations:

- *Acer saccharinum* / *Leersia lenticularis* - *Commelina virginica* Forest (CEGL007727, G3?)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Onoclea sensibilis* Forest (CEGL007329, G4)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Quercus (phellos, palustris, michauxii)* - *Liquidambar styraciflua* / *Cinna arundinacea* Forest (CEGL006605, G3G4)
- *Quercus michauxii* / *Carpinus caroliniana* - *Ilex opaca* / *Leucothoe racemosa* Forest (CEGL007737, G2G3)
- *Quercus phellos* - *Quercus laurifolia* - *Nyssa biflora* - *Liquidambar styraciflua* / *Arundinaria gigantea* ssp. *tecta* - *Sabal minor* Forest (CEGL007846, G4?)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Salix caroliniana* Temporarily Flooded Forest (CEGL007373, G4)
- *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* / *Fraxinus caroliniana* / *Itea virginica* Forest (CEGL007432, G3G4)
- *Taxodium distichum* - *Nyssa aquatica* / *Fraxinus caroliniana* Forest (CEGL007431, G5?)

Alliances:

- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus michauxii* - *Quercus pagoda* Saturated Forest Alliance (A.353)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix caroliniana* Temporarily Flooded Forest Alliance (A.296)

SPATIAL CHARACTERISTICS

Spatial Summary: Generally a linear system, with narrow bands or dendritic patches interspersed with other systems.

Size: Occurs in narrow bands, from a few hundred feet to possibly as much as a mile in width, and often several to many miles long. Natural limitations on development and conversion often result in contiguous patches that may be hundreds or even thousands of acres. However, because of relatively easy accessibility compared to larger floodplains, patches of mature vegetation are often small.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)
- East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299)

Adjacent Ecological System Comments: May be associated with a variety of systems, especially upland hardwood forests and upland or wetland longleaf pine systems. Most naturally connect downstream to Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250) or to Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240).

DISTRIBUTION

Range: This system is found throughout the Atlantic Coastal Plain, from southeastern Virginia to southeastern Georgia.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723237#references

Description Author: M. Schafale and R. Evans

Version: 02 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1459 ATLANTIC COASTAL PLAIN CLAY-BASED CAROLINA BAY WETLAND (CES203.245)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Depressional; Graminoid

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2459; ESLF 9128; ESP 1459

CONCEPT

Summary: This system consists of wetlands associated with ovoid, shallow depressions with nearly flat bottoms in parts of the Atlantic Coastal Plain. Often called Carolina bays, these areas are most numerous and extensive in South Carolina but are also present in adjacent Georgia and the Inner Coastal Plain of North Carolina. The depressions have mineral soils with clay hardpans that trap and retain water from a combination of rainfall and exposure of a high regional water table. Some examples are essentially permanently flooded, while others support water levels that vary substantially from year to year and over longer climatic cycles. Vegetation includes a series of primarily herbaceous and woodland associations. The wettest sites have open water and floating-leaved aquatic vegetation, or marsh vegetation of tall graminoids. Drier sites often have an open canopy of *Taxodium ascendens*, with a dense, often fairly species-rich herbaceous layer beneath. A few occurrences are shrubby, but none contain the dense shrub layers of characteristic pocosin species that occur in the bays with organic soils. Vegetational composition often varies substantially from year to year, in response to differences in water levels and drawdown times. Variation in hydroperiod is the most important dynamic, causing rapid major changes in the herbaceous vegetation. Unlike the steeper-sided solution depressions, where many different hydroperiods are present within a short distance and vegetation zones simply shift, the flat-bottomed Carolina bays experience drastic yearly changes in hydroperiod over most of their extent. Fire periodically spreads into the bays from adjacent uplands when conditions are dry, helps prevent invasion by less water-tolerant trees during dry periods, and interacts with flooding to affect vegetational composition. Where fire is removed, *Pinus taeda* often invades the bays. Fire may also be important in preventing buildup of organic matter on the soil surface.

Classification Comments: The distinction between the central concepts of this system and Southern Atlantic Coastal Plain Depression Pondshore (CES203.262) is well marked, with basin morphology, geographic range, and prevailing communities differing. However, there is a common set of plant species, including some rare ones, that occur in both systems. Thus, there may be difficulty in defining the local boundary, and some atypical depressions may have to be placed in one system or the other based on the preponderance of evidence. This system is related to Northern Atlantic Coastal Plain Pondshore (CES203.518) which occurs farther north in the Coastal Plain, and to some of the flat-bottomed basin wetlands of Florida which occur outside the range of this system to the south.

Similar Ecological Systems:

- East Gulf Coastal Plain Depression Pondshore (CES203.558)
- Northern Atlantic Coastal Plain Pondshore (CES203.518)
- Southeastern Coastal Plain Natural Lakeshore (CES203.044)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)

Related Concepts:

- Cypress Savanna (Schafale and Weakley 1990) Intersecting

DESCRIPTION

Environment: Occurs in Carolina bays with mineral soils and with seasonal to permanent standing water. Carolina bays are oriented, oval, shallow depressions with nearly flat bottoms, which range from North Carolina through South Carolina, and into adjacent Georgia. Most Carolina bays in the Outer Coastal Plain occur in sandy sediments and are filled with peat, while most Carolina bays in the Inner Coastal Plain occur in loamy sediments and have mineral soils with clay hardpans. These depressions hold water, due to a combination of rainfall and exposure of a high regional water table. Some are essentially permanently flooded. Others contain water well into the growing season in most years, but water levels vary substantially from year to year and over longer climatic cycles. Fire is an important natural influence in dry times.

Vegetation: Vegetation includes a series of primarily herbaceous and woodland associations. The wettest sites have open water and floating-leaved aquatic vegetation, or marsh vegetation of tall graminoids. Drier sites often have an open canopy of *Taxodium ascendens*, with a dense, often fairly species-rich herbaceous layer beneath. A large number of annual species are present. Some sites have similar herbaceous vegetation without trees. A few occurrences are shrubby, but none contain the dense shrub layers of characteristic pocosin species that occur in the bays with organic soils. Vegetational composition often varies substantially from year to year, in response to differences in water levels and drawdown times. Seed banking plays an important role in component communities. The system is also important as amphibian breeding habitat and may support a distinctive aquatic invertebrate community.

Dynamics: Variation in hydroperiod is the most important dynamic, causing rapid major changes in the herbaceous vegetation. Unlike the steeper-sided solution depressions, where many different hydroperiods are present within a short distance and vegetation zones simply shift, the flat-bottomed Carolina bays experience drastic yearly changes in hydroperiod over most of their extent. Many plants persist in seed banks for periods of years when conditions are not suitable. Fire is also an important process, spreading into the bays from adjacent uplands when conditions are dry. Fire prevents invasion by less water-tolerant trees during dry periods, and interacts with flooding to affect vegetational composition. Where fire is removed, *Pinus taeda* often invades the bays. Fire may also be important in preventing buildup of organic matter on the soil surface.

MEMBERSHIP

Associations:

- *Taxodium ascendens* / *Cyrilla racemiflora* - *Zenobia pulverulenta* Woodland (CEGL003734, G2)
- *Taxodium ascendens* / *Panicum hemitomon* - *Polygala cymosa* Woodland (CEGL003733, G2G3)
- *Taxodium ascendens* / *Woodwardia virginica* Woodland (CEGL004441, G2?)

Alliances:

- *Taxodium ascendens* Seasonally Flooded Woodland Alliance (A.651)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, occurring alone or in closely associated complexes.

Size: Most clay-based Carolina bays are \hat{A} ½ mile or less long. Some are isolated, while in places several bays may be close enough together to be considered part of the same occurrence.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)

Adjacent Ecological System Comments: Most occurrences were naturally associated with or embedded within Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265) and Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281). Most are now surrounded by heavily altered systems.

DISTRIBUTION

Range: This system is found in the Inner to Middle Coastal Plain, from southern North Carolina, through South Carolina, and into adjacent Georgia. It is most numerous and extensive in South Carolina.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC

Map Zones: 55:C, 58:C

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, Elliott pers. comm., EPA 2004, Sharitz 2003, Wharton 1978

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723240#references

Description Author: M. Schafale and R. Evans

Version: 02 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN LARGE RIVER FLOODPLAIN FOREST (CES203.066)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Riverine / Alluvial [Brownwater]

National Mapping Codes: ESLF 9313

CONCEPT

Summary: This system represents a geographic subset of Kuchler's (1964) Southern Floodplain Forest. Examples may be found along large rivers of the Atlantic Coastal Plain, especially the Roanoke, Great Pee Dee, Congaree/Santee, Savannah, and Altamaha rivers. Several distinct plant communities can be recognized within this system that may be related to the array of different geomorphologic features present within the floodplain. Some of the major geomorphic features associated with different community types include natural levees, point bars, meander scrolls, oxbows, and sloughs (Sharitz and Mitsch 1993). Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding. However, herbaceous and shrub vegetation may be present in certain areas as well.

Classification Comments: This system has some overlap in associations with CES203.489, but many more are not in common. In addition "...most, if not all, associations in the system are shared with Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250). The main difference is in the scale of landscape pattern, but the extent and relief of fluvial landforms like natural levees and backswamps and the general flooding dynamics also differ" (M. Schafale pers. comm.).

Similar Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)
- East Gulf Coastal Plain Large River Floodplain Forest (CES203.489)--East Gulf equivalent.
- Northern Atlantic Coastal Plain Stream and River (CES203.070)

DESCRIPTION

Environment: Examples of this system are generally forested with stands of bottomland hardwood species and other trees tolerant of flooding. Local composition varies depending upon actual position within the floodplain, disturbance history, and underlying soils and geology. Although most examples of this system may be thought of as acidic, some examples of this system flow through regions with sufficient calcareous influence to effect vegetation composition.

Vegetation: Trees dominating stands of this system can include *Acer negundo*, *Acer rubrum* var. *rubrum*, *Acer rubrum* var. *drummondii*, *Acer saccharinum*, *Betula nigra*, *Carya aquatica*, *Celtis laevigata*, *Fraxinus caroliniana*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Nyssa aquatica*, *Nyssa biflora*, *Nyssa ogeche*, *Platanus occidentalis*, *Populus deltoides*, *Quercus laurifolia*, *Quercus michauxii*, *Salix nigra*, and *Ulmus americana*. Some disturbed stands may contain *Pinus taeda*. Shrubs and small trees can include *Alnus serrulata*, *Asimina triloba*, *Carpinus caroliniana*, *Cephalanthus occidentalis*, *Cornus foemina*, *Decodon verticillatus*, *Hypericum prolificum*, *Ilex decidua*, *Itea virginica*, *Lindera benzoin*, *Lyonia lucida*, *Planera aquatica*, *Sabal minor*, *Salix caroliniana*, *Sebastiania fruticosa*, and *Arundinaria gigantea* ssp. *gigantea*. Vines can include *Ampelopsis arborea*, *Vitis* spp., and others. Herbs can include *Boehmeria cylindrica*, *Carex abscondita*, *Carex albolutescens*, *Carex bromoides*, *Carex grayi*, *Carex intumescens*, *Carex jorii*, *Carex lupulina*, *Carex retroflexa*, *Chasmanthium laxum*, *Commelina virginica*, *Glyceria septentrionalis*, *Hydrocotyle ranunculoides*, *Leersia lenticularis*, *Lemna minor*, *Onoclea sensibilis*, *Saururus cernuus*, *Typha latifolia*, and *Zizaniopsis miliacea*, as well as the epiphytes *Tillandsia bartramii* and *Tillandsia usneoides*, and the aquatic exotic *Alternanthera philoxeroides*.

MEMBERSHIP

Associations:

- *Acer negundo* Forest (CEGL005033, G4G5)
- *Acer saccharinum* / *Leersia lenticularis* - *Commelina virginica* Forest (CEGL007727, G3?)
- *Alternanthera philoxeroides* Herbaceous Vegetation (CEGL003858, GNA)
- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Betula nigra* / *Salix nigra* / *Hypericum prolificum* - *Ampelopsis arborea* Forest (CEGL007794, G3?)
- *Celtis laevigata* - *Fraxinus pennsylvanica* - *Acer negundo* - (*Juglans nigra*) / *Asimina triloba* / *Carex grayi* Forest (CEGL004740, G3G5)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Decodon verticillatus* Seasonally Flooded Shrubland (CEGL003905, G4)
- *Fraxinus pennsylvanica* - *Quercus laurifolia* - *Quercus lyrata* - *Carya aquatica* Forest (CEGL004695, G3G4)

- *Fraxinus pennsylvanica* - *Ulmus americana* / *Carpinus caroliniana* / *Boehmeria cylindrica* Forest (CEGL007806, G4?)
- *Fraxinus pennsylvanica* / *Cornus foemina* / *Carex bromoides* Forest (CEGL007742, G3G4)
- *Fraxinus pennsylvanica* / *Leersia lenticularis* - *Carex lupulina* Forest (CEGL007728, G2G3)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Onoclea sensibilis* Forest (CEGL007329, G4)
- *Liquidambar styraciflua* - *Quercus (laurifolia, nigra)* - (*Pinus taeda*) / *Arundinaria gigantea* / *Carex abscondita* Forest (CEGL007732, G3G4)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Nyssa biflora* - (*Liquidambar styraciflua*) / *Itea virginica* / *Saururus cernuus* Forest (CEGL007847, G4?)
- *Nyssa biflora* - (*Taxodium distichum*) Forest (CEGL004640, GNA)
- *Nyssa biflora* - *Acer rubrum* var. *rubrum* / *Lyonia lucida* Forest (CEGL007864, G3G4)
- *Nyssa biflora* - *Liquidambar styraciflua* / *Glyceria septentrionalis* - *Hydrocotyle ranunculoides* Forest (CEGL007743, G3G4)
- *Nyssa ogeche* - (*Nyssa biflora*, *Taxodium ascendens*) Forest (CEGL007392, G4)
- *Nyssa ogeche* - *Nyssa aquatica* Forest (CEGL007393, G3)
- *Pinus taeda* - *Liquidambar styraciflua* - *Nyssa biflora* Temporarily Flooded Forest (CEGL004606, G4)
- *Pinus taeda* Temporarily Flooded Forest (CEGL007142, G4?)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Platanus occidentalis* - *Celtis laevigata* - *Fraxinus pennsylvanica* / *Lindera benzoin* - *Ilex decidua* / *Carex retroflexa* Forest (CEGL007730, G4?)
- *Populus deltoides* - *Salix caroliniana* Forest (CEGL007343, G4G5)
- *Populus deltoides* / *Acer negundo* / *Boehmeria cylindrica* Forest (CEGL007731, G3G5)
- *Quercus laurifolia* - *Quercus lyrata* / *Carpinus caroliniana* - *Persea palustris* / *Vaccinium elliotii* Forest (CEGL004737, G4?)
- *Quercus laurifolia* - *Quercus michauxii* - *Liquidambar styraciflua* / *Carpinus caroliniana* Forest (CEGL004678, G3G4)
- *Quercus lyrata* - *Carya aquatica* Forest (CEGL007397, G4G5)
- *Quercus lyrata* - *Liquidambar styraciflua* Forest (CEGL008583, G3G4)
- *Quercus lyrata* - *Quercus laurifolia* - *Taxodium distichum* / *Saururus cernuus* Forest (CEGL004735, G3G5)
- *Quercus michauxii* / *Carpinus caroliniana* - *Ilex opaca* / *Leucothoe racemosa* Forest (CEGL007737, G2G3)
- *Quercus phellos* / *Carex (albolutescens, intumescens, jorii)* / *Climacium americanum* Forest (CEGL007403, G2G3)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Salix nigra* - *Fraxinus pennsylvanica* Forest (CEGL007734, G3G4)
- *Salix nigra* Temporarily Flooded Shrubland (CEGL003901, G4?)
- *Taxodium distichum* - *Betula nigra* / *Cyrilla racemiflora* - *Sebastiania fruticosa* Forest (CEGL004505, G3?)
- *Taxodium distichum* - *Fraxinus pennsylvanica* - *Quercus laurifolia* / *Acer rubrum* / *Saururus cernuus* Forest (CEGL007719, G3G4)
- *Taxodium distichum* - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Forest (CEGL007422, G4?)
- *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* / *Fraxinus caroliniana* / *Itea virginica* Forest (CEGL007432, G3G4)
- *Taxodium distichum* - *Nyssa aquatica* / *Fraxinus caroliniana* Forest (CEGL007431, G5?)
- *Taxodium distichum* - *Nyssa biflora* / *Fraxinus caroliniana* / *Lyonia lucida* Forest (CEGL004733, G3G4)
- *Taxodium distichum* - *Nyssa biflora* / *Sabal palmetto* / *Tillandsia (bartramii, usneoides)* Forest (CEGL003850, G3G4)
- *Taxodium distichum* - *Nyssa ogeche* Forest (CEGL003841, G3G4)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)
- *Zizaniopsis miliacea* Coastal Plain Slough Herbaceous Vegetation (CEGL004139, G4?)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Alternanthera philoxeroides* Semipermanently Flooded Herbaceous Alliance (A.2015)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Pinus taeda* - *Liquidambar styraciflua* - *Nyssa biflora* Temporarily Flooded Forest Alliance (A.433)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)

- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Quercus michauxii* - *Quercus pagoda* Saturated Forest Alliance (A.353)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Salix nigra* Temporarily Flooded Shrubland Alliance (A.948)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Zizaniopsis miliacea* Seasonally Flooded Temperate Herbaceous Alliance (A.1395)

DISTRIBUTION

Range: This system is found on the Atlantic Coastal Plain, from North Carolina south to Georgia, especially (from north to south) the Roanoke, Great Pee Dee, Congaree/Santee, and Savannah rivers. This includes Omernik Level 4 Ecoregions 63n, 65p, 75i (in part) (EPA 2004).

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC

Map Zones: 55:C, 58:C

TNC Ecoregions: 56:C, 57:C

SOURCES

References: EPA 2004, Kuchler 1964, Schafale pers. comm., Sharitz and Mitsch 1993, Southeastern Ecology Working Group n.d., Wharton et al. 1982

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.754563#references

Description Author: M. Pyne and M. Schafale, mod. C.W. Nordman and M. Pyne

Version: 11 Dec 2006

Concept Author: M. Pyne, M. Schafale

Stakeholders: Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN NORTHERN BOG (CES203.893)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Acidic Water; Shrubland (Shrub-dominated); Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9189

CONCEPT

Summary: This system is comprised of dwarf-shrub sphagnum bogs dominated by *Chamaedaphne calyculata* occurring on Cape Cod, Massachusetts; Long Island, New York; and the Coastal Plain of New Jersey. North of the glacial border, this system typically occurs in isolated glacial kettleholes and in New Jersey in similar isolated basins. This system occurs in regions of deep sands supporting a pine barrens landscape. The system is characterized by acidic, tannic water supporting a floating or grounded *Sphagnum* mat over which *Chamaedaphne calyculata*, *Gaylussacia dumosa*, and other dwarf-shrubs have rooted. Taller shrubs such as *Vaccinium corymbosum* may occur at the periphery of the bog, and *Decodon verticillatus* often forms a distinct zone adjacent to open water. Rooted hydromorphic plants such as *Nymphaea odorata* occur in open water.

MEMBERSHIP

Associations:

- *Chamaecyparis thyoides* / *Ilex glabra* - *Rhododendron viscosum* Forest (CEGL006188, G3)
- *Chamaedaphne calyculata* - (*Gaylussacia dumosa*) - *Decodon verticillatus* / *Woodwardia virginica* Dwarf-shrubland (CEGL006008, G5)
- *Chamaedaphne calyculata* / *Carex striata* Dwarf-shrubland (CEGL006208, GNR)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Pinus rigida* / *Chamaedaphne calyculata* / *Sphagnum* spp. Woodland (CEGL006194, G3G5)
- *Sphagnum cuspidatum* Nonvascular Vegetation (CEGL004384, G2?)

Alliances:

- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Pinus rigida* Saturated Woodland Alliance (A.580)
- *Sphagnum cuspidatum* Seasonally Flooded Nonvascular Alliance (A.1821)

DISTRIBUTION

Range: This system occurs on Cape Cod, Massachusetts; Long Island, New York; and the Coastal Plain of New Jersey.

Divisions: 203:C

Nations: US

Subnations: MA, NJ, NY

Map Zones: 60:C, 65:C

TNC Ecoregions: 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722787#references

Description Author: L. Sneddon

Version: 09 Sep 2004

Concept Author: L. Sneddon

Stakeholders: East

ClassifResp: East

1452 ATLANTIC COASTAL PLAIN PEATLAND POCOSIN AND CANEBRAKE (CES203.267)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Shrubland (Shrub-dominated); Extensive Wet Flat

Non-Diagnostic Classifiers: Organic Peat (>40 cm)

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2452; ESLF 9121; ESP 1452

CONCEPT

Summary: This system includes wetlands of organic soils, occurring on broad flats or gentle basins, primarily on the outer terraces of the Atlantic Coastal Plain of the Carolinas and southeastern Virginia. Under current conditions, the vegetation is predominantly dense shrubland and very shrubby open woodlands. A characteristic suite of primarily evergreen shrubs, greenbriars, and pond pine (*Pinus serotina*) dominates. These shrubs include *Ilex glabra*, *Lyonia lucida*, *Lyonia mariana*, *Cyrilla racemiflora*, *Ilex coriacea*, and *Zenobia pulverulenta*, along with *Smilax laurifolia*. *Pinus serotina* is the characteristic tree, along with *Gordonia lasianthus*, *Magnolia virginiana*, and *Persea palustris*. Herbs are scarce and largely limited to small open patches. Under pre-European settlement fire regimes, stands of *Arundinaria gigantea ssp. tecta* (canebrakes) would have been more common and extensive. Soil saturation, sheet flow, and peat depth create a distinct zonation, with the highest stature woody vegetation on the edges and lowest in the center. Catastrophic fires are important in this system, naturally occurring at moderate frequency. Fires generally kill all above-ground vegetation in large patches, creating a shifting mosaic. Vegetation structure and biomass recover rapidly in most of the burned areas, primarily by sprouting.

Classification Comments: Related vegetation occurs in Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252), which may share many plant species but which has hydrology driven by seepage. This system ((CES203.267) has three recognizable landscape patterns within it: domed peatlands, peat-filled Carolina bays, and small swales. Vegetational and ecological differences between these have not been demonstrated but may warrant further investigation. There are differences in landscape pattern among them. The "small swale" manifestation of this exists in smaller patches.

Similar Ecological Systems:

- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)
- Central Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)

DESCRIPTION

Environment: This system occurs on broad interfluvial flats and in small to large, very gentle basins and swales, largely on the outermost terraces of the Outer Coastal Plain. Some occurrences are in large to small peat-filled Carolina bays. Smaller patches occur in shallow swales associated with relict coastal dune system or other irregular sandy surfaces. Soils range from wet mineral soils with mucky surface layers to peats several meters deep. Most of the largest occurrences are domed peatlands with the deepest peat associated with topographic highs in the center, but deep peats are also associated with buried drainage channels. Hydrology is driven by rainfall and sheet flow. The low hydraulic conductivity of the organic material limits interaction with the groundwater. The raised center of domed peatlands is fed only by rainwater and is therefore a true ombrotrophic bog. More peripheral portions are fed by sheet flow from the center, and so receive only acidic water low in nutrients. Occurrences in Carolina bays and other basins appear to be similarly isolated from surface or groundwater inflow from adjacent areas. Soils are normally saturated throughout the winter and well into the growing season, though the organic material may dry enough to burn during droughts. Standing water is limited to local depressions and disturbed areas. Soil saturation and peat depth, with its corresponding nutrient limitation, are the primary drivers of vegetational zonation as well as the distinction between this system and adjacent ones, but their effect may be modified by drainage patterns.

Vegetation: Vegetation is a series of distinctive associations known as pocosins. Under current conditions, the vegetation is predominantly dense shrubland and very shrubby open woodlands, ranging to nearly closed forests. Herbaceous associations are present only as small patches. Vegetation is typically zoned. The lowest stature vegetation occurs in the center of the system, with woodlands on the edges and in the smaller occurrences. The communities have in common a dense shrub layer of wetland shrubs tolerant of the organic soils, low nutrient conditions, and fire. *Ilex glabra*, *Lyonia lucida*, *Lyonia mariana*, *Cyrilla racemiflora*, *Ilex coriacea*, and *Zenobia pulverulenta* are characteristic and usually dominant in some combination, along with *Smilax laurifolia*. *Pinus serotina* is the characteristic tree, and it along with a set of evergreen hardwoods, including *Gordonia lasianthus*, *Magnolia virginiana*, and *Persea palustris*, are generally the only trees present. Under pre-European settlement fire regimes, stands of *Arundinaria gigantea ssp. tecta* (canebrakes) would have been more common and extensive. Component communities tend to be low in plant species richness, and woody species richness exceeds herbaceous in most associations, with herbs being limited to small open patches. These areas would have formerly been more extensive under pre-European settlement fire regimes. The dominance of pond pine and evergreen shrubs as opposed to a canopy of deciduous hardwoods distinguishes this system from nonriverine swamp forests (CES203.304).

Dynamics: Fire is an important factor in these systems, with the pre-settlement fire regime probably being very different from that observed under current conditions. Natural fire-return intervals are not well known, but are probably on the order of a decade or two in the wettest areas. Peripheral areas may be subject to fire as often as the surrounding vegetation burns, which may naturally have been an average of 3 years. Fires are typically intense due to density and flammability of the vegetation, killing all above-ground vegetation. They are followed by vigorous root sprouting by shrubs and hardwoods, leading to recovery of standing biomass within a few years. *Pinus serotina* recovers by epicormic sprouting or by regeneration from seeds released from serotinous cones. Fires during droughts may ignite peat, forming holes that take longer to recover. Herb-dominated openings in pocosins may depend on peat fires, though this is not well documented. Natural fires occur in large patches, creating a shifting patch structure in the system that interacts with the vegetational zonation created by peat depth. The intensity of fire in these systems makes fire control difficult; prescribed burning is seldom done, and wild fires continue to be a significant influence. The larger peatlands are believed to have been created by paludification following natural blocking of drainage (Otte 1981). Peat buildup raises the water table in the center, creating the domed structure of the largest peatlands and allowing the wetland to spread out as wetness is increased at the edges. Most deeper pocosin peats contain fossil logs that indicate dominance by a swamp forest in past millennia. Otte (1981) noted that peat fires likely limit the height to which the peat can accumulate, in proportion to how high it can raise the local water table.

MEMBERSHIP

Associations:

- *Arundinaria gigantea* ssp. *tecta* Shrubland (CEGL003843, G1)
- *Chamaedaphne calyculata* - *Vaccinium macrocarpon* / *Carex striata* var. *striata* - *Woodwardia areolata* Dwarf-shrubland (CEGL004165, G1)
- *Chamaedaphne calyculata* / *Carex striata* var. *striata* - *Sarracenia (flava, purpurea, rubra* ssp. *rubra)* Dwarf-shrubland (CEGL004164, G1)
- *Chamaedaphne calyculata* / *Carex striata* var. *striata* - *Woodwardia virginica* Dwarf-shrubland (CEGL004163, G1G2)
- *Cyrilla racemiflora* - *Persea palustris* - *Magnolia virginiana* Shrubland (CEGL004449, G2)
- *Cyrilla racemiflora* - *Zenobia pulverulenta* Shrubland (CEGL003943, G2G3)
- *Gordonia lasianthus* - *Magnolia virginiana* - *Persea palustris* / *Sphagnum* spp. Forest (CEGL007044, G4)
- *Ilex glabra* - *Lyonia lucida* - *Zenobia pulverulenta* Shrubland (CEGL003944, G2)
- *Magnolia virginiana* - *Persea palustris* / *Lyonia lucida* Forest (CEGL007049, G3?)
- *Pinus serotina* - *Gordonia lasianthus* / *Lyonia lucida* Woodland (CEGL003671, G3)
- *Pinus serotina* / *Arundinaria gigantea* ssp. *tecta* Wooded Shrubland (CEGL003851, G1)
- *Pinus serotina* / *Arundinaria gigantea* ssp. *tecta* Woodland (CEGL004433, G1)
- *Pinus serotina* / *Cyrilla racemiflora* - *Lyonia lucida* - *Ilex glabra* Woodland (CEGL003670, G3)
- *Pinus serotina* / *Ilex glabra* / *Woodwardia virginica* Woodland (CEGL004652, G2?)
- *Pinus serotina* / *Lyonia lucida* - *Ilex glabra* - (*Cyrilla racemiflora*) Shrubland (CEGL003846, G3)
- *Pinus serotina* / *Morella cerifera* / *Osmunda regalis* var. *spectabilis* Woodland (CEGL003669, G2?)
- *Pinus serotina* / *Zenobia pulverulenta* - *Cyrilla racemiflora* - *Lyonia lucida* Wooded Shrubland (CEGL004458, G2?)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Arundinaria gigantea* Saturated Wooded Shrubland Alliance (A.804)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Lyonia lucida* - *Ilex glabra* Saturated Wooded Shrubland Alliance (A.805)
- *Magnolia virginiana* - *Persea palustris* Saturated Forest Alliance (A.60)
- *Pinus serotina* Saturated Woodland Alliance (A.581)
- *Zenobia pulverulenta* - *Cyrilla racemiflora* Saturated Wooded Shrubland Alliance (A.1055)
- *Zenobia pulverulenta* - *Lyonia lucida* - *Ilex (coriacea, glabra)* Saturated Shrubland Alliance (A.1054)

SPATIAL CHARACTERISTICS

Spatial Summary: This system occurs both as large patches in domed peatlands and large Carolina bays, and as complexes or isolated individual small patches in swales. Large patches tend to be homogeneous systems, while small patches often occur in mosaics with other systems. Large patches are usually zoned, with large patches of different associations.

Size: Occurs as both large patches, a few up to 10,000 acres or more, and also as small patches. Small patches are often in complexes, with many in close proximity.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Central Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536)
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)

Adjacent Ecological System Comments: Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281) and Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536) may be the most adjacent systems in the southern part of the range, and in swale and Carolina bay occurrences. Nonriverine swamp systems are the most frequently associated in the northern half

of the range.

DISTRIBUTION

Range: This systems is found primarily in North Carolina, extending into northern South Carolina and southeastern Virginia.

Divisions: 203:C

Nations: US

Subnations: NC, SC, VA

Map Zones: 58:C, 60:C

TNC Ecoregions: 57:C

SOURCES

References: Comer et al. 2003, Otte 1981, Richardson 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723219#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 11 Dec 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN SMALL BLACKWATER RIVER FLOODPLAIN FOREST (CES203.249)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Blackwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9318

CONCEPT

Summary: This system encompasses the floodplains of small to medium blackwater rivers, intermediate between the smaller streams and the largest rivers. Blackwater rivers originate in the sandy areas of the Coastal Plain and have less well-developed depositional alluvial landforms. Soils are sandy or mucky, acidic, and infertile. Vegetation is a mosaic of cypress and gum swamps and bottomland hardwoods of a limited set of oaks and other species. In general vegetation is low in species richness.

Classification Comments: The distinction between brownwater and blackwater rivers is sometimes problematic. A number of plant species are characteristic of brownwater floodplains and not blackwater. Well-developed blackwater rivers may be confined to areas with primarily sandy soils. The boundary between systems based on river/stream size is necessarily somewhat arbitrary, but is based on significant differences which correspond with river size. Smaller streams have smaller watersheds, which tend to lead to more variable water levels and irregular flooding. Depositional landforms are small enough that they do not differentiate communities well, and communities tend to have more of a mixture of species that are segregated on the larger floodplains. Large rivers have greater variation in water levels and have flood regimes that integrate the effects of very large watersheds. Depositional landforms are larger, and communities can be more segregated.

Similar Ecological Systems:

- Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
- Northern Atlantic Coastal Plain Stream and River (CES203.070)

Related Concepts:

- Bottomland Forest (FNAI 1990) Intersecting
- Floodplain Forest (FNAI 1990) Intersecting
- Floodplain Swamp (FNAI 1990) Intersecting

DESCRIPTION

Environment: Occurs in floodplains of medium to small Coastal Plain rivers that carry little mineral sediment (blackwater rivers). These rivers have their headwaters in sandy portions of the Coastal Plain. The water is usually strongly stained by tannins but has little suspended clay and is not turbid. Depositional landforms such as natural levees and backswamps are usually not well-developed, but point bars, ridge-and-swale systems (scrollwork), and sloughs caused by river meandering may be prominent. Soils are generally sandy in drier portions of the floodplain, mucky in wetter portions, and are very acidic. Spring-fed rivers may have calcareous water and non-acid soils. Flooding ranges from semipermanent in the wettest areas to intermittent and short on the higher portions of the floodplain. The sandy soils may make some higher areas within the floodplain well-drained and dry when not flooded. The highest terraces may no longer flood at all and belong to a different system.

Vegetation: Vegetation consists largely of forests dominated by wetland trees species. Non-forested vegetation is present only on recently deposited bars and in oxbow lakes. The lowest, wettest areas have some combination of *Taxodium distichum*, *Taxodium ascendens*, and *Nyssa biflora*. *Nyssa aquatica* is generally scarce or absent. Higher portions of the floodplain have forests with combinations of a small set of wetland oaks and other species, including *Quercus laurifolia*, *Quercus lyrata*, *Quercus nigra*, *Liquidambar styraciflua*, *Pinus taeda*, *Magnolia virginiana*, and other species. Overall canopy species richness in a given site and over the system as a whole is lower than in comparable brownwater river systems. The distinctive levee assemblage of trees in brownwater river systems is largely lacking, though *Betula nigra*, *Salix nigra*, *Salix caroliniana*, and *Planera aquatica* may dominate banks and bars. The wettest forests are sometimes simple in structure, with an understory but little shrub or herb layer, but the other communities tend to have well-developed understories, shrub, and herb layers. Woody vines are usually prominent.

Dynamics: Flooding is the most important ecological factor in this system. Frequency and duration of flooding determine the occurrences of different associations and separate the system from other kinds of wetlands. Flooding brings nutrients and excludes non-flood-tolerant species. When flooded, the system may have a substantial aquatic faunal component, with high densities of invertebrates, and may play an important role in the life cycle of fish in the associated river. Unusually long or deep floods may stress vegetation or act as a disturbance for some species. Larger floods cause local disturbance by scouring and depositing sediment along channels, and occasionally causing channel shifts. However, the low gradient and binding of sediment by vegetation generally makes these processes much slower and less frequent than in river systems of most other regions. Except for primary successional communities such as bars, most forests exist naturally as multi-aged old-growth forests driven by gap-phase regeneration. Wind throw is probably the most important cause of gaps. Fire is not believed to be important, due to low flammability of much of the vegetation, wetness, and abundance of natural firebreaks. However, some areas of bottomlands apparently were once canebrakes, which

presumably were maintained by periodic fire.

MEMBERSHIP

Associations:

- *Eragrostis hypnoides* - *Micranthemum umbrosum* - *Lipocarpha micrantha* - (*Juncus repens*) Herbaceous Vegetation (CEGL004341, G2)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Nuphar lutea* ssp. *sagittifolia* Herbaceous Vegetation (CEGL004328, G3?)
- *Pinus glabra* - *Quercus virginiana* - *Carya glabra* / *Carpinus caroliniana* / *Serenoa repens* Forest (CEGL004676, G2G3)
- *Pinus taeda* - *Quercus laurifolia* - *Chamaecyparis thyoides* - (*Quercus virginiana*) / *Vaccinium elliottii* Forest (CEGL007548, G2?)
- *Pinus taeda* - *Quercus laurifolia* / *Vaccinium elliottii* - *Arundinaria gigantea* Forest (CEGL004736, G3G4)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Quercus laurifolia* - *Quercus lyrata* / *Carpinus caroliniana* - *Persea palustris* / *Vaccinium elliottii* Forest (CEGL004737, G4?)
- *Quercus lyrata* - *Quercus laurifolia* - *Taxodium distichum* / *Saururus cernuus* Forest (CEGL004735, G3G5)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* / *Fraxinus caroliniana* / *Itea virginica* Forest (CEGL007432, G3G4)
- *Taxodium distichum* - *Nyssa biflora* / *Fraxinus caroliniana* / *Lyonia lucida* Forest (CEGL004733, G3G4)

Alliances:

- *Eragrostis hypnoides* - *Lipocarpha micrantha* - *Micranthemum umbrosum* Seasonally Flooded Herbaceous Alliance (A.1816)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system, often contiguous over thousands of acres. Could potentially be regarded as matrix.

Size: This system occurs in broad linear bodies that are usually at least a mile wide, sometimes several miles wide, and may be dozens of miles long. The natural limitations on development and conversion often result in contiguous patches of tens of thousands of acres in natural or semi-natural condition. Areas of vegetation in good condition are more likely to be hundreds of acres, bordered by young forests, clearcut areas, or pine plantations.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)
- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Central Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)

Adjacent Ecological System Comments: Generally bordered by upland hardwood systems on bluffs, by longleaf pine or Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267). Riverine aquatic systems are closely associated.

DISTRIBUTION

Range: This system is potentially found throughout the Atlantic Coastal Plain north to about the James River in Virginia, but it is most abundant in North Carolina and South Carolina.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC

Map Zones: 55:C, 58:C, 60:P

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723236#references

Description Author: M. Schafale and R. Evans

Version: 23 Sep 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN SMALL BROWNWATER RIVER FLOODPLAIN FOREST (CES203.250)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9315

CONCEPT

Summary: This system encompasses the floodplains of small to medium brownwater rivers of the Atlantic Coastal Plain which are intermediate between the smaller streams and the largest rivers. Brownwater rivers originate in clayey areas and carry substantial amounts of mineral sediment, creating well-developed deposition alluvial landforms and fertile soils. Vegetation is a mosaic of cypress and gum swamps, oak-dominated bottomland hardwoods, and mixed levee forests, with only local non-forested communities. **Classification Comments:** The distinction between brownwater and blackwater rivers is sometimes problematic. A number of plant species are characteristic of brownwater floodplains and not blackwater. Well-developed blackwater rivers may be confined to areas with primarily sandy soils. The boundary between systems based on river/stream size is necessarily somewhat arbitrary, but is based on significant differences which correspond with river size. Smaller streams have smaller watersheds, which tend to lead to more variable water levels and irregular flooding. Depositional landforms are small enough that they don't differentiate communities well, and communities tend to have more of a mixture of species that are segregated on the larger floodplains. Large rivers have greater variation in water levels and have flood regimes that integrate the effects of very large watersheds. Depositional landforms are larger, and communities can be more segregated.

This system as defined covers a large geographic range. There are some significant biogeographic differences across this range, leading to a large number of associations. However, more plant species are shared across the region in this system than in most other systems in the region.

Similar Ecological Systems:

- Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
- Northern Atlantic Coastal Plain Stream and River (CES203.070)

DESCRIPTION

Environment: Occurs in floodplains of medium to small Coastal Plain rivers that carry significant mineral sediment (brownwater or redwater rivers). These rivers have their headwaters in the Piedmont, Blue Ridge, Interior Plateaus, or in portions of the Coastal Plain where fine-textured sediment predominates. The water generally carries substantial amounts of silt, clay, and sometimes sand. Depositional landforms such as point bars, natural levees, backswamps, and ridge-and-swale systems (scrollwork) are well-developed and form patterns of significant variation in flooding duration and nutrient input. Soil texture varies from sandy to clayey. Soils are generally fertile and not strongly acidic. Flooding ranges from semipermanent in the wettest areas to intermittent and short on the higher portions of the floodplain. The highest terraces may no longer flood at all and belong to a different system.

Vegetation: Vegetation consists largely of forests dominated by wetland tree species. Non-forested vegetation is present only on recently deposited bars and in oxbow lakes. Three distinct groups of associations can be recognized. The lowest, wettest areas have some combination of *Taxodium distichum* and *Nyssa aquatica* dominating. Natural levees and riverfronts have a diverse mixture of trees that typically includes *Platanus occidentalis*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Acer negundo*, and other species that benefit from the high light levels and heavy alluvial deposition of these sites. Moderate to high parts of the floodplain away from the levee are usually dominated by bottomland hardwoods, various mixtures of wetland oaks, including *Quercus laurifolia*, *Quercus michauxii*, *Quercus pagoda*, and sometimes a number of other oak species, along with *Liquidambar styraciflua*, but other species are sometimes codominant. The wettest forests are sometimes simple in structure, with an understory but little shrub or herb layer, but the other communities tend to have well-developed understories, shrub, and herb layers. Woody vines are usually prominent.

Dynamics: Flooding is the most important ecological factor in this system. Frequency and duration of flooding determines the occurrences of different associations and separates the system from other kinds of wetlands. Flooding brings nutrients and excludes non-flood-tolerant species. When flooded, the system has a substantial aquatic faunal component, with high densities of invertebrates, and may play an important role in the life cycle of fish in the associated river. Unusually long or deep floods may stress vegetation or act as a disturbance for some species. Larger floods cause local disturbance by scouring and depositing sediment along channels, and occasionally causing channel shifts. However, the low gradient and binding of sediment by vegetation generally makes these processes much slower and less frequent than in river systems of most other regions. Except for primary successional communities such as bars, most forests exist naturally as multi-aged old-growth forests driven by gap-phase regeneration. Wind throw is probably the most important cause of gaps. Fire is not believed to be important, due to low flammability of much of the vegetation, wetness, and abundance of natural firebreaks. However, some areas of bottomlands apparently were once canebrakes, which presumably were maintained by periodic fire.

MEMBERSHIP

Associations:

- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Celtis laevigata* - *Fraxinus pennsylvanica* - *Acer negundo* - (*Juglans nigra*) / *Asimina triloba* / *Carex grayi* Forest (CEGL004740, G3G5)
- *Cornus amomum* - *Alnus serrulata* Shrubland (CEGL006414, GNR)
- *Fagus grandifolia* - *Liquidambar styraciflua* - *Quercus (michauxii, nigra)* Forest (CEGL007866, G3?)
- *Fraxinus pennsylvanica* - *Quercus laurifolia* - *Quercus lyrata* - *Carya aquatica* Forest (CEGL004695, G3G4)
- *Fraxinus pennsylvanica* - *Ulmus americana* / *Carpinus caroliniana* / *Boehmeria cylindrica* Forest (CEGL007806, G4?)
- *Fraxinus pennsylvanica* / *Cornus foemina* / *Carex bromoides* Forest (CEGL007742, G3G4)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*) Temporarily Flooded Forest (CEGL007330, GNA)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Onoclea sensibilis* Forest (CEGL007329, G4)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Nyssa biflora* - *Liquidambar styraciflua* / *Glyceria septentrionalis* - *Hydrocotyle ranunculoides* Forest (CEGL007743, G3G4)
- *Pinus glabra* - *Quercus (laurifolia, michauxii, nigra)* / *Carpinus caroliniana* ssp. *caroliniana* / *Sabal minor* Forest (CEGL007544, G3G4)
- *Pinus glabra* - *Quercus virginiana* - *Carya glabra* / *Carpinus caroliniana* / *Serenoa repens* Forest (CEGL004676, G2G3)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) / *Asimina triloba* Forest (CEGL006603, G3G4)
- *Platanus occidentalis* - *Celtis laevigata* - *Fraxinus pennsylvanica* / *Lindera benzoin* - *Ilex decidua* / *Carex retroflexa* Forest (CEGL007730, G4?)
- *Populus deltoides* - *Salix caroliniana* Forest (CEGL007343, G4G5)
- *Populus deltoides* - *Salix nigra* / *Mikania scandens* Forest (CEGL007346, G4G5)
- *Populus deltoides* / *Acer negundo* / *Boehmeria cylindrica* Forest (CEGL007731, G3G5)
- *Quercus (phellos, palustris, michauxii)* - *Liquidambar styraciflua* / *Cinna arundinacea* Forest (CEGL006605, G3G4)
- *Quercus laurifolia* - *Quercus michauxii* - *Liquidambar styraciflua* / *Carpinus caroliniana* Forest (CEGL004678, G3G4)
- *Quercus lyrata* - *Carya aquatica* Forest (CEGL007397, G4G5)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Salix nigra* - *Fraxinus pennsylvanica* Forest (CEGL007734, G3G4)
- *Salix nigra* / (*Clethra alnifolia*, *Morella cerifera*) / *Nyssa aquatica* Successional Forest (CEGL007411, GNA)
- *Taxodium distichum* - *Fraxinus pennsylvanica* - *Quercus laurifolia* / *Acer rubrum* / *Saururus cernuus* Forest (CEGL007719, G3G4)
- *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* / *Fraxinus caroliniana* / *Itea virginica* Forest (CEGL007432, G3G4)
- *Taxodium distichum* - *Nyssa aquatica* / *Fraxinus caroliniana* Forest (CEGL007431, G5?)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Pinus glabra* - *Quercus (laurifolia, michauxii, nigra)* Temporarily Flooded Forest Alliance (A.431)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)

SPATIAL CHARACTERISTICS

Spatial Summary: Linear system, often contiguous over thousands of acres. Could potentially be regarded as matrix.

Size: This system occurs in broad linear bodies that are usually several miles wide and may be hundreds of miles long. The natural limitations on development and conversion often result in contiguous patches of tens of thousands of acres in natural or semi-natural condition. Areas of vegetation in good condition are more likely to be hundreds to possibly thousands of acres, bordered by young forests, clearcut areas, or pine plantations.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)

Adjacent Ecological System Comments: Generally bordered by upland hardwood systems on bluffs or adjacent high terraces. Riverine aquatic systems are closely associated.

DISTRIBUTION

Range: This ranges throughout the Atlantic Coastal Plain from Georgia, north to about the James River in Virginia.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC

Map Zones: 55:C, 58:C, 60:C

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723235#references

Description Author: M. Schafale and R. Evans

Version: 23 Sep 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1468 ATLANTIC COASTAL PLAIN STREAMHEAD SEEPAGE SWAMP, POCOSIN, AND BAYGALL (CES203.252)

CLASSIFIERS

Conf.: 3 - Weak

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Seepage-Fed Sloping

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2468; ESLF 9137; ESP 1468

CONCEPT

Summary: This system encompasses seepage-fed wetlands in dissected Coastal Plain landscapes, from southeastern Virginia to northeastern Florida. Examples are usually associated with ravines or along headwater streams. Overbank flooding is a negligible influence. Fire may be an important force in some associations and not in others. Vegetation consists of open to closed forest of acid-tolerant wetland hardwoods or pine. Generally there is a dense shrub layer consisting primarily of species shared with Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267).

Classification Comments: This system is very heterogeneous in vegetation and in the role of fire, as well as extensive in geographic range. It might be appropriate to split it into two or even three systems. The streamhead pocosins of the Fall-line Sandhills region of North Carolina and northern South Carolina (EPA 65c), as well as related areas of Georgia, Florida, and southern Virginia are distinctive in being strongly fire-dominated, having pine as a major canopy dominant, and having a flora consisting largely of pocosin species. The closely related white-cedar- and cane-dominated associations would also fit into this system. A second set of associations ranging from South Carolina through the Gulf Coastal Plain has vegetation that suggests less influence by fire, including hardwood canopies and shrub layers that are primarily pocosin species but share some other wetland species. A third set, from a wider variety of topographic settings throughout the region, has hardwood canopies and shrub and herb layers with less peatland affinities, more closely related to floodplain communities. Their flora suggests a minor role for fire.

This system is distinguished from Atlantic Coastal Plain Sandhill Seep (CES203.253) by the predominance of woody vegetation indicative of less frequent fire. Where the two co-occur, it occurs in larger and topographically lower patches. This system is distinguished from Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267), which may have fairly similar flora, by having seepage-dominated hydrology and occurring in dissected landscapes.

Similar Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Atlantic Coastal Plain Sandhill Seep (CES203.253)
- Piedmont Seepage Wetland (CES202.298)

Related Concepts:

- Baygall (FNAI 1990) Undetermined
- Streamhead pocosins (Fleming et al. 2005) Finer

DESCRIPTION

Environment: This system occurs in dissected Coastal Plain terrain on sites saturated by seepage of shallow groundwater. Seasonal to permanent saturation combined with fire of only moderate to low frequency and woody vegetation are the unifying characteristics of this system. A stream is often present draining the site, but it is small, and overbank flooding is a negligible influence. Most examples are in bottoms of ravines, but some are on sideslopes or flats at the base of slopes. Most examples are in sandy areas where rapid soil drainage in the surrounding landscape supplies the seepage. Soils within the system itself are generally mucky sands or clay, or deeper organic soils. This system occurs in landscapes that had frequent fire under natural conditions, but the wetness sometimes limited fire spread, creating a less frequent fire-return interval. Natural fire intensity varies among associations, with some readily producing intense fire when they burn, while others probably experience only low-intensity fires because of low flammability.

Vegetation: Vegetation is dominated by woody plants. An open to closed tree canopy is usually present and consists of a mixture of acid-tolerant wetland trees such as *Nyssa biflora*, *Acer rubrum*, *Pinus serotina*, *Magnolia virginiana*, *Liriodendron tulipifera*, and *Chamaecyparis thuyoides*. There is generally a dense shrub layer that is dominated by species shared with pocosins or baygalls, such as *Cyrilla racemiflora*, *Leucothoe axillaris*, *Lyonia lucida*, *Lyonia ligustrina*, *Clethra alnifolia*, *Cliftonia monophylla*, *Ilex glabra*, and *Arundinaria gigantea ssp. tecta*, but includes some species of other saturated wetlands, such as *Toxicodendron vernix*, *Morella caroliniensis*, *Persea palustris*, and *Viburnum nudum*. *Smilax laurifolia* may be abundant. The herb layer, if well-developed at all, generally consists of large wetland ferns, such as *Osmunda cinnamomea*, *Osmunda regalis var. spectabilis*, *Woodwardia virginica*, and *Woodwardia areolata*, with *Carex* spp.

Dynamics: Seepage is the most important ecological factor determining this system, but probably varies relatively little. Fire is the most important dynamic process in many examples. Fire frequency and intensity vary among associations, from moderately frequent intense fires to infrequent low-intensity fires.

MEMBERSHIP

Associations:

- *Arundinaria gigantea* ssp. *tecta* Shrubland (CEGL003843, G1)
- *Chamaecyparis thyoides* - (*Liriodendron tulipifera*) / *Lyonia lucida* Forest (CEGL007563, G2)
- *Cyrilla racemiflora* - *Cliftonia monophylla* Shrubland (CEGL003847, G4)
- *Gordonia lasianthus* / *Woodwardia virginica* - *Osmunda regalis* var. *spectabilis* Forest (CEGL004410, G2G3)
- *Ilex coriacea* - *Lyonia lucida* - *Smilax laurifolia* Shrubland (CEGL004666, G3G4)
- *Magnolia virginiana* - *Nyssa biflora* / *Carpinus caroliniana* / *Thelypteris noveboracensis* - *Athyrium filix-femina* Forest (CEGL004722, G3G4)
- *Nyssa biflora* - (*Acer rubrum*) / *Ilex opaca* / *Leucothoe axillaris* / *Carex atlantica* ssp. *capillacea* Forest (CEGL004427, G2G3)
- *Nyssa biflora* - *Acer rubrum* var. *trilobum* - *Liriodendron tulipifera* / *Ilex coriacea* - *Lyonia lucida* Forest (CEGL004645, G3)
- *Pinus serotina* - (*Liriodendron tulipifera*) / *Lyonia lucida* - *Clethra alnifolia* - *Ilex glabra* Woodland (CEGL004435, GNR)
- *Pinus serotina* / *Gordonia lasianthus* - *Persea palustris* Saturated Woodland (CEGL007996, G3?Q)
- *Pinus serotina* / *Sporobolus floridanus* - *Aristida beyrichiana* Woodland (CEGL003797, G2)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Magnolia virginiana* - *Persea palustris* Saturated Forest Alliance (A.60)
- *Nyssa biflora* - *Acer rubrum* - (*Liriodendron tulipifera*) Saturated Forest Alliance (A.351)
- *Pinus serotina* Saturated Woodland Alliance (A.581)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurs as large patches or as long narrow bodies following ravines, often in dendritic networks interfingering with upland systems.

Size: Most occurrences are in narrow bodies that may be very local or may be long and connected in dendritic networks. Networks may contain hundreds of contiguous acres but with few areas very far from an edge.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)
- Atlantic Coastal Plain Sandhill Seep (CES203.253)

Adjacent Ecological System Comments: Most frequently associated with Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254) in the northern part of the range. Potentially associated with a variety of upland systems in the southern part of the range. Many examples will grade downstream to small or large floodplain systems.

DISTRIBUTION

Range: Primarily in the Fall-line Sandhills region of the Atlantic Coastal Plain; rarely in dissected terrain in the Outer Coastal Plain.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC, VA

Map Zones: 55:C, 58:C, 59:C, 60:C

USFS Ecomap Regions: 232C:CC, 232I:CP, 232Ja:CCC

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723233#references

Description Author: M. Schafale and R. Evans

Version: 05 Apr 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1470 CARIBBEAN COASTAL WETLAND SYSTEMS (CES411.626)

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Tropical/Subtropical; Tidal / Estuarine

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2470; ESLF 9139; ESP 1470

CONCEPT

Summary: This systems group includes mangrove and other tidal wetlands of tropical southern Florida. It occurs along intertidal and supratidal shorelines in southern and western Florida, north to Tampa Bay. The primary species comprising this system are *Rhizophora mangle*, *Avicennia germinans*, *Laguncularia racemosa*, and *Conocarpus erectus*, each with essentially tropical affinities and poor survival in cold temperatures. Other salt-tolerant species may also be present, although the combined stresses of flooding and salinity tend to result in limited competition (FNAI 1990), lack of plant species richness, and relatively simple stand structure (Mendelssohn and McKee 1988). This system group attains best development in low wave-energy, depositional environments, including barrier islands developed on remnant limestone reefs. Examples occur on soils generally saturated with brackish water at all times and which become inundated during high tides. The brackish environment tends to limit competition from other species. At least four broad variants of this system can be recognized, i.e., riverine mangrove forests, fringe mangrove forests, basin mangrove forests (Lugo et al. 1988), and barrier mangrove forests (Montague and Wiegert 1990).

MEMBERSHIP

Standard Ecological Systems:

- South Florida Mangrove Swamp (CES411.289)
- Southwest Florida Perched Barriers Tidal Swamp and Lagoon (CES203.540)

DISTRIBUTION

Range: This systems group occurs along the western and southern coast of Florida from Tampa south.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C, 55:C

SOURCES

References: Albert 1975, FNAI 1990, Lewis et al. 1979, Lugo and Snedaker 1974, Mendelssohn and McKee 1988, Montague and Wiegert 1990, Odum and McIvor 1990, Odum et al. 1982, Rehm 1976, Savage 1972, Sherrod and McMillan 1985, Soil Conservation Service 1981a, Southeastern Ecology Working Group n.d., Teas 1977

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.784934#references

Description Author: M. Pyne, mod. S.C. Gawler

Version: 23 Jan 2007

Concept Author: Southeastern Ecology Group

Stakeholders: Southeast

ClassifResp: Southeast

1478 CARIBBEAN SWAMP SYSTEMS (CES411.634)

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tropical/Subtropical; Extensive Wet Flat; Broad-Leaved Tree; Palm or Sabal

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2478; ESLF 9147; ESP 1478

CONCEPT

Summary: These raised hammocks of southern Florida are dominated by hardwood tree species. They occur on slightly elevated sites, either as "tree islands" amid the Everglades marshes (bayhead swamps) or adjacent to floodplains where they are only infrequently subject to overbank flooding (hydric hammocks). These wetlands have high water tables and/or ponded surface water, and peaty or mucky soils. Patches range in size from one-quarter acre to 300 or more acres. Some examples, particularly the bayhead swamps, are adjacent to fire-prone marshes, but these swamps burn only under extreme drought conditions. *Quercus laurifolia*, *Magnolia virginiana*, and *Sabal palmetto* are characteristic species.

MEMBERSHIP

Standard Ecological Systems:

- South Florida Bayhead Swamp (CES411.366)
- South Florida Hydric Hammock (CES411.273)

DISTRIBUTION

Range: This systems group is endemic to southern Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Alexander 1967, FNAI 1990, FNAI 1997, Gunderson and Loftus 1993, Loveless 1959, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.784942#references

Description Author: S.C. Gawler

Version: 23 Jan 2007

Concept Author: Southeastern Ecology Group

Stakeholders: Southeast

ClassifResp: Southeast

1501 CENTRAL ATLANTIC COASTAL PLAIN NONRIVERINE SWAMP AND WET HARDWOOD FOREST (CES203.304)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Extensive Wet Flat; Needle-Leaved Tree; Broad-Leaved Tree

Non-Diagnostic Classifiers: Organic Peat (>40 cm); Mineral: W/ A-Horizon >10 cm

FGDC Crosswalk: Vegetated, Tree-dominated

National Mapping Codes: EVT 2501; ESLF 9310; ESP 1501

CONCEPT

Summary: This system consists of poorly drained, organic or mineral soil flats of the outer Atlantic Coastal Plain. These areas are saturated by rainfall and seasonal high water tables without influence of river or tidal flooding. Fire is generally infrequent but may be important for some associations. Vegetation consists of hardwood or mixed forests of *Taxodium distichum*, *Nyssa* spp., bottomland oaks, *Acer rubrum*, or other wetland trees of similar tolerance. The lower strata have affinities with pocosin or baygall systems rather than the river floodplain systems that have affinities with the canopy. The combination of hardwood/deciduous canopy dominants and nonriverine, non-seepage hydrology distinguishes this system from other Coastal Plain systems. Stands with a high cover of *Chamaecyparis thyoides* formerly occupied much of the acreage of this system. This phase is presently only present in high-quality examples, and it helps distinguish this system from other Coastal Plain systems. Disturbed and fire-disrupted examples (those dominated by *Nyssa* spp., bottomland oaks, *Acer rubrum*) may be hard to distinguish from other wetland forests based purely on canopy composition.

Classification Comments: This system contains two to three distinctive subgroups within it. A wetter group has communities containing significant amounts of *Taxodium* or *Nyssa*. A drier group has communities with *Quercus* as a significant component. Within this group the calcareous association (CEGL007316) is very distinctive floristically.

The combination of canopy species with nonriverine hydrology distinguishes this system from all others. This system is distinguished from the various floodplain systems, with which the canopy shares affinities, by the distinctive hydrology and the differences in nutrient dynamics and other ecosystem process that follow from it. The overall flora is usually distinct and reflects these differences in nutrient status. The invertebrate fauna is likely very distinct. This system is distinguished from Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267), which can share organic soils and a number of shrub and herb species, by the canopy dominants and the lack of *Pinus serotina* and evergreen hardwoods as major canopy components. Fire frequency is an important difference. It is unclear if fire frequency determines the difference in vegetation or if the different flammability of the vegetation determines the fire regime.

The boundary between this system and Southern Coastal Plain Hydric Hammock (CES203.501) of Florida and Georgia may need clarification.

Similar Ecological Systems:

- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)
- Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)

Related Concepts:

- Non-alluvial swamp forest (Nelson 1986) Finer
- Peatland Atlantic White Cedar Forest (Schafale and Weakley 1990) Finer
- Peatland Atlantic White Cedar Forest (Schafale 2003b) Finer

DESCRIPTION

Environment: This system occurs on flat areas of the outer Atlantic Coastal Plain, where soils are seasonally to nearly semipermanently saturated because of low relief, poor soil drainage, and seasonal high water table. The largest areas are on broad interfluvial flats, but substantial areas occur on organic deposits in drowned river valleys in the Embayed Region of North Carolina and Virginia, beyond the reach of the influence of wind tides. Hydrology is dominated by rainfall and sheetflow, and overbank flooding, tidal flooding, and seepage are a secondary influence, if at all. Soils may be loamy to clayey, or may be shallow to deep organic. A distinctive small subset has soils with limestone near the surface, influencing soil chemistry. Natural fire is infrequent in this system, and varies from a minor to a significant influence on vegetational composition and structure. Infrequency of fire may be an important factor in differentiating this system from Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267) and the various wet longleaf pine forest systems.

In a phase or component of this system on mucky peat soils (Terric or Typic Medisaprists) up to 3 m deep and occasionally on mucky sand or wet mineral soils with an organic epipedon, Atlantic white-cedar (*Chamaecyparis thyoides*) was the most common dominant species; it occurred in a fire-generated patch mosaic in which the various patch dominants are a variable combination of Atlantic white-cedar, swamp blackgum (*Nyssa sylvatica*), pond pine (*Pinus serotina*), red maple (*Acer rubrum*) and *Taxodium*, most frequently

pond cypress (*Taxodium ascendens*). While this is fire-dominated, it is only found in substantially fire-sheltered portions of the landscape where scarps or water bodies prevent easy access by fire, resulting in a long fire-return interval. The original vegetation constituted a true shifting mosaic. The original extent was up to 1 million acres of which at least 400,000 acres were Atlantic white-cedar in Mapzones 58 and 60. This is a long-interval, fire-dependent, forested peatland with its greatest extent found on the Pamlico Terrace of Virginia and North Carolina. The largest sites lie at less than 9 m (30 feet) above sea level (C. Frost pers. comm.).

Vegetation: Vegetation is a closed-canopy forest of wetland trees. The wetter sites are dominated by combinations of *Taxodium distichum*, *Nyssa biflora*, and occasionally *Nyssa aquatica*, *Pinus taeda*, *Chamaecyparis thyoides*, *Liquidambar styraciflua*, and *Liriodendron tulipifera*. Less wet sites have canopies of wetland oaks such as *Quercus laurifolia*, *Quercus michauxii*, and *Quercus pagoda*. Most communities have a well-developed shrub layer that has more floristic affinities with pocosins or baygalls than with river floodplain communities that have similar canopies. The shrub layer is usually dominated by *Clethra alnifolia*, *Leucothoe axillaris*, or species shared with pocosins. The herb layer is not usually well-developed but may be dense where shrubs are atypically sparse. Wetland ferns, such as *Osmunda regalis* and *Woodwardia areolata*, and *Carex* spp. usually dominate. In the Atlantic white-cedar-related phase of this system, stands that regenerated from crown fire often have nearly pure cover of *Chamaecyparis thyoides*. The most common subcanopy species are *Acer rubrum*, *Persea palustris*, and *Magnolia virginiana*. Typical shrubs include *Ilex glabra*, *Ilex coriacea*, *Leucothoe racemosa*, *Itea virginica*, and *Lyonia lucida*. Herbs, chiefly ferns and sedges, are typically sparse, but mosses may be common (C. Frost pers. comm.).

Dynamics: Fire is an important influence in a subset of this system. Communities dominated by *Chamaecyparis thyoides* depend on fire for regeneration of the canopy trees. The occurrence of fires on the time scale of several decades to a century or more may determine the mosaic of *Chamaecyparis* forests and other associations. Some areas may once have been canebrakes, with dominance of *Arundinaria* determined by more frequent fire. In the oak-dominated communities and in wetter *Taxodium* and *Nyssa* communities, fire is probably of little ecological significance because the vegetation is not flammable. Without fire as a major factor, most communities probably occur naturally as old-growth multi-aged forests dominated by gap-phase regeneration. Hurricanes may create larger canopy gaps occasionally. Examples in drowned river valleys are subject to influence by rising sea level and can be expected to evolve into tidal swamp systems, sometimes fairly quickly.

In specific relation to the *Chamaecyparis*-dominated phase of this system, succession pathways depend on water table depth at time of replacement fire. Having the water table at the surface results in regeneration of *Chamaecyparis thyoides* from the seedbank. If the water table is slightly to moderately below the surface, the seedbank is destroyed and succession is dominated by some combination of *Acer rubrum*, *Nyssa biflora*, *Pinus taeda*, and related taxa. If the water table is well below the surface, the seedbank is destroyed and a deeper hole is created in the peat. In this case, succession is dominated by *Taxodium distichum* and a deeper water area is created with *Chamaecyparis thyoides* only on the edge.

MEMBERSHIP

Associations:

- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Arundinaria gigantea* ssp. *tecta* Shrubland (CEGL003843, G1)
- *Carya cordiformis* - *Quercus pagoda* - *Quercus shumardii* - *Carya myristiciformis* / *Sabal minor* - *Cornus asperifolia* Forest (CEGL007316, G1)
- *Chamaecyparis thyoides* / *Persea palustris* / *Lyonia lucida* - *Ilex coriacea* Forest (CEGL006146, G2)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa biflora* - *Acer rubrum* var. *trilobum* - *Liriodendron tulipifera* / *Magnolia virginiana* - *Asimina triloba* / *Clethra alnifolia* Forest (CEGL004428, G2)
- *Nyssa biflora* - *Liquidambar styraciflua* - *Acer rubrum* var. *trilobum* / *Clethra alnifolia* Forest (CEGL004679, G2?)
- *Pinus taeda* - *Acer rubrum* - *Liquidambar styraciflua* / *Arundinaria gigantea* ssp. *tecta* Forest (CEGL004649, GNA)
- *Pinus taeda* - *Chamaecyparis thyoides* - *Acer rubrum* - *Nyssa biflora* / *Lyonia lucida* - *Clethra alnifolia* Forest (CEGL007558, G2G3)
- *Pinus taeda* - *Nyssa biflora* - *Liquidambar styraciflua* / *Lyonia lucida* Saturated Forest (CEGL007560, GNA)
- *Quercus laurifolia* - *Nyssa biflora* / *Clethra alnifolia* - *Leucothoe axillaris* Forest (CEGL007447, G2G3)
- *Quercus michauxii* - *Quercus pagoda* / *Clethra alnifolia* - *Leucothoe axillaris* Forest (CEGL007449, G2)
- *Quercus pagoda* - *Quercus michauxii* - *Quercus alba* / *Arundinaria gigantea* ssp. *tecta* - *Sabal minor* / *Chasmanthium laxum* Forest (CEGL007849, G2?)
- *Quercus virginiana* - *Quercus nigra* - *Quercus pagoda* - *Liquidambar styraciflua* / *Sabal minor* - *Ilex vomitoria* Forest (CEGL007851, G1G2Q)
- *Taxodium distichum* - *Nyssa biflora* / *Berchemia scandens* - *Toxicodendron radicans* / *Woodwardia areolata* Forest (CEGL004429, G2G3)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Nyssa biflora* - *Acer rubrum* - (*Liriodendron tulipifera*) Saturated Forest Alliance (A.351)
- *Pinus taeda* - *Chamaecyparis thyoides* - *Acer rubrum* - *Nyssa biflora* Saturated Forest Alliance (A.444)
- *Pinus taeda* - *Liquidambar styraciflua* - *Acer rubrum* Saturated Forest Alliance (A.445)

- *Quercus laurifolia* - *Nyssa biflora* Saturated Forest Alliance (A.352)
- *Quercus michauxii* - *Quercus pagoda* Saturated Forest Alliance (A.353)
- *Quercus virginiana* - *Quercus nigra* Saturated Forest Alliance (A.379)
- *Taxodium distichum* - *Nyssa biflora* - (*Nyssa aquatica*) Saturated Forest Alliance (A.355)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurs as large patches in the Embayed Region, as small patches most other places.

Size: Size distribution may vary across the range. In the Embayed Region of North Carolina and Virginia, this system can cover thousands of contiguous acres. Elsewhere in the region, occurrences tend to be much smaller, usually tens of acres. The drier, oak-dominated associations are now known only from remnants with artificial boundaries. Historical stands ranged in size from the Great Dismal Swamp of Virginia and North Carolina, which included the largest Atlantic white-cedar stand of 112,000 acres, associated with a considerable acreage of swamp blackgum and bald-cypress, as well as smaller peatlands of only a 50-100 acres. The scale of disturbances included fires, ranging in size from 50 to >10,000 acres, and winds, especially those associated with hurricanes, in which effects were more limited, typically consisting of locally intense small blowdowns of a few acres each.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)
- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

Adjacent Ecological System Comments: May be bordered by tidal swamps, Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267), upland hardwoods, or less frequently by longleaf pine systems.

DISTRIBUTION

Range: This system ranges from southeastern Virginia to Georgia. This system is most abundant in the Embayed Region of northeastern North Carolina and southeastern Virginia (south of the James River), where it covers large expanses.

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, Frost 1987, Frost pers. comm., Schafale 2003b, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723187#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 02 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1449 CENTRAL ATLANTIC COASTAL PLAIN WET LONGLEAF PINE SAVANNA AND FLATWOODS (CES203.265)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Short Disturbance Interval; Needle-Leaved Tree

Non-Diagnostic Classifiers: Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2449; ESLF 9118; ESP 1449

CONCEPT

Summary: This system of wet *Pinus palustris*-dominated savannas and flatwoods ranges from southern Virginia to southern South Carolina. It was once one of the most extensive systems in the coastward part of its range. Examples and associations share the common features of wet, seasonally saturated, mineral soils and exposure to frequent fire. They occur on a wide range of soil textures, which is an important factor in distinguishing different associations. The vegetation is naturally dominated by *Pinus palustris* or, less frequently, other wetland pines. There is a dense ground cover of herbs and low shrubs; grasses dominate but there is often a large diversity of other herbs. Frequent, low-intensity fire is the dominant natural ecological force.

Classification Comments: This system is distinguished from Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536) because of substantial biogeographic differences. The break is placed at the northern range limit of *Aristida beyrichiana*, which is a keystone species in the communities where it occurs. This corresponds roughly with the geographic break in the upland longleaf pine systems. This system is distinguished from Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281) because of its more upland character. However, the two systems have much in common, including frequent fire and the same primary dominant tree and many herbaceous species. They can also occur in the same landscapes. However, floristic differences are well marked, and no associations are shared. This system occurs primarily in the Outer Coastal Plain, but small patches may occur in atypical landforms in the Fall-line Sandhills. Sandhills examples are not treated as a separate system, as the upland longleaf pine systems are, because they are confined to sites that more resemble the Outer Coastal Plain. They are distinguished in the Sandhills from Atlantic Coastal Plain Sandhill Seep (CES203.253) by landform and apparent hydrology that is driven by seasonal high water table rather than seepage.

Similar Ecological Systems:

- Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)
- Atlantic Coastal Plain Sandhill Seep (CES203.253)
- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536)

DESCRIPTION

Environment: This system occurs on wet mineral soil sites, primarily in the Middle and Outer Coastal Plain but occasionally in the Fall-line Sandhills. Landforms include low areas in relict beach ridge systems and eolian sand deposits, and poorly drained clayey, loamy, or sandy flats. They occasionally occur on river terraces above current flood levels. Soils range from clayey to sandy, with no accumulated organic surface layer. Soils are seasonally saturated, due to high water table or poor soil drainage. The unifying feature of this system is wet mineral soils associated with a high frequency of fire. Variation in soil texture appears to be a primary driver of differences between associations within the system, with biogeography also important.

Vegetation: Vegetation is a set of associations that are naturally woodlands or savannas dominated by *Pinus palustris* or, less frequently, by *Pinus serotina*, *Pinus elliottii*, or some combination. Hardwoods are present in any abundance only in examples altered by fire suppression. The ground cover is a dense combination of herbs and low shrubs. A variety of ericaceous shrubs and hollies is common, with density determined by fire history. Grasses naturally dominate the ground cover. *Aristida stricta* often dominates within its range, but *Ctenium aromaticum*, *Sporobolus pinetorum*, *Sporobolus teretifolius*, or other grasses may dominate. A great diversity of other herbs is often present, including composites, sedges, insectivorous plants, and variety of showy forbs. Communities in this system are often very high in species richness, with some of the highest values measured anywhere at the 1/10-hectare, 1/100-hectare, and 1-square-meter levels. However, some associations are naturally low to moderate in species richness.

Dynamics: Frequent fire is the predominant natural force in this system and is crucial in determining its structure and even its identity. Communities naturally burned every few years, many averaging as often as every 3 years. Fires are naturally low to moderate in intensity. They burn above-ground parts of herbs and shrubs but have little effect on the fire-tolerant trees. Vegetation recovers very quickly from fire, with live herbaceous biomass often restored in just a few weeks. Many plants have their flowering triggered by burning. In the absence of fire, the shrubs increase and hardwoods may invade the system. Herb layer density and diversity decline after just a couple of years without fire. In time, unburned examples will become nearly indistinguishable from the drier associations of Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267).

Canopies are believed to naturally be many-aged, consisting of a fine mosaic of small even-aged groves driven by gap-phase regeneration. Longleaf pine is shade-intolerant and slow to reach reproductive age but is very long-lived. Most plants in this system

appear to be conservative, living a long time and only rarely sexually reproducing or colonizing new sites. Similar conservatism is shown by some of the vertebrates, such as *Picoides borealis*. Different dynamics occur in insect populations, whose individuals are not resilient to fire. Insect populations must recolonize burned areas from nearby unburned patches.

MEMBERSHIP

Associations:

- *Hypericum reductum* / *Aristida stricta* Dwarf-shrubland (CEGL003954, G1G2Q)
- *Pinus palustris* - (*Pinus serotina*) / *Ilex glabra* - *Gaylussacia frondosa* - (*Kalmia carolina*) Woodland (CEGL003647, G2)
- *Pinus palustris* - *Pinus (serotina, taeda)* / *Sporobolus curtissii* - *Muhlenbergia expansa* Woodland (CEGL004085, G1)
- *Pinus palustris* - *Pinus serotina* / *Aristida palustris* - *Sarracenia flava* Woodland (CEGL004498, G1)
- *Pinus palustris* - *Pinus serotina* / *Ctenium aromaticum* - *Muhlenbergia expansa* - *Carphephorus odoratissimus* Woodland (CEGL003658, G3)
- *Pinus palustris* - *Pinus serotina* / *Ctenium aromaticum* - *Muhlenbergia expansa* - *Rhynchospora latifolia* Woodland (CEGL003660, G1)
- *Pinus palustris* - *Pinus serotina* / *Ctenium aromaticum* - *Scleria pauciflora* - *Sarracenia flava* Woodland (CEGL004499, G1)
- *Pinus palustris* - *Pinus serotina* / *Magnolia virginiana* / *Sporobolus teretifolius* - *Carex striata* Woodland (CEGL004500, G1)
- *Pinus palustris* - *Pinus serotina* / *Pilea tenuifolia* - *Aristida stricta* Woodland (CEGL003661, G1)
- *Pinus palustris* - *Pinus serotina* / *Sporobolus pinetorum* - (*Aristida stricta*) - *Eryngium integrifolium* Woodland (CEGL004501, G2)
- *Pinus palustris* - *Pinus serotina* / *Sporobolus pinetorum* - *Ctenium aromaticum* - *Eriocaulon decangulare* var. *decangulare* Woodland (CEGL004502, G1)
- *Pinus palustris* - *Pinus taeda* - *Pinus serotina* / *Quercus marilandica* / (*Quercus pumila*) / *Aristida stricta* Woodland (CEGL003664, G1)
- *Pinus palustris* / *Arundinaria gigantea* ssp. *tracta* - *Liquidambar styraciflua* / *Andropogon glomeratus* - *Sarracenia minor* Woodland (CEGL004495, G1)
- *Pinus palustris* / *Clethra alnifolia* - *Gaylussacia frondosa* - *Quercus pumila* / *Schizachyrium scoparium* Woodland (CEGL004496, G1)
- *Pinus palustris* / *Ilex glabra* / *Aristida stricta* Woodland (CEGL003648, G3)
- *Pinus palustris* / *Leiophyllum buxifolium* / *Aristida stricta* Woodland (CEGL003649, G2?)

Alliances:

- *Hypericum reductum* Temporarily Flooded Dwarf-shrubland Alliance (A.1088)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)

SPATIAL CHARACTERISTICS

Spatial Summary: This system naturally occurs as large to small patches, sometimes part of extensive matrix mosaics with other systems. It was naturally one of the most abundant systems on the lower terraces of the Outer Coastal Plain.

Size: Ranges from large to small patch, which may form a matrix mosaic with other systems. Many remaining examples are naturally bounded islands.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242)
- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)
- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)

Adjacent Ecological System Comments: Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281) and Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267) are the most frequently associated systems. Southern Atlantic Coastal Plain Depression Pondshore (CES203.262) patches may be embedded, and Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249), Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250), and Atlantic Coastal Plain Mesic Hardwood Forest (CES203.242) may adjoin.

DISTRIBUTION

Range: This system ranges from southern Virginia to southern South Carolina. To the south, the equivalent system is Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536), the range of which includes Georgia.

Divisions: 203:C

Nations: US

Subnations: NC, SC, VA

Map Zones: 58:C, 60:C

TNC Ecoregions: 57:C

SOURCES

References: Comer et al. 2003, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723221#references

Description Author: M. Schafale and R. Evans

Version: 02 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Central Interior and Appalachian (202)**Land Cover Class:** Woody Wetland**Spatial Scale & Pattern:** Large patch, Small patch**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Wetland**Diagnostic Classifiers:** Saturated Soil; Forest and Woodland (Treed); Histosoles; Temperate; Extensive Wet Flat; Depressional**FGDC Crosswalk:** Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy**National Mapping Codes:** EVT 2479; ESLF 9148; ESP 1479

CONCEPT

Summary: This systems group includes swamps that occur primarily in the glaciated landscape of the eastern United States, with outliers found to the south of the periglacial landscape. Most are small-patch features, but some may be more extensive in larger basins or wet flats; in either case, they are usually discrete elements of the landscape. The acidic substrate is typically mineral soil with a component of organic muck; there may be a peaty epipedon. In some cases, such as kettleholes, a true peat substrate develops. Vegetation physiognomy ranges from forested swamps to semi-open fens. Forested swamps may be dominated by *Tsuga canadensis* mixed with deciduous wetland trees such as *Acer rubrum* or *Nyssa sylvatica*; or in areas with higher pH and/or nutrient levels, by *Acer rubrum* and *Fraxinus nigra*, with calciphilic herbs and sometimes with *Larix laricina*. High-elevation wetlands in the Allegheny Mountains are characterized by additional northern elements such as *Abies balsamea* and *Picea rubens*, with open shrub- and graminoid-dominated fens and occasional bogs. Common species in the understory layers of these wetlands include *Carex* spp., *Osmunda cinnamomea*, *Cephalanthus occidentalis*, *Alnus* spp., *Rhododendron maximum*, *Hypericum densiflorum*, and *Ilex* spp. The hemlock-dominated swamps generally develop in larger lowland basins. In kettleholes or other deep glacial depressions, semi-open fens develop (colloquially called kettlehole "bogs"), where the nutrient-poor substrate and the reduced throughflow of water create oligotrophic conditions fostering the development of *Sphagnum* peat and the growth of peatland vegetation. Ericaceous shrubs and dwarf-shrubs (e.g., *Chamaedaphne calyculata*) dominate, with patches of graminoid dominance. Some may have a sparse tree layer, with *Acer rubrum* and/or *Nyssa sylvatica* characteristic. Many, though not all, of these swamps have a bryoid layer featuring *Sphagnum*.

DESCRIPTION

Environment: This systems group includes swamps that occur primarily in the glaciated landscape of the eastern United States, with outliers found to the south of the periglacial landscape. Most are small-patch features, but some may be more extensive in larger basins or wet flats; in either case, they are usually discrete elements of the landscape. The acidic substrate is typically mineral soil with a component of organic muck; there may be a peaty epipedon. In some cases, such as kettleholes, a true peat substrate develops.

Vegetation: Vegetation physiognomy ranges from forested swamps to semi-open fens. Forested swamps may be dominated by *Tsuga canadensis* mixed with deciduous wetland trees such as *Acer rubrum* or *Nyssa sylvatica*; or in areas with higher pH and/or nutrient levels, by *Acer rubrum* and *Fraxinus nigra*, with calciphilic herbs and sometimes with *Larix laricina*. High-elevation wetlands in the Allegheny Mountains are characterized by additional northern elements such as *Abies balsamea* and *Picea rubens*, with open shrub- and graminoid-dominated fens and occasional bogs. Common species in the understory layers of these wetlands include *Carex* spp., *Osmunda cinnamomea*, *Cephalanthus occidentalis*, *Alnus* spp., *Rhododendron maximum*, *Hypericum densiflorum*, and *Ilex* spp. The hemlock-dominated swamps generally develop in larger lowland basins. In kettleholes or other deep glacial depressions, semi-open fens develop (colloquially called kettlehole "bogs"), where the nutrient-poor substrate and the reduced throughflow of water create oligotrophic conditions fostering the development of *Sphagnum* peat and the growth of peatland vegetation. Ericaceous shrubs and dwarf-shrubs (e.g., *Chamaedaphne calyculata*) dominate, with patches of graminoid dominance. Some may have a sparse tree layer, with *Acer rubrum* and/or *Nyssa sylvatica* characteristic. Many, though not all, of these swamps have a bryoid layer featuring *Sphagnum*.

MEMBERSHIP

Standard Ecological Systems:

- High Allegheny Wetland (CES202.069)
- North-Central Appalachian Acidic Swamp (CES202.604)
- North-Central Interior and Appalachian Acidic Peatland (CES202.606)
- North-Central Interior and Appalachian Rich Swamp (CES202.605)

DISTRIBUTION

Range: This systems group of the eastern United States is found from New England south to West Virginia, west to Minnesota and Ohio, as well as in adjacent Ontario, Canada. Its range is primarily north of the glacial terminus, as well as in periglacial areas. It extends southward at higher elevations in the mountains of western Virginia and eastern West Virginia.

Divisions: 201:P; 202:C**Nations:** CA, US**Subnations:** CT, DE?, IA, IL, IN, MA, MD, ME, MI, MN, MO, NH, NJ, NY, OH, ON, PA, RI, VA, VT, WI, WV

Map Zones: 38:C, 41:?, 42:C, 43:P, 44:P, 47:C, 49:C, 50:C, 51:C, 52:C, 59:C, 60:C, 61:C, 62:C, 63:C, 64:C, 65:C, 66:C
TNC Ecoregions: 36:C, 44:C, 45:C, 46:C, 47:?, 48:C, 49:C, 52:P, 59:C, 60:P, 61:C, 62:C, 64:P

SOURCES

References: Braun 1950, Damman and French 1987, Fleming et al. 2005, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.784943#references

Description Author: S.C. Gawler

Version: 23 Jul 2007

Concept Author: Southeastern Ecology Group

Stakeholders: Canada, East, Midwest, Southeast

ClassifResp: East

CENTRAL INTERIOR HIGHLANDS AND APPALACHIAN SINKHOLE AND DEPRESSION POND (CES202.018)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Lowland [Lowland]; Depressional [Pond]; Depressional [Sinkhole]; Muck; Mineral: W/ A-Horizon >10 cm

Non-Diagnostic Classifiers: Alkaline Water; Circumneutral Water; Forest and Woodland (Treed); Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9160

CONCEPT

Summary: This system of ponds and wetlands is found in the Interior Highlands of the Ozark, Ouachita, and Interior Low Plateau regions, and ranges north from the southern and central Appalachians to the northern Piedmont regions. Stands occur in basins of sinkholes or other isolated depressions on uplands. Soils are very poorly drained, and surface water may be present for extended periods of time, rarely becoming dry. Water depth may vary greatly on a seasonal basis and may be a meter deep or more in the winter. Some examples become dry in the summer. Soils may be deep (100 cm or more), consisting of peat or muck, with parent material of peat, muck or alluvium. Ponds vary from open water to herb-, shrub-, or tree-dominated. Tree-dominated examples typically contain *Quercus* species, *Platanus occidentalis*, *Fraxinus pennsylvanica*, *Acer saccharinum*, or *Nyssa* species, or a combination of these. In addition, *Liquidambar styraciflua* may be present in southern examples. *Cephalanthus occidentalis* is a typical shrub component. The herbaceous layer is widely variable depending on geography.

Classification Comments: Many of these ponds have their geologic origin as a more-or-less complete karst collapse feature. Some of them may display this geologic origin in a more explicit manner, with definite walls and exposed limestone or dolomite at the surface ("sinkholes"). Others are more subtle, and exist as more gentle depressions, with no exposed surface geology ("depression ponds"). This includes the "sagponds" of northwestern Georgia and adjacent Alabama. Rare examples in the Ridge and Valley of Georgia (Coosa Valley) are included here. These occur on limestones or dolomites of the Chickamauga Group. Matt Elliott (pers. comm.): "I would put Ridge and Valley sagponds in with Interior Highlands ponds rather than Piedmont, as they are essentially karst features. R&V sagponds are generally pretty rare but are common in parts of Bartow County, Georgia, and a few other places. The shallower ones are dominated by willow oak, the deeper ones *Nyssa biflora*. On the Cumberland Plateau, the ones I have seen usually have sweetgum and *Nyssa sylvatica*, but I think willow oak and possibly *Nyssa biflora* might occur in some of the deeper ones. A lot of the plateau ponds seem more like swales than deep ponds, but they still may be related to underlying karst features. The Ridge and Valley sagponds may be somewhat different from those on the plateau - often deeper and with even more Coastal Plain elements." It also includes sinkhole ponds of northern New Jersey (K. Strakosch-Walz pers. comm.) and ponds of the Ridge and Valley in Pennsylvania. These are very similar to Shenandoah sinkhole ponds of Virginia and are in Maryland as well (L. Sneddon pers. comm.).

Similar Ecological Systems:

- Piedmont Upland Depression Swamp (CES202.336)

Related Concepts:

- Depression Swamp (Evans 1991) Finer
- Sagponds (Wharton 1978) Finer
- Sinkhole/Depression Marsh (Evans 1991) Finer
- Sinkhole/Depression Pond (Evans 1991) Finer

DESCRIPTION

Environment: Examples of this system occur in basins of sinkholes or other isolated depressions on uplands. Soils are very poorly drained, and surface water may be present for extended periods of time, rarely becoming dry. Water depth may vary greatly on a seasonal basis, and may be a meter deep or more in the winter. Some examples become dry in the summer. Soils may be deep (100 cm or more), consisting of peat or muck, with parent material of peat, muck or alluvium.

Vegetation: Ponds vary from open water to herb-, shrub-, or tree-dominated types. Tree-dominated examples typically contain *Quercus* species, *Platanus occidentalis*, *Fraxinus pennsylvanica*, *Acer saccharinum*, or *Nyssa* species, or a combination of these. In addition, *Liquidambar styraciflua* may be present in southern examples. *Cephalanthus occidentalis* is a typical shrub component. The herbaceous layer is widely variable depending on geography.

Dynamics: Water depth may vary greatly on a seasonal basis, and may be a meter deep or more in the winter. Some examples become dry in the summer.

MEMBERSHIP

Associations:

- *Brasenia schreberi* Herbaceous Vegetation (CEGL004527, G4?)
- *Carex aquatilis* - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL008542, G1?)
- *Carex barrattii* Herbaceous Vegetation (CEGL007857, G1)

- *Carex comosa* - *Carex decomposita* - *Dulichium arundinaceum* - *Lycopus rubellus* Herbaceous Vegetation (CEGL002413, G3G4)
- *Cephalanthus occidentalis* - (*Salix nigra*, *Quercus lyrata*) Karst Depression Shrubland (CEGL008439, G1Q)
- *Cephalanthus occidentalis* / *Dulichium arundinaceum* Shrubland (CEGL007854, G1)
- *Cephalanthus occidentalis* / *Hibiscus moscheutos* ssp. *moscheutos* Depression Pond Shrubland (CEGL004742, G3?)
- *Cephalanthus occidentalis* / *Torreya chloa pallida* Shrubland (CEGL007855, G1?)
- *Ceratophyllum demersum* - *Stuckenia pectinata* Herbaceous Vegetation (CEGL004528, G4G5)
- *Dasiphora fruticosa* ssp. *floribunda* / *Rhynchospora capillacea* - *Scleria verticillata* Shrub Herbaceous Vegetation (CEGL006356, G1)
- *Fraxinus pennsylvanica* - *Acer saccharinum* - *Quercus bicolor* / *Boehmeria cylindrica* Forest (CEGL006634, GNR)
- *Leersia oryzoides* - *Boehmeria cylindrica* - *Ranunculus flabellaris* Herbaceous Vegetation (CEGL006903, GNR)
- *Liquidambar styraciflua* - *Acer rubrum* / *Carex* spp. - *Sphagnum* spp. Forest (CEGL007388, G2G3Q)
- *Ludwigia peploides* Herbaceous Vegetation (CEGL007835, G4G5)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Nyssa aquatica* / *Cephalanthus occidentalis* Pond Forest (CEGL004712, G1?)
- *Nyssa biflora* / *Cephalanthus occidentalis* - *Lyonia lucida* Sagpond Forest (CEGL004116, G1G2)
- *Orontium aquaticum* - *Schoenoplectus subterminalis* - *Eriocaulon aquaticum* Herbaceous Vegetation (CEGL007859, G1)
- *Panicum hemitomon* - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL004126, G1)
- *Phalaris arundinacea* Eastern Herbaceous Vegetation (CEGL006044, GNA)
- *Platanus occidentalis* - *Fraxinus pennsylvanica* - *Ulmus americana* / *Cornus sericea* Forest (CEGL006901, G2G3)
- *Pontederia cordata* - *Sagittaria graminea* - *Sagittaria latifolia* Semipermanently Flooded Herbaceous Vegetation (CEGL004986, G1G2Q)
- *Quercus alba* - *Nyssa sylvatica* Sandstone Ridgetop Depression Forest (CEGL008440, G2Q)
- *Quercus alba* - *Nyssa sylvatica* Seasonally Flooded Forest [Provisional] (CEGL008473, GNR)
- *Quercus bicolor* - *Fraxinus pennsylvanica* / *Carex* spp. Forest (CEGL004422, G1G2)
- *Quercus lyrata* - *Quercus (palustris, phellos)* - *Liquidambar styraciflua* - (*Populus heterophylla*) Forest (CEGL004421, G2G3)
- *Quercus lyrata* / *Betula nigra* / *Pleopeltis polypodioides* ssp. *michauxiana* Forest (CEGL004975, G1)
- *Quercus lyrata* Pond Forest (CEGL004642, G1G3)
- *Quercus palustris* - (*Quercus bicolor*) / *Carex crinita* / *Sphagnum* spp. Forest (CEGL002406, G3?)
- *Quercus palustris* - *Quercus bicolor* - (*Liquidambar styraciflua*) Mixed Hardwood Forest (CEGL002432, G3G4)
- *Quercus palustris* / *Panicum rigidulum* var. *rigidulum* - *Panicum verrucosum* - *Eleocharis acicularis* Herbaceous Vegetation (CEGL007858, G1)
- *Quercus palustris* Pond Forest (CEGL007809, G2)
- *Quercus phellos* - *Liquidambar styraciflua* / *Chasmanthium laxum* Cumberland / Southern Ridge and Valley Forest (CEGL008441, G3)
- *Quercus phellos* Seasonally Flooded Ozark Pond Forest [Provisional] (CEGL007402, GNR)
- *Saccharum baldwinii* - *Calamagrostis coarctata* - *Panicum rigidulum* - *Rhynchospora capitellata* Herbaceous Vegetation (CEGL004750, G2G3)
- *Scirpus cyperinus* - *Dulichium arundinaceum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL004134, G1Q)
- *Scirpus cyperinus* - *Panicum rigidulum* - *Rhynchospora corniculata* - (*Dulichium arundinaceum*) Herbaceous Vegetation (CEGL004719, G2G3)
- *Sparganium americanum* - (*Sparganium erectum* ssp. *stoloniferum*) - *Epilobium leptophyllum* Herbaceous Vegetation (CEGL004510, G2G3)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)
- *Vaccinium oxycoccos* - (*Vaccinium macrocarpon*) / *Rhynchospora alba* - *Drosera rotundifolia* / *Sphagnum* spp. Dwarf-shrubland (CEGL007856, G2)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Brasenia schreberi* Permanently Flooded Herbaceous Alliance (A.1742)
- *Carex (flava, hystericina, interior, sterilis)* Saturated Shrub Herbaceous Alliance (A.1561)
- *Carex barrattii* Seasonally Flooded Herbaceous Alliance (A.1930)
- *Carex comosa* - (*Carex decomposita*) Semipermanently Flooded Herbaceous Alliance (A.1439)
- *Cephalanthus occidentalis* Seasonally Flooded Shrubland Alliance (A.988)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Leersia oryzoides* - *Glyceria striata* Seasonally Flooded Herbaceous Alliance (A.1399)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Ludwigia peploides* Semipermanently Flooded Herbaceous Alliance (A.1928)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)

- *Orontium aquaticum* - (*Schoenoplectus subterminalis*) Permanently Flooded Herbaceous Alliance (A.1931)
- *Panicum hemitommon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Alliance (A.1669)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Quercus alba* - (*Nyssa sylvatica*) Seasonally Flooded Forest Alliance (A.1996)
- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Rhynchospora* spp. - *Panicum (rigidulum, verrucosum)* - *Rhexia virginica* Seasonally Flooded Herbaceous Alliance (A.1384)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Sparganium americanum* Seasonally Flooded Herbaceous Alliance (A.1388)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Vaccinium macrocarpon* Saturated Dwarf-shrubland Alliance (A.1094)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Eastern Highland Rim Prairie and Barrens (CES202.354)

DISTRIBUTION

Range: This system is found from the Ozark and Ouachita mountains east to the southern and central Appalachians and the northern Piedmont regions (?), including the unglaciated Interior Low Plateau and Ridge and Valley. It ranges from Missouri, West Virginia, Pennsylvania, and Delaware south to Arkansas, Alabama and Georgia.

Divisions: 202:C

Nations: US

Subnations: AL, AR, DE, GA, IL, IN, KY, MD, MO, NC, NJ, OH, PA, TN, VA, WV

Map Zones: 44:C, 47:C, 48:C, 49:C, 53:C, 57:C, 61:C, 62:P, 64:P

USFS Ecomap Regions: 221F:CC, 221H:CC, 221J:CC, 223A:CC, 223D:CC, 223E:CC, 223F:CC, 231C:CC, 231D:CC, M221A:CC, M223A:CC, M231A:CC

TNC Ecoregions: 38:C, 39:C, 44:C, 50:C, 59:C, 61:C

SOURCES

References: Comer et al. 2003, Elliott pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722687#references

Description Author: M. Pyne, S. Menard, D. Faber-Langendoen

Version: 26 Jan 2006

Concept Author: M. Pyne, S. Menard, D. Faber-Langendoen

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)**Land Cover Class:** Woody Wetland**Spatial Scale & Pattern:** Linear**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Wetland**Diagnostic Classifiers:** Short (<5 yrs) Flooding Interval; Riparian Mosaic; Riverine / Alluvial; Graminoid**Non-Diagnostic Classifiers:** Lowland [Foothill]; Woody-Herbaceous; Broad-Leaved Deciduous Tree; Broad-Leaved Deciduous Shrub**National Mapping Codes:** ESLF 9164

CONCEPT

Summary: Examples of this riverscour-influenced system may occur on high-gradient and very high-gradient streams in the gorges of the Cumberland Plateau, the Cumberland Mountains, and the more rugged parts of the Ridge and Valley in Kentucky, Tennessee, and Alabama, and possibly in Georgia. The succession of woody plants (particularly trees) is retarded by the force of "flashy," high-velocity water traveling down the stream channels. This system may occur on flood-scoured acidic or calcareous bedrock, cobble, pebble, or sandbar substrates of sandstone, limestone, dolomite, and possibly other sedimentary and weakly metamorphosed geologies. The most distinctive parts of the system are dominated by shrubs, perennial grasses, and forbs. In some areas, a riparian woodland composed of *Betula nigra* and *Platanus occidentalis* may be a component association. Some common shrubs include *Alnus serrulata*, *Betula nigra*, *Cephalanthus occidentalis*, *Cornus amomum*, *Fothergilla major*, *Itea virginica*, *Salix caroliniana*, *Rhododendron arborescens*, *Toxicodendron radicans*, and *Juniperus virginiana* var. *virginiana*. Some grasses (typical of prairies) include *Andropogon gerardii*, *Sorghastrum nutans*, *Schizachyrium scoparium*, *Chasmanthium latifolium*, *Tripsacum dactyloides*, and/or *Panicum virgatum*. Forbs are diverse and variable from occurrence to occurrence. This system is affected by flood-scouring in some areas and deposition in others. There is typically a gradient from dry, nutrient-poor conditions upslope to moist and relatively enriched conditions downslope. A variety of these conditions may exist at any one site. Some areas are prone to severe drought periods that may stress or kill some (particularly woody) vegetation. Flood-scouring is a powerful and ecologically important abrasive force along the riverbanks where this system is found.

Classification Comments: Examples of the system are sometimes called "scoured riverbank prairies," "riverside prairies," "linear prairies," "rivershore grasslands," or "scoured riverine bluff prairie." River systems where it is found include the Cumberland and its tributaries, the Obed, the Obey, Chickasaw Creek (Tennessee), the Cahaba (Alabama), the Red River Gorge (Kentucky), Rockcastle River (Kentucky), the Big South Fork of the Cumberland (Kentucky/Tennessee) and its tributaries, and many others.

Similar Ecological Systems:

- Central Appalachian Stream and Riparian (CES202.609)
- South-Central Interior Small Stream and Riparian (CES202.706)

DESCRIPTION

Environment: Examples may occur on high-gradient and very high-gradient streams in the gorges of the Cumberland Plateau, the Cumberland Mountains, and rugged parts of the Ridge and Valley, in Kentucky, Tennessee, and Alabama, and possibly in Georgia. The succession of woody plants (particularly trees) is retarded by the force of "flashy," high-velocity water traveling down the stream channels. This system may occur on flood-scoured acidic or calcareous bedrock, cobble, pebble, or sandbar substrates of sandstone, limestone, dolomite, and possibly other sedimentary and weakly metamorphosed geologies. It is presumably more extensive and better developed in materials derived from sandstone, where the erodibility creates more material circulating in the stream to create the sandbar/gravelbar areas where the system may occur in extensive patches, and where the extremely well-drained qualities of the coarse sediments further help to retard woody plant succession.

Vegetation: Examples of this system are typically dominated by shrubs, perennial grasses, and forbs. In some areas, a riparian woodland composed of *Betula nigra* and *Platanus occidentalis* may be a component association. Some common shrub component species include *Alnus serrulata*, *Betula nigra*, *Cephalanthus occidentalis*, *Cornus amomum*, *Fothergilla major*, *Itea virginica*, *Salix caroliniana*, *Rhododendron arborescens*, *Toxicodendron radicans*, and *Juniperus virginiana* var. *virginiana*. More southern examples may contain *Hydrangea quercifolia*, *Hypericum densiflorum*, and *Morella cerifera* (= *Myrica cerifera* var. *cerifera*). Some grasses and forbs include *Andropogon gerardii*, *Sorghastrum nutans*, *Schizachyrium scoparium*, *Chasmanthium latifolium*, *Tripsacum dactyloides*, *Panicum virgatum*, *Baptisia australis*, *Conoclinium coelestinum* (= *Eupatorium coelestinum*), *Coreopsis pubescens*, *Coreopsis tripteris*, *Elephantopus carolinianus*, *Helenium autumnale*, *Hydrocotyle* sp., *Ludwigia leptocarpa*, *Lycopus* spp., *Orontium aquaticum*, *Osmunda regalis* var. *spectabilis*, *Oxypolis rigidior*, *Phlox carolina*, *Pityopsis graminifolia* var. *latifolia*, *Rhynchospora colorata* (= *Dichromena colorata*), *Rudbeckia laciniata*, and *Vernonia gigantea*. Patches of *Carex torta* may be present in some examples. Distinctive shoals with *Hymenocallis coronaria* and *Justicia americana* may be present as well. Some of these species are typical of prairies, and thrive in the well-lit environment.

Dynamics: This system is prone to flooding in the upper regions and deposition in the topographically lower areas. There is typically a gradient from dry acidic conditions higher on the bank to moist, fairly enriched conditions lower down may exist at any one site. It is prone to severe drought periods that may stress or kill some vegetation. Flood scouring is a powerful and ecologically important

abrasive force along the riverbanks where this system is found. Soils in sandstone areas are rapidly drained Psammets, and may be restricted to the narrow interstices of tightly packed boulders, or to small crevices in bedrock exposures. Within the system the various species are distributed patchily probably due to microsite conditions.

MEMBERSHIP

Associations:

- (*Salix caroliniana*, *Rhododendron arborescens*) - *Andropogon gerardii* - *Baptisia australis* - (*Solidago simplex* var. *randii*) Herbaceous Vegetation (CEGL008471, G2?)
- *Alnus serrulata* - *Xanthorhiza simplicissima* Shrubland (CEGL003895, G3G4)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Carex torta* Herbaceous Vegetation (CEGL004103, G3G4)
- *Hymenocallis coronaria* - *Justicia americana* Herbaceous Vegetation (CEGL004285, G1)
- *Hypericum densiflorum* - *Alnus serrulata* / *Jamesianthus alabamensis* - *Xyris tennesseensis* Shrubland (CEGL008494, G1G2)
- *Hypericum densiflorum* - *Alnus serrulata* / *Tripsacum dactyloides* Shrubland (CEGL008495, G1G2)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Osmunda regalis* var. *spectabilis* Seepage Scour Herbaceous Vegetation (CEGL008404, G3?)
- *Platanus occidentalis* - (*Betula nigra*, *Salix* spp.) Temporarily Flooded Woodland (CEGL003725, GNR)
- *Podostemum ceratophyllum* Herbaceous Vegetation (CEGL004331, G3G5)
- *Vallisneria americana* - (*Heteranthera dubia*) Riverine Herbaceous Vegetation (CEGL004333, G3G4)

Alliances:

- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Osmunda* (*cinnamomea*, *regalis*) Saturated Herbaceous Alliance (A.1692)
- *Platanus occidentalis* - (*Betula nigra*, *Salix* spp.) Temporarily Flooded Woodland Alliance (A.633)
- *Podostemum ceratophyllum* Permanently Flooded Herbaceous Alliance (A.1752)
- *Vallisneria americana* Permanently Flooded Temperate Herbaceous Alliance (A.1757)

DISTRIBUTION

Range: This system is found in the Cumberland Plateau, the Cumberland Mountains, and the more rugged parts of the Ridge and Valley, in Kentucky, Tennessee, and Alabama, and possibly in Georgia.

Divisions: 202:C

Nations: US

Subnations: AL, GA?, KY, TN, WV

Map Zones: 48:C, 53:C

TNC Ecoregions: 50:C

SOURCES

References: Bailey and Coe 2001, Comer et al. 2003, NatureServe Ecology - Southeastern U.S. unpubl. data

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722671#references

Description Author: R. Evans, M. Pyne

Version: 17 Apr 2006

Concept Author: R. Evans, M. Pyne

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

CUMBERLAND SEEPAGE FOREST (CES202.361)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping [Mineral]; Broad-Leaved Tree

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9316

CONCEPT

Summary: This system of seepage-influenced, primarily forested wetlands is found in the Cumberland Plateau and Ridge and Valley regions of Alabama, Tennessee, West Virginia, and Kentucky. It is also found on the flat metasedimentary upland surfaces of Chilhowee Mountain, Tennessee. This area is part of the Southern Blue Ridge (TNC Ecoregion 51), but its ecological communities are similar to those of the Cumberlands. Examples most often occur in streamhead swales or on broad sandstone ridges where soils are sandy and saturated due to a combination of perched water table and seepage flow. Examples range in condition from open woodlands to forests, and some may lack a canopy and then will be dominated by shrubs or herbs. Typical woody species, when present, include *Acer rubrum*, *Nyssa sylvatica*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Ilex opaca* var. *opaca*, *Oxydendrum arboreum*, and *Kalmia latifolia*.

Classification Comments: Examples range in condition from open woodlands to forests, and some may lack a canopy and then will be dominated by shrubs or herbs.

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Seepage Swamp (CES203.554)

DESCRIPTION

Environment: Examples occur in streamhead swales or on broad sandstone ridges. Soils are sandy and saturated due to a combination of perched water table and seepage flow.

Vegetation: Typical woody species, when present, include *Acer rubrum*, *Nyssa sylvatica*, *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Ilex opaca* var. *opaca*, *Oxydendrum arboreum*, and *Kalmia latifolia*. Some extreme southerly examples may contain *Nyssa biflora*. Some stands are more open due to fire frequency, windthrow, or other disturbance. These are more likely to contain noteworthy herbaceous plant species (e.g., *Platanthera* spp.).

MEMBERSHIP

Associations:

- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Osmunda cinnamomea* - *Chasmanthium laxum* - *Carex intumescens* / *Sphagnum lescurii* Forest (CEGL007443, G3?)
- *Acer rubrum* var. *trilobum* / *Alnus serrulata* / *Calamagrostis coarctata* Saturated Woodland (CEGL003737, G2G3)
- *Alnus serrulata* - *Salix sericea* - *Rhododendron (catawbiense, maximum)* Saturated Shrubland [Placeholder] (CEGL004972, G4?)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Acer rubrum* Saturated Woodland Alliance (A.657)
- *Alnus serrulata* - *Salix sericea* - *Rhododendron (catawbiense, maximum)* Saturated Shrubland Alliance (A.1880)

DISTRIBUTION

Range: This systems is found in the Cumberland Plateau and Ridge and Valley regions of Alabama, Tennessee, West Virginia, and Kentucky. Related stands in the Interior Low Plateau of Kentucky ("Shawnee Hills") need to be provided for here or in a separate system.

Divisions: 202:C

Nations: US

Subnations: AL, KY, TN, WV

Map Zones: 48:C, 53:C, 57:C

TNC Ecoregions: 50:C, 51:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723153#references

Description Author: R. Evans and M. Pyne

Version: 17 Apr 2006

Concept Author: R. Evans and M. Pyne

Stakeholders: East, Southeast
ClassifResp: Southeast

EAST GULF COASTAL PLAIN INTERIOR SHRUB BOG (CES203.385)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shrubland (Shrub-dominated); Seepage-Fed Sloping

National Mapping Codes: ESLF 9341

CONCEPT

Summary: This ecological system includes wet, shrub-dominated seepage communities in the Upper East Gulf Coastal Plain of Alabama, adjacent Georgia, and possibly Mississippi. These wetlands generally occur in small patches on slopes within a matrix of longleaf pine-dominated vegetation. Wetland conditions are maintained by seepage flow from adjacent uplands. Examples of this system can vary between densely shrubby and fairly open and herbaceous, depending on frequency of fire and amount of elapsed time since the previous fires. However, this system tends to be much shrubbier due to topographic isolation than related seepage bog system of the Outer Coastal Plain such as Southern Coastal Plain Herbaceous Seep and Bog (CES203.078). The globally rare pitcher plant *Sarracenia rubra* ssp. *alabamensis* may be present in some examples of this system.

Similar Ecological Systems:

- Atlantic Coastal Plain Sandhill Seep (CES203.253)
- Southern Coastal Plain Herbaceous Seep and Bog (CES203.078)

DESCRIPTION

Environment: Examples may be found along steep to gentle slopes in the historically longleaf pine-dominated landscape of the Upper East Gulf Coastal Plain.

Vegetation: The physiognomy is variable, depending on fire history, and can vary from densely shrubby to herbaceous. In current condition, most examples are shrubby. Dominant species include *Morella cerifera* (= *Myrica cerifera* var. *cerifera*), *Kalmia latifolia*, *Symplocos tinctoria*, *Ilex coriacea*, *Ilex glabra*, *Arundinaria gigantea* ssp. *tecta*, and *Cyrilla racemiflora*. A number of other shrubs may also be present. Some stands, or portions of them, are strongly dominated by *Arundinaria gigantea* ssp. *tecta*. A fairly rich herb layer is present that may include *Osmunda cinnamomea* (dominant), *Eupatorium album*, *Xyris caroliniana*, *Aletris farinosa*, *Aristida purpurascens*, *Dichanthelium dichotomum* var. *ensifolium*, *Epigaea repens*, *Eupatorium pilosum*, *Eupatorium rotundifolium*, *Helianthus angustifolius*, *Lachnocaulon anceps*, *Polygala nana*, *Pteridium aquilinum* var. *pseudocaudatum*, *Rhexia alifanus*, *Rhexia petiolata*, *Rhynchospora plumosa*, *Sarracenia rubra* ssp. *alabamensis*, *Schizachyrium scoparium*, *Solidago odora* var. *odora*, and *Xyris ambigua*.

MEMBERSHIP

Associations:

- *Arundinaria gigantea* ssp. *tecta* Shrubland (CEGL003843, G1)
- *Ilex (coriacea, glabra) / Osmunda cinnamomea - Rhexia petiolata* Herbaceous Vegetation (CEGL008550, G2?)
- *Ilex coriacea - Lyonia lucida - Smilax laurifolia* Shrubland (CEGL004666, G3G4)
- *Morella cerifera - Kalmia latifolia - Symplocos tinctoria / Osmunda cinnamomea* Herbaceous Vegetation (CEGL008548, G2?)
- *Pinus serotina / Lyonia lucida - Ilex glabra - (Cyrilla racemiflora)* Shrubland (CEGL003846, G3)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Cyrilla racemiflora - Ilex coriacea - (Cliftonia monophylla)* Saturated Shrubland Alliance (A.802)
- *Lyonia lucida - Ilex glabra* Saturated Wooded Shrubland Alliance (A.805)
- *Rhynchospora oligantha - Sarracenia* spp. - (*Aristida beyrichiana, Ctenium aromaticum*) - *Osmunda cinnamomea / Sphagnum* spp. Saturated Herbaceous Alliance (A.1463)

DISTRIBUTION

Range: This system is found in the Upper East Gulf Coastal Plain of Alabama, adjacent Georgia, and possibly Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, GA, MS?

Map Zones: 46:C, 55:C, 99:P

TNC Ecoregions: 43:C, 53:P

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723131#references

Description Author: A. Schotz and R. Evans, mod. M. Pyne

Version: 27 Sep 2005
Concept Author: A. Schotz and R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

EAST GULF COASTAL PLAIN LARGE RIVER FLOODPLAIN FOREST (CES203.489)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Riverine / Alluvial [Brownwater]

National Mapping Codes: ESLF 9199

CONCEPT

Summary: This system represents a geographic subset of Kuchler's (1964) Southern Floodplain Forest. Examples may be found along large rivers of the East and Upper East Gulf Coastal Plain, especially the Apalachicola, Alabama/Cahaba, Tombigbee, Pascagoula, and Pearl rivers, all of which ultimately drain into the Gulf of Mexico. Several distinct plant communities can be recognized within this system that may be related to the array of different geomorphologic features present within the floodplain. Some of the major geomorphic features associated with different community types include natural levees, point bars, meander scrolls, oxbows, and sloughs (Sharitz and Mitsch 1993). Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding. However, herbaceous and shrub vegetation may be present in certain areas as well.

Classification Comments: In the Upper East Gulf Plain of Kentucky, this system is represented in the Ecoregions of Kentucky map (Woods et al. 2002) by the lower part of the Wabash-Ohio bottomlands (72a). In the lower Gulf Coastal Plain, this includes at least EPA (Omernik) Level IV ecoregions 65p and 75i (EPA 2004).

Similar Ecological Systems:

- Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
- East Gulf Coastal Plain Small Stream and River Floodplain Forest (CES203.559)

Related Concepts:

- Bottomland Forest (FNAI 1990) Intersecting
- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Floodplain Forest (FNAI 1990) Intersecting
- Floodplain Ridge/Terrace Forest (Evans 1991) Intersecting
- Floodplain Swamp (FNAI 1990) Intersecting
- Gravel/Cobble Bar (Evans 1991) Finer

DESCRIPTION

Environment: Examples of this system are generally forested with stands of bottomland hardwood species and other trees tolerant of flooding. Local composition varies depending upon actual position within the floodplain, disturbance history, and underlying soils and geology. Although most examples of this system may be thought of as acidic, some examples of this system flow through regions with sufficient calcareous influence to effect vegetation composition.

MEMBERSHIP

Associations:

- *Acer negundo* Forest (CEGL005033, G4G5)
- *Acer rubrum* - *Gleditsia aquatica* - *Planera aquatica* - *Fraxinus profunda* Forest (CEGL002422, G3G5)
- *Acer saccharinum* - *Celtis laevigata* - *Carya illinoensis* Forest (CEGL002431, G3G4)
- *Acer saccharum* - *Carya cordiformis* / *Asimina triloba* Floodplain Forest (CEGL005035, G2)
- *Alternanthera philoxeroides* Herbaceous Vegetation (CEGL003858, GNA)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Betula nigra* / *Salix nigra* / *Hypericum prolificum* - *Ampelopsis arborea* Forest (CEGL007794, G3?)
- *Brunnichia ovata* Vine-Shrubland (CEGL008446, G4?)
- *Catalpa bignonioides* - *Salix nigra* / *Brunnichia ovata* / *Eupatorium serotinum* Forest (CEGL008547, G2G3)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Decodon verticillatus* Seasonally Flooded Shrubland (CEGL003905, G4)
- *Forestiera acuminata* - (*Planera aquatica*, *Cephalanthus occidentalis*) Shrubland (CEGL003911, G3?)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Fraxinus pennsylvanica* - *Ulmus americana* / *Carpinus caroliniana* / *Boehmeria cylindrica* Forest (CEGL007806, G4?)
- *Gleditsia aquatica* - *Carya aquatica* Forest (CEGL007426, G3?)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*) Temporarily Flooded Forest (CEGL007330, GNA)
- *Liquidambar styraciflua* - *Quercus (laurifolia, nigra)* - (*Pinus taeda*) / *Arundinaria gigantea* / *Carex abscondita* Forest

(CEGL007732, G3G4)

- *Liquidambar styraciflua* - *Quercus pagoda* - *Carya* spp. / *Carpinus caroliniana* / *Carex* spp. Forest (CEGL007353, G3G4)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Nyssa aquatica* - *Fraxinus pennsylvanica* - *Taxodium distichum* / *Sabal minor* Forest (CEGL008463, GNR)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Nyssa biflora* - *Acer rubrum* var. *rubrum* / *Lyonia lucida* Forest (CEGL007864, G3G4)
- *Nyssa biflora* - *Taxodium ascendens* / *Ludwigia pilosa* - *Bacopa caroliniana* Woodland (CEGL003735, G1?)
- *Nyssa biflora* / *Itea virginica* - *Cephalanthus occidentalis* Depression Forest (CEGL007434, G3G4)
- *Nyssa ogeche* - (*Nyssa biflora*, *Taxodium ascendens*) Forest (CEGL007392, G4)
- *Nyssa ogeche* - *Nyssa aquatica* Forest (CEGL007393, G3)
- *Pinus glabra* - *Quercus virginiana* - *Carya glabra* / *Carpinus caroliniana* / *Serenoa repens* Forest (CEGL004676, G2G3)
- *Platanus occidentalis* - *Liquidambar styraciflua* - (*Ulmus americana*) / (*Crataegus viridis*) Forest (CEGL007335, G3G4)
- *Polygonum* spp. - *Phanopyrum gymnocarpon* Seasonally Flooded Herbaceous Vegetation (CEGL008555, G4)
- *Populus deltoides* - *Salix caroliniana* Forest (CEGL007343, G4G5)
- *Populus deltoides* - *Salix nigra* / *Mikania scandens* Forest (CEGL007346, G4G5)
- *Populus deltoides* - *Salix nigra* Forest (CEGL002018, G3G4)
- *Populus deltoides* / *Acer negundo* / *Boehmeria cylindrica* Forest (CEGL007731, G3G5)
- *Quercus laurifolia* - *Quercus michauxii* - *Liquidambar styraciflua* / *Carpinus caroliniana* Forest (CEGL004678, G3G4)
- *Quercus lyrata* - *Carya aquatica* - (*Quercus texana*) / *Forestiera acuminata* Forest (CEGL002423, G3?)
- *Quercus lyrata* - *Carya aquatica* Forest (CEGL007397, G4G5)
- *Quercus lyrata* - *Liquidambar styraciflua* Forest (CEGL008583, G3G4)
- *Quercus michauxii* - *Quercus shumardii* - *Liquidambar styraciflua* / *Arundinaria gigantea* Forest (CEGL002099, G3G4)
- *Quercus nigra* - *Quercus pagoda* - *Carya myristiciformis* / *Cercis canadensis* Forest (CEGL004770, G3?)
- *Quercus pagoda* - *Quercus nigra* / *Halesia diptera* - *Ilex decidua* / *Chasmanthium sessiliflorum* - *Dicliptera brachiata* Forest (CEGL007354, G4?)
- *Quercus phellos* - *Quercus nigra* - *Liquidambar styraciflua* Mississippi River Alluvial Plain Forest (CEGL007915, G4G5)
- *Quercus shumardii* - *Quercus michauxii* - *Quercus nigra* / *Acer barbatum* - *Tilia americana* var. *heterophylla* Forest (CEGL008487, G3)
- *Quercus texana* - *Celtis laevigata* - *Ulmus (americana, crassifolia)* - (*Gleditsia triacanthos*) Forest (CEGL004619, G4G5)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Salix nigra* / (*Clethra alnifolia*, *Morella cerifera*) / *Nyssa aquatica* Successional Forest (CEGL007411, GNA)
- *Salix nigra* Forest (CEGL002103, G4)
- *Salix nigra* Large River Floodplain Forest (CEGL007410, G3G5)
- *Taxodium distichum* - *Fraxinus pennsylvanica* - *Quercus laurifolia* / *Acer rubrum* / *Saururus cernuus* Forest (CEGL007719, G3G4)
- *Taxodium distichum* - *Nyssa ogeche* Forest (CEGL003841, G3G4)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)
- *Zizaniopsis miliacea* Coastal Plain Slough Herbaceous Vegetation (CEGL004139, G4?)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Acer saccharum* - *Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
- *Alternanthera philoxeroides* Semipermanently Flooded Herbaceous Alliance (A.2015)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Brunnichia ovata* Temporarily Flooded Vine-Shrubland Alliance (A.2002)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Forestiera acuminata* Semipermanently Flooded Shrubland Alliance (A.1012)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Nyssa biflora* - *Taxodium ascendens* Semipermanently Flooded Woodland Alliance (A.655)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)

- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii) - Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus lyrata - (Carya aquatica)* Seasonally Flooded Forest Alliance (A.328)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Taxodium distichum - Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)
- *Typha (angustifolia, latifolia) - (Schoenoplectus spp.)* Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Zizaniopsis miliacea* Seasonally Flooded Temperate Herbaceous Alliance (A.1395)

DISTRIBUTION

Range: East and Upper East Gulf Coastal Plain, especially the Apalachicola, Alabama, Tombigbee, Pascagoula, and Pearl rivers, all of which ultimately drain into the Gulf of Mexico.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, KY, MS, TN

Map Zones: 46:C, 47:C, 55:C, 99:C

TNC Ecoregions: 43:C, 53:C

SOURCES

References: Comer et al. 2003, EPA 2004, Kuchler 1964, Sharitz and Mitsch 1993, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723097#references

Description Author: R. Evans and A. Schotz

Version: 27 Sep 2005

Concept Author: R. Evans and A. Schotz

Stakeholders: Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN NORTHERN SEEPAGE SWAMP (CES203.554)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 9351

CONCEPT

Summary: This wetland system of the Upper East Gulf Coastal Plain consists of forested wetlands in acidic, seepage-influenced habitats. These are mostly deciduous forests (and less commonly herbaceous communities) generally found at the base of slopes or other habitats where seepage flow is concentrated. Resulting moisture conditions are saturated or even inundated. The vegetation is characterized by *Nyssa sylvatica*, *Nyssa biflora*, and *Acer rubrum*. Examples occur in portions of the Coastal Plain north of the range of *Persea palustris* and *Magnolia grandiflora*. *Magnolia virginiana* is of less value as a differential species. To the south this system grades into Southern Coastal Plain Seepage Swamp and Baygall (CES203.505), where evergreen species are of much greater importance in the canopy and understory. Due to excessive wetness, these habitats are normally protected from fire except those which occur during extreme droughty periods. These environments are prone to long-duration standing water and tend to occur on highly acidic, nutrient-poor soils.

Classification Comments: Some authors have treated *Persea palustris* (of wetlands) and *Persea borbonia* (of uplands) as one taxon under a broadly conceived *Persea borbonia*. We recognize two distinct taxa, following Kartesz (1999) and Weakley (2005).

Similar Ecological Systems:

- Cumberland Seepage Forest (CES202.361)
- Piedmont Seepage Wetland (CES202.298)
- Southern Coastal Plain Seepage Swamp and Baygall (CES203.505)

DESCRIPTION

Vegetation: The vegetation is characterized by *Nyssa sylvatica*, *Nyssa biflora*, and *Acer rubrum*. The canopies of stands are primarily deciduous-dominated. Stands in the southern part of the system's range may contain *Magnolia virginiana*, particularly in the understory. This system occurs north of the range of *Persea palustris* and *Magnolia grandiflora*, and these species will be lacking from stands.

Dynamics: Due to excessive wetness, these habitats are normally protected from fire except those which occur during extreme droughty periods. These environments are prone to long-duration standing water and tend to occur on highly acidic, nutrient-poor soils.

MEMBERSHIP

Associations:

- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhododendron canescens* - *Viburnum nudum* var. *nudum* / *Woodwardia areolata* Forest (CEGL004425, G2G3)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Herbaceous Vegetation (CEGL002263, G2G3)
- *Magnolia virginiana* - *Nyssa biflora* / *Oxydendrum arboreum* / *Viburnum nudum* var. *nudum* Forest (CEGL008552, G3?)
- *Nyssa biflora* - *Liquidambar styraciflua* / *Magnolia virginiana* / *Hamamelis virginiana* - *Viburnum nudum* Forest (CEGL008477, G2G3)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Nyssa biflora* - *Acer rubrum* - (*Liriodendron tulipifera*) Saturated Forest Alliance (A.351)

DISTRIBUTION

Range: This system is found in the East Gulf Coastal Plain portions of western Kentucky and Tennessee, northern Mississippi, northwestern and central Alabama, and southern Illinois.

Divisions: 203:C

Nations: US

Subnations: AL, IL, KY, MS, TN

Map Zones: 46:C, 47:C, 49:?

TNC Ecoregions: 43:C

SOURCES

References: Comer et al. 2003, Kartesz 1999, Weakley 2005

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723050#references

Description Author: R. Evans and M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN SMALL STREAM AND RIVER FLOODPLAIN FOREST (CES203.559)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Intermittent Flooding; Forest and Woodland (Treed); Riverine / Alluvial [Brownwater]

National Mapping Codes: ESLF 9339

CONCEPT

Summary: This is a predominantly forested system of the East Gulf Coastal Plain associated with small brownwater rivers and creeks. In contrast to East Gulf Coastal Plain Large River Floodplain Forest (CES203.489), it has fewer major geomorphic floodplain features typically associated with large river floodplains. Those features that are present tend to be smaller and more closely intermixed with one another, resulting in less obvious vegetational zonation. Bottomland hardwood tree species are typically important and diagnostic, although mesic hardwood species are also present in areas with less inundation, such as upper terraces and possibly second bottoms. As a whole, flooding occurs annually, but the water table usually is well below the soil surface throughout most of the growing season. Areas impacted by beaver impoundments are also included in this system.

Classification Comments: This is primarily a linear system, with some variability as to the size type of the associations included within it. Most are temporarily flooded, with the possible addition of smaller-scale seasonally flooded features such as beaver-created herbaceous wetlands and shrub-dominated features. It is confined to floodplains or terraces of streams and creeks. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. These landscapes usually encompass a variety of habitats resulting from natural hydrological spatial patterns (i.e., meander scars, sloughs, old depressions, and/or oxbows are present).

Similar Ecological Systems:

- East Gulf Coastal Plain Large River Floodplain Forest (CES203.489)
- East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299)

Related Concepts:

- Bottomland Forest (FNAI 1990) Intersecting
- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Floodplain Forest (FNAI 1990) Intersecting
- Floodplain Ridge/Terrace Forest (Evans 1991) Intersecting
- Floodplain Swamp (FNAI 1990) Intersecting
- Gravel/Cobble Bar (Evans 1991) Intersecting
- Riparian Forest (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: This system is associated with small brownwater rivers and creeks of the East Gulf Coastal Plain. It is confined to floodplains or terraces of streams and creeks. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. These landscapes usually encompass a variety of habitats resulting from natural hydrological spatial patterns (i.e., meander scars, sloughs, gravel bars, old depressions, and/or oxbows are present). Most component associations are temporarily flooded, with the possible addition of smaller-scale seasonally flooded features such as beaver-created herbaceous wetlands and shrub-dominated features. Some larger examples of this system include the Escambia, the Yellow (Alabama, Florida), the Choctawhatchee, the Chattahoochee, and the Flint rivers.

Vegetation: Examples of this system may include a number of different plant communities, each with distinctive floristic compositions. Drew et al. (1998) described vegetation attributable to this systems as including the following species: *Carya glabra*, *Magnolia grandiflora*, *Quercus virginiana*, *Liquidambar styraciflua*, *Acer barbatum*, *Fraxinus americana*, *Fraxinus caroliniana*, *Celtis laevigata*, *Sabal minor*, *Sebastiania fruticosa*, *Serenoa repens*, and *Itea virginica*. Smaller-scale features may be dominated by shrubs (*Cephalanthus occidentalis*, *Decodon verticillatus*) and/or perennial and annual herbs.

MEMBERSHIP

Associations:

- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhododendron canescens* - *Viburnum nudum* var. *nudum* / *Woodwardia areolata* Forest (CEGL004425, G2G3)
- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912, G4)
- *Alnus serrulata* Southeastern Seasonally Flooded Shrubland (CEGL008474, G4)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)

- *Betula nigra* / *Salix nigra* / *Hypericum prolificum* - *Ampelopsis arborea* Forest (CEGL007794, G3?)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Chamaecyparis thyoides* / *Magnolia virginiana* - *Cliftonia monophylla* / *Orontium aquaticum* - *Sphagnum* spp. Forest (CEGL007151, G2G3)
- *Decodon verticillatus* Seasonally Flooded Shrubland (CEGL003905, G4)
- *Fagus grandifolia* - *Carya* spp. / (*Acer negundo*, *Magnolia macrophylla*, *Tilia americana* var. *heterophylla*) Temporarily Flooded Forest (CEGL004745, G3G4)
- *Fagus grandifolia* - *Magnolia grandiflora* - *Quercus michauxii* - *Quercus nigra* / *Rhododendron canescens* Forest (CEGL004965, G2G3)
- *Glottidium vesicarium* - *Lindernia dubia* Sandbar Herbaceous Vegetation (CEGL008498, G3G4)
- *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112, G5)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*) Temporarily Flooded Forest (CEGL007330, GNA)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Onoclea sensibilis* Forest (CEGL007329, G4)
- *Liquidambar styraciflua* - *Quercus (laurifolia, nigra)* - (*Pinus taeda*) / *Arundinaria gigantea* / *Carex abscondita* Forest (CEGL007732, G3G4)
- *Ludwigia peploides* Herbaceous Vegetation (CEGL007835, G4G5)
- *Myriophyllum heterophyllum* Herbaceous Vegetation (CEGL008457, G4)
- *Nelumbo lutea* Herbaceous Vegetation (CEGL004323, G4?)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Pallavicinia lyellii* - *Sphagnum* sp. Nonvascular Vegetation (CEGL004779, G4?)
- *Panicum virgatum* - *Panicum rigidulum* var. *elongatum* - *Polygonum hydropiperoides* Herbaceous Vegetation (CEGL004921, G3?)
- *Pinus elliotii* var. *elliotii* / *Cliftonia monophylla* - *Cyrilla racemiflora* Woodland (CEGL003638, G2G3G)
- *Pinus glabra* - *Quercus (laurifolia, michauxii, nigra)* / *Carpinus caroliniana* ssp. *caroliniana* / *Sabal minor* Forest (CEGL007544, G3G4)
- *Pinus taeda* - *Liquidambar styraciflua* - *Nyssa biflora* Temporarily Flooded Forest (CEGL004606, G4)
- *Pinus taeda* - *Quercus hemisphaerica* / *Osmanthus americanus* / *Ilex glabra* Woodland (CEGL003619, G2)
- *Pinus taeda* Temporarily Flooded Forest (CEGL007142, G4?)
- *Platanus occidentalis* - *Liquidambar styraciflua* - (*Ulmus americana*) / (*Crataegus viridis*) Forest (CEGL007335, G3G4)
- *Polygonum (hydropiperoides, punctatum)* - *Leersia (lenticularis, virginica)* Herbaceous Vegetation (CEGL004290, G4?)
- *Polygonum* spp. - *Phanopyrum gymnocarpon* Seasonally Flooded Herbaceous Vegetation (CEGL008555, G4)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Vegetation [Placeholder] (CEGL004291, GNR)
- *Quercus laurifolia* - *Quercus michauxii* - *Liquidambar styraciflua* / *Carpinus caroliniana* Forest (CEGL004678, G3G4)
- *Quercus laurifolia* / *Carpinus caroliniana* / *Justicia ovata* Forest (CEGL007348, G4?)
- *Quercus nigra* - *Magnolia virginiana* - *Taxodium distichum* Forest (CEGL004978, G3?)
- *Quercus pagoda* - *Quercus nigra* / *Halesia diptera* - *Ilex decidua* / *Chasmanthium sessiliflorum* - *Dicliptera brachiata* Forest (CEGL007354, G4?)
- *Quercus phellos* - *Quercus nigra* - *Quercus alba* / *Chasmanthium (laxum, sessiliflorum)* Forest (CEGL004771, G3G4)
- *Quercus shumardii* - *Quercus michauxii* - *Quercus nigra* / *Acer barbatum* - *Tilia americana* var. *heterophylla* Forest (CEGL008487, G3)
- *Quercus virginiana* - (*Pinus taeda*) / (*Sabal minor*, *Serenoa repens*) Forest (CEGL007039, G3G4)
- *Salix caroliniana* Temporarily Flooded Forest (CEGL007373, G4)
- *Salix nigra* Forest (CEGL002103, G4)
- *Scirpus cyperinus* Seasonally Flooded Southern Herbaceous Vegetation (CEGL003866, G4)
- *Taxodium distichum* - *Fraxinus pennsylvanica* - *Quercus laurifolia* / *Acer rubrum* / *Saururus cernuus* Forest (CEGL007719, G3G4)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Alnus serrulata* Seasonally Flooded Shrubland Alliance (A.994)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Fagus grandifolia* - *Magnolia grandiflora* Forest Alliance (A.369)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Lindernia dubia* - *Glottidium vesicarium* - *Eupatorium serotinum* Temporarily Flooded Herbaceous Alliance (A.2008)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Ludwigia peploides* Semipermanently Flooded Herbaceous Alliance (A.1928)
- *Myriophyllum heterophyllum* Permanently Flooded Herbaceous Alliance (A.2003)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)

- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Panicum virgatum* Temporarily Flooded Herbaceous Alliance (A.1343)
- *Pinus elliotii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus glabra* - *Quercus (laurifolia, michauxii, nigra)* Temporarily Flooded Forest Alliance (A.431)
- *Pinus taeda* - *Liquidambar styraciflua* - *Nyssa biflora* Temporarily Flooded Forest Alliance (A.433)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)
- *Pinus taeda* Woodland Alliance (A.526)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica, Celtis laevigata, Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Alliance (A.1669)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57)
- *Salix caroliniana* Temporarily Flooded Forest Alliance (A.296)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Sphagnum* spp. - *Pallavicinia lyellii* Saturated Nonvascular Alliance (A.1823)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)

DISTRIBUTION

Range: This system is found in the East Gulf Coastal Plain, from the coast northward and inland to the extent of unconsolidated sediments in Kentucky.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, KY, MS, TN

Map Zones: 46:C, 55:C

TNC Ecoregions: 43:C, 53:C

SOURCES

References: Comer et al. 2003, Drew et al. 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723045#references

Description Author: M. Pyne and R. Evans

Version: 18 Apr 2006

Concept Author: M. Pyne and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1455 EAST GULF COASTAL PLAIN SOUTHERN LOBLOLLY-HARDWOOD FLATWOODS (CES203.557)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Extensive Wet Flat

Non-Diagnostic Classifiers: Pimple mounds; Isolated Wetland [Partially Isolated]; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2455; ESLF 9124; ESP 1455

CONCEPT

Summary: This forested system occurs on broad upland flats in the East Gulf Coastal Plain of Alabama and Mississippi, as well as western parts of the lower terraces of the East Gulf Coastal Plain ("Florida Parishes"; 74d of EPA) of Louisiana, and likely occurs in other parts of the region as well. Its status and extent in this intervening terrain is unknown. Known examples in the Alabama/Mississippi parts of the range include a mosaic of open forests dominated by *Pinus taeda* interspersed with patches of *Quercus phellos* and sometimes other tree species. The ground surface displays an evident microtopography of alternating mounds and swales occurring in a tight local mosaic. These mounds are most likely "gilgai" (R. Wieland pers. comm.) resulting from vertic or shrink-swell properties of the Luinn soil series. Known examples display a range of moisture conditions from dry to wet. The wettest examples trap significant moisture from local rainfall events. These areas have ponded water for a minimum of several days at an interval and potentially for long periods of the year, especially when evapotranspiration is lowest. The vegetation of this system supports a relatively low vascular plant diversity and thus may appear floristically similar to other pine-hardwood vegetation of the region. The dry portion of this vegetational mosaic is dominated by grassy ground cover (*Chasmanthium sessiliflorum*) with scattered emergent greenbriars (*Smilax* spp.) underneath a nearly pure *Pinus taeda* overstory. The historical composition of this type is unknown, but it seems likely that *Pinus taeda* was a natural and even dominant component of this system, as it is in related systems in the West Gulf Coastal Plain (R. Evans pers. obs., T. Foti pers. comm.). Wetter areas are dominated by an overstory of *Quercus phellos* with an abundance of *Sabal minor* in the understory. Although the specific role of fire in this system is unknown, low-intensity ground fires may have been ecologically important. Such fires could have originated in the surrounding East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506).

In the western parts of the lower terraces of the East Gulf Coastal Plain ("Florida Parishes") of Louisiana (74d and adjacent 75a of EPA), the flatwoods vegetation tends to be dominated primarily by hardwoods in the most western portion, and a mixture of *Pinus glabra* and *Pinus taeda* in the intermediate portion to the east of this (Smith 1996b). In this "Louisiana Florida Parishes Spruce Pine Flatwoods Forest" some characteristic species include *Pinus glabra*, *Quercus laurifolia*, *Quercus michauxii*, *Quercus nigra*, *Quercus pagoda*, *Quercus virginiana*, *Pinus taeda*, and *Magnolia grandiflora*. Some important understory trees and shrubs include *Crataegus opaca*, *Sabal minor* (which may often be very abundant or dominant), and *Arundinaria gigantea ssp. tecta*.

Classification Comments: The description of associations in the NVC for this system is undoubtedly incomplete. Classification work is in progress, but more information is needed.

Related Concepts:

- Wet Spruce Pine-Hardwood Flatwoods Forest (Smith 1996b) Finer

DESCRIPTION

Environment: In the Alabama/Mississippi parts of this system's range, the ground surface displays an evident microtopography of alternating mounds and swales occurring in a tight local mosaic. In Louisiana, the soils are described as Hydric, acidic silt loams (including the Encrow, Gilbert, and Springfield series). The setting is broad, low flats, in small to large depressions, and along small, ill-defined drainages (locally known as "slashes" (Smith 1996b).

Vegetation: Known examples of this system in the Alabama/Mississippi parts of its range include a mosaic of open forests dominated by *Pinus taeda* interspersed with patches of *Quercus phellos* and sometimes other tree species. The vegetation of this system supports a relatively low vascular plant diversity and thus may appear floristically similar to other pine-hardwood vegetation of the region. The dry portion of this vegetational mosaic is dominated by grassy ground cover (e.g., *Chasmanthium sessiliflorum*) with scattered emergent greenbriars (*Smilax* spp.) underneath a nearly pure *Pinus taeda* overstory. The historical composition of this type is unknown, but it seems likely that *Pinus taeda* was a natural and even dominant component of this system, as it is in related systems in the West Gulf Coastal Plain (R. Evans pers. obs., T. Foti pers. comm.). Wetter areas are dominated by an overstory of *Quercus phellos* with an abundance of *Sabal minor* in the understory.

In the western parts of the lower terraces of the East Gulf Coastal Plain ("Florida Parishes") of Louisiana, the flatwoods vegetation tends to be dominated primarily by hardwoods in the most western portion, and a mixture of *Pinus glabra* and *Pinus taeda* in the intermediate portion to the east of this. In this "Louisiana Florida Parishes Spruce Pine Flatwoods Forest" stands contain *Pinus glabra*, *Quercus laurifolia*, *Quercus phellos*, *Quercus michauxii*, *Quercus nigra*, *Quercus pagoda*, *Quercus virginiana*, *Pinus taeda*, *Nyssa biflora*, *Nyssa sylvatica*, *Magnolia grandiflora*, *Salix nigra*, *Liquidambar styraciflua*, *Carya glabra*, *Acer rubrum*, and *Fraxinus*

pennsylvanica. Understory trees and shrubs include *Crataegus opaca* and *Sabal minor* (which may often be very abundant or dominant), as well as *Arundinaria gigantea ssp. tecta*, *Cephalanthus occidentalis*, *Diospyros virginiana*, *Cornus foemina*, *Crataegus viridis*, *Ilex opaca var. opaca*, *Ilex decidua*, *Itea virginica*, *Morella cerifera* (= *Myrica cerifera*), *Sambucus canadensis*, *Styrax americanus*, and *Viburnum dentatum* (Smith 1996b).

MEMBERSHIP

Associations:

- (*Quercus laurifolia*) / *Crataegus opaca* - *Crataegus viridis* Forest (CEGL007386, G1)
- *Pinus glabra* - *Quercus laurifolia* / *Crataegus opaca* / *Sabal minor* Forest (CEGL004534, G1G2)
- *Quercus michauxii* - *Quercus (nigra, pagoda)* - *Liquidambar styraciflua* - *Pinus taeda* Forest (CEGL007715, G2G3)

Alliances:

- *Crataegus (aestivalis, opaca, rufula)* Seasonally Flooded Forest Alliance (A.320)
- *Pinus glabra* - *Quercus laurifolia* Saturated Forest Alliance (A.442)
- *Quercus michauxii* - *Quercus pagoda* Saturated Forest Alliance (A.353)

SPATIAL CHARACTERISTICS

Spatial Summary: Apparently occurs in a variable patch size (large to small) across its range.

Adjacent Ecological Systems:

- East Gulf Coastal Plain Interior Shortleaf Pine-Oak Forest (CES203.506)

DISTRIBUTION

Range: This forested system occurs on broad upland flats in the East Gulf Coastal Plain of Alabama and Mississippi, as well as western parts of the lower terraces of the East Gulf Coastal Plain ("Florida Parishes") in Louisiana. The complete and detailed range of this system is being developed and is not completely understood. It is not thought to extend into the Mississippi River Alluvial Plain of Louisiana (P. Faulkner pers. comm.).

Divisions: 203:C

Nations: US

Subnations: AL, GA?, LA, MS

Map Zones: 46:C, 99:C

TNC Ecoregions: 43:C, 53:P

SOURCES

References: Comer et al. 2003, Smith 1996b

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723047#references

Description Author: R. Evans, mod. M. Pyne

Version: 09 Feb 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN TIDAL WOODED SWAMP (CES203.299)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Riverine / Alluvial; Tidal / Estuarine

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: ESLF 9132

CONCEPT

Summary: This system encompasses the tidally flooded portions of river floodplains which flow into the northern Gulf of Mexico east of the Mississippi River. Large outflows of freshwater keep salinity levels at a minimum, and flooding is of short enough duration to allow survival of tree canopies. *Taxodium*, *Nyssa*, or *Fraxinus* generally dominate. These swamps may be regularly flooded at least twice daily (FNAI 1990).

Similar Ecological Systems:

- East Gulf Coastal Plain Small Stream and River Floodplain Forest (CES203.559)
- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

Related Concepts:

- Freshwater Tidal Swamp (FNAI 1990) Broader

DESCRIPTION

Vegetation: Stands are dominated by a combination of *Nyssa aquatica*, *Nyssa biflora*, *Taxodium distichum*, *Magnolia virginiana*, *Sabal palmetto*, *Juniperus virginiana* var. *silicicola*, *Cyrilla racemiflora*, *Quercus laurifolia*, *Fraxinus pennsylvanica*, *Sabal minor*, *Taxodium ascendens*, *Cliftonia monophylla*, *Pinus elliotii* var. *elliotii*, *Chamaecyparis thyoides*, *Hypericum nitidum*, *Cladium mariscus* ssp. *jamaicense*, and *Persea palustris*.

MEMBERSHIP

Associations:

- *Nyssa aquatica* Tidal Forest (CEGL008561, G3?)
- *Nyssa biflora* - (*Nyssa aquatica*, *Taxodium distichum*) Tidal Forest (CEGL004484, G3G4)
- *Nyssa biflora* - *Magnolia virginiana* - *Sabal palmetto* - *Juniperus virginiana* var. *silicicola* Forest (CEGL004684, G2)
- *Nyssa biflora* - *Magnolia virginiana* / *Cyrilla racemiflora* Forest (CEGL004683, G2)
- *Quercus laurifolia* - *Fraxinus pennsylvanica* - *Nyssa aquatica* / *Sabal minor* Tidal Forest (CEGL007884, G3?)
- *Taxodium ascendens* - *Cliftonia monophylla* - *Pinus elliotii* var. *elliotii* - *Chamaecyparis thyoides* / *Hypericum nitidum* - *Cladium mariscus* ssp. *jamaicense* Forest (CEGL004981, G2?)
- *Taxodium distichum* - *Nyssa aquatica* - *Persea palustris* Forest (CEGL004681, G2)
- *Taxodium distichum* - *Nyssa biflora* - *Magnolia virginiana* - *Fraxinus profunda* Forest (CEGL004682, G2)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Vine-Shrubland (CEGL004620, GNA)

Alliances:

- *Magnolia virginiana* - *Nyssa biflora* - (*Taxodium distichum*, *Nyssa aquatica*, *Persea palustris*) Tidal Forest Alliance (A.1885)
- *Nyssa biflora* - (*Nyssa aquatica*, *Taxodium distichum*) Tidal Forest Alliance (A.357)
- *Quercus* (*phellos*, *nigra*, *laurifolia*) Temporarily Flooded Forest Alliance (A.292)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Seasonally Flooded Vine-Shrubland Alliance (A.993)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)

DISTRIBUTION

Range: This system includes river floodplains which flow into the northern Gulf of Mexico east of the Mississippi River.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, FNAI 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723192#references

Description Author: R. Evans, mod. M. Pyne
Version: 11 Dec 2006
Concept Author: R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Gulf and Atlantic Coastal Plain (203)**Land Cover Class:** Woody Wetland**Spatial Scale & Pattern:** Linear, Matrix**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Wetland**Diagnostic Classifiers:** Forest and Woodland (Treed); Riverine / Alluvial; Broad-Leaved Deciduous Tree**FGDC Crosswalk:** Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy**National Mapping Codes:** EVT 2473; ESLF 9142; ESP 1473

CONCEPT

Summary: This systems group comprises floodplain forests in the southeastern United States, from southern Virginia south to central Florida and west to the Gulf Coast, Mississippi River, and eastern Texas. It includes broad gradients of river size, soil nutrient levels, and flood frequency. Flooding ranges from semipermanent in the wettest areas to intermittent and short on the higher portions of the floodplain. Some of the major geomorphic features associated with different community types include natural levees, point bars, meander scrolls, oxbows, and sloughs. Small river floodplain forests have fewer major geomorphic floodplain features typically associated with large river floodplains. Those features that are present tend to be smaller and more closely intermixed with one another, resulting in less obvious vegetational zonation. Large rivers have greater variation in water levels and have flood regimes that integrate the effects of very large watersheds. Depositional landforms are larger, and communities can be more segregated. Along the Mississippi River and other very large rivers, low bottomlands are characteristic. These are seasonally flooded backswamps, with flooding usually more frequently than every two years, generally by still water that may be impounded behind natural levees.

Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding. However, herbaceous and shrub vegetation may be present in certain areas, particularly on recently deposited bars and in oxbow lakes. Most examples are nearly contiguous over large areas, broken only by the river itself. Higher terraces may have a mosaic of floodplain and upland systems, and may include nonriverine wetland systems. Some of the most typical and characteristic tree species found in stands of this systems group include *Taxodium distichum*, *Nyssa aquatica*, *Acer saccharinum*, *Platanus occidentalis*, *Populus deltoides*, *Acer negundo*, and *Salix nigra*. Other trees may include *Celtis laevigata*, *Carya illinoensis*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Liquidambar styraciflua*, *Nyssa biflora*, *Quercus laurifolia*, *Quercus lyrata*, *Quercus michauxii*, *Quercus nigra*, *Quercus pagoda*, *Quercus phellos*, *Quercus similis*, *Quercus texana*, *Quercus virginiana*, *Salix nigra*, *Ulmus americana*, and *Ulmus crassifolia*. Three distinct groups of associations can be recognized. The lowest, wettest areas have some combination of *Taxodium distichum* and *Nyssa aquatica* dominating. Natural levees and riverfronts have a diverse mixture of trees that typically includes *Platanus occidentalis*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Acer saccharinum*, *Acer negundo*, and other species that benefit from the high light levels and heavy alluvial deposition of these sites. Soils are typically sandier than those of the lower bottomlands. *Arundinaria gigantea* (giant cane) is a common understory in these forests on natural levees and higher point bars, and may become dominant after thinning or removal of the overstory. Willow and cottonwood sandbars may have an open-canopy (woodland-type) structure. Moderate to high parts of the floodplain away from the levee are usually dominated by bottomland hardwoods, various mixtures of wetland oaks, including *Quercus laurifolia*, *Quercus michauxii*, *Quercus pagoda*, and sometimes a number of other oak species, along with *Liquidambar styraciflua* or other species. The wettest forests can be simple in structure, with an understory but little shrub or herb layer; others tend to have well-developed subcanopy, shrub, and herb layers. Woody vines are usually prominent. Shrubs and small trees include *Alnus serrulata*, *Arundinaria gigantea*, *Carpinus caroliniana*, *Cephalanthus occidentalis*, *Clethra alnifolia*, *Cornus foemina*, *Crataegus viridis*, *Forestiera acuminata*, *Ilex decidua*, *Itea virginica*, *Morella cerifera*, *Planera aquatica*, *Sabal minor*, and *Sebastiania fruticosa*. Vines may include *Berchemia scandens* and *Smilax bona-nox*. Herbaceous species may include *Boehmeria cylindrica*, *Carex complanata*, *Carex debilis*, *Carex intumescens*, *Carex jorii*, *Leersia virginica*, *Lycopus virginicus*, *Mikania scandens*, *Saccharum baldwinii*, and *Typha latifolia*. Aquatic and floating herbs include *Lemna minor*, *Nelumbo lutea*, *Nuphar lutea ssp. advena*, and *Nymphaea odorata*.

Classification Comments: This systems group applies to river floodplains; smaller stream floodplains and riparian systems are covered in Gulf and Atlantic Coastal Plain Small Stream Riparian Systems (CES203.630).

Similar Ecological Systems:

- Gulf and Atlantic Coastal Plain Small Stream Riparian Systems (CES203.630)

DESCRIPTION

Vegetation: Vegetation generally includes forests dominated by bottomland hardwood species and other trees tolerant of flooding. However, herbaceous and shrub vegetation may be present in certain areas, particularly on recently deposited bars and in oxbow lakes. Most examples are nearly contiguous over large areas, broken only by the river itself. Higher terraces may have a mosaic of floodplain and upland systems, and may include nonriverine wetland systems. Some of the most typical and characteristic tree species found in stands of this systems group include *Taxodium distichum*, *Nyssa aquatica*, *Acer saccharinum*, *Platanus occidentalis*, *Populus deltoides*, *Acer negundo*, and *Salix nigra*. Other trees may include *Acer rubrum var. rubrum*, *Acer rubrum var. drummondii*, *Betula nigra*, *Carya aquatica*, *Carya illinoensis*, *Celtis laevigata*, *Fraxinus caroliniana*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Liquidambar styraciflua*, *Nyssa biflora*, *Nyssa ogeche*, *Quercus laurifolia*, *Quercus lyrata*, *Quercus michauxii*, *Quercus nigra*,

Quercus pagoda, *Quercus phellos*, *Quercus similis*, *Quercus texana*, *Quercus virginiana*, *Salix nigra*, *Ulmus americana*, and *Ulmus crassifolia*. Some disturbed stands may contain *Pinus taeda*. Shrubs and small trees can include *Alnus serrulata*, *Asimina triloba*, *Carpinus caroliniana*, *Cephalanthus occidentalis*, *Cornus foemina*, *Decodon verticillatus*, *Hypericum prolificum*, *Ilex decidua*, *Itea virginica*, *Lindera benzoin*, *Lyonia lucida*, *Planera aquatica*, *Sabal minor*, *Salix caroliniana*, *Sebastiania fruticosa*, and the bamboo *Arundinaria gigantea ssp. gigantea*. Vines can include *Ampelopsis arborea*, *Vitis* spp., and others. Herbs can include *Boehmeria cylindrica*, *Carex abscondita*, *Carex albolutescens*, *Carex bromoides*, *Carex grayi*, *Carex intumescens*, *Carex jooirii*, *Carex lupulina*, *Carex retroflexa*, *Chasmanthium laxum*, *Commelina virginica*, *Glyceria septentrionalis*, *Hydrocotyle ranunculoides*, *Leersia lenticularis*, *Lemna minor*, *Onoclea sensibilis*, *Saururus cernuus*, *Typha latifolia*, and *Zizaniopsis miliacea*.

Dynamics: When flooded, these systems may have a substantial aquatic faunal component, with high densities of invertebrates, and may play an important role in the life cycle of fish in the associated river. Unusually long or deep floods may stress vegetation or act as a disturbance for some species. Larger floods cause local disturbance by scouring and depositing sediment along channels and occasionally causing channel shifts. Except for primary successional communities such as bars, most forests exist naturally as multi-aged old-growth forests driven by gap-phase regeneration. Windthrow is probably the most important cause of gaps. Fire is not believed to be important, due to low flammability of much of the vegetation, wetness, and abundance of natural firebreaks.

MEMBERSHIP

Standard Ecological Systems:

- Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)
- East Gulf Coastal Plain Large River Floodplain Forest (CES203.489)
- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)
- Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)
- Mississippi River Riparian Forest (CES203.190)
- Red River Large Floodplain Forest (CES203.065)
- Southern Coastal Plain Blackwater River Floodplain Forest (CES203.493)
- West Gulf Coastal Plain Large River Floodplain Forest (CES203.488)

DISTRIBUTION

Range: This systems group ranges across much of the southeastern United States, from the Chesapeake Bay to southern Illinois and Missouri, south to central Florida and west to the Gulf Coast and Mississippi River, Oklahoma, and Texas.

Divisions: 203:C

Nations: US

Subnations: AL, AR, DE, FL, GA, IL, KY, LA, MD, MO, MS, NC, OK, SC, TN, TX, VA

Map Zones: 36:C, 37:C, 44:C, 45:C, 46:C, 55:C, 56:C, 58:C, 60:C, 98:C, 99:C

TNC Ecoregions: 31:C, 40:C, 41:C, 42:C, 43:C, 53:C, 55:C, 56:C, 57:C, 58:C

SOURCES

References: EPA 2004, Evans 1991, FNAI 1990, Klimas et al. 1981, Kuchler 1964, Marks and Harcombe 1981, Post 1969, Sharitz and Mitsch 1993, Southeastern Ecology Working Group n.d., Wharton et al. 1982, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.784937#references

Description Author: M. Pyne, mod. S.C. Gawler

Version: 23 Jan 2007

Concept Author: Southeastern Ecology Group

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

1474 GULF AND ATLANTIC COASTAL PLAIN SMALL STREAM RIPARIAN SYSTEMS (CES203.630)

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Intermittent Flooding; Forest and Woodland (Treed); Riverine / Alluvial

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2474; ESLF 9143; ESP 1474

CONCEPT

Summary: This systems group encompasses the floodplains of small streams in the Gulf and Atlantic coastal plains of the southeastern United States, north to southern New Jersey. Compared to larger river systems, flooding tends to be variable and of shorter duration. These landscapes usually encompass a variety of habitats resulting from natural hydrological spatial patterns (i.e., meander scars, sloughs, gravel bars, old depressions, and/or oxbows are present). Most of the communities are temporarily flooded, with the possible addition of smaller-scale seasonally flooded features such as beaver-created herbaceous wetlands and shrub-dominated features. The vegetation generally consists almost entirely of forests of wetland trees, but occasional, small shrubby or herbaceous sloughs may also be present.

Examples of these systems may include a number of different plant communities, each with distinctive floristic compositions. Wetter examples may be strongly dominated by *Taxodium distichum* and *Nyssa biflora*. Other canopy trees include *Betula nigra*, *Celtis laevigata*, *Diospyros virginiana*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Liquidambar styraciflua*, *Pinus taeda*, *Platanus occidentalis*, *Quercus laurifolia*, *Quercus lyrata* (in longer hydroperiod stands), *Quercus michauxii*, *Quercus nigra*, *Quercus pagoda*, *Quercus phellos*, *Quercus texana*, *Ulmus americana*, *Ulmus crassifolia*, and *Ulmus rubra*. Except in the very wet examples, subcanopy, shrub, and herb layers are generally well-developed and woody vines are also prominent. Associated species vary to some extent with geography but include *Carya glabra*, *Magnolia grandiflora*, *Quercus virginiana*, *Liquidambar styraciflua*, *Acer barbatum*, *Fraxinus americana*, *Fraxinus caroliniana*, *Celtis laevigata*, *Sabal minor*, *Sebastiania fruticosa*, *Serenoa repens*, and *Itea virginica*. Shrubs and understory trees may include (depending on length of hydroperiod) *Carpinus caroliniana*, *Cephalanthus occidentalis*, *Cornus obliqua*, *Crataegus marshallii*, *Ilex opaca*, *Ostrya virginiana*, *Salix nigra*, and *Vaccinium fuscatum*. In addition, *Arundinaria gigantea* may be present. Vines may include *Berchemia scandens*, *Smilax bona-nox*, and *Toxicodendron radicans*. Some herbs may include *Bidens aristosa*, *Boehmeria cylindrica*, *Carex cherokeensis*, *Carex debilis*, *Carex digitalis*, *Carex jooirii*, *Chasmanthium latifolium*, *Geum canadense*, *Glyceria striata*, *Leersia virginica*, and *Polygonum hydropiperoides*. Smaller-scale features may be dominated by shrubs (*Cephalanthus occidentalis*, *Decodon verticillatus*) and/or perennial and annual herbs. In the Gulf Coastal Plain, this systems group includes small streams and sloughs that course through the coastal prairie in Louisiana and Texas.

Similar Ecological Systems:

- Gulf and Atlantic Coastal Plain Floodplain Systems (CES203.629)

DESCRIPTION

Vegetation: Canopy trees may include *Acer barbatum*, *Acer negundo*, *Betula nigra*, *Celtis laevigata*, *Chamaecyparis thyoides*, *Diospyros virginiana*, *Fagus grandifolia*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Liquidambar styraciflua*, *Liriodendron tulipifera*, *Magnolia grandiflora*, *Magnolia macrophylla*, *Magnolia virginiana*, *Nyssa aquatica*, *Nyssa biflora*, *Nyssa sylvatica*, *Pinus elliotii* var. *elliottii*, *Pinus glabra*, *Pinus taeda*, *Platanus occidentalis*, *Quercus alba*, *Quercus laurifolia*, *Quercus lyrata*, *Quercus michauxii*, *Quercus muehlenbergii*, *Quercus nigra*, *Quercus pagoda*, *Quercus phellos*, *Quercus shumardii*, *Quercus texana*, *Quercus virginiana*, *Salix nigra*, *Taxodium distichum*, *Tilia americana* var. *heterophylla*, *Ulmus alata*, *Ulmus americana*, *Ulmus crassifolia*, and *Ulmus rubra*. Shrubs, small trees, and vines may include *Alnus serrulata*, *Ampelopsis arborea*, *Arundinaria gigantea*, *Berchemia scandens*, *Carpinus caroliniana* ssp. *caroliniana*, *Cephalanthus occidentalis*, *Cliftonia monophylla*, *Cornus obliqua*, *Crataegus marshallii*, *Cyrilla racemiflora*, *Decodon verticillatus*, *Halesia diptera*, *Ilex decidua*, *Ilex glabra*, *Ilex opaca*, *Osmanthus americanus*, *Ostrya virginiana*, *Rhododendron canescens*, *Sabal minor*, *Salix caroliniana*, *Serenoa repens*, *Toxicodendron radicans*, *Vaccinium fuscatum*, and *Viburnum nudum* var. *nudum*. Herbs may include *Bidens aristosa*, *Boehmeria cylindrica*, *Carex abscondita*, *Carex cherokeensis*, *Carex debilis*, *Carex digitalis*, *Carex jooirii*, *Chasmanthium latifolium*, *Chasmanthium laxum*, *Chasmanthium sessiliflorum*, *Dicliptera brachiata*, *Geum canadense*, *Glyceria striata*, *Juncus effusus*, *Justicia ovata*, *Leersia lenticularis*, *Leersia virginica*, *Lemna* spp., *Lindernia dubia*, *Ludwigia peploides*, *Myriophyllum heterophyllum*, *Nelumbo lutea*, *Onoclea sensibilis*, *Orontium aquaticum*, *Panicum rigidulum* var. *elongatum*, *Panicum virgatum*, *Peltandra virginica*, *Phanopyrum gymnocarpon*, *Polygonum hydropiperoides*, *Polygonum punctatum*, *Polygonum* spp., *Pontederia cordata*, *Saururus cernuus*, *Scirpus cyperinus*, *Smilax bona-nox*, and *Woodwardia areolata*.

Dynamics: Flooding is an important ecological factor in these systems and may be the most important factor separating them from adjacent systems. Flooding brings nutrients and excludes non-flood-tolerant species. Most of these forests exist naturally as multi-aged old-growth forests driven by gap-phase regeneration. Windthrow is probably the most important cause of gaps. Fire is probably more important than in larger river systems, because distances to uplands are short and because stream channels and sloughs are smaller and less effective as firebreaks. However, most of the vegetation is not very flammable and usually will not carry fire.

MEMBERSHIP

Standard Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)
- East Gulf Coastal Plain Small Stream and River Floodplain Forest (CES203.559)
- Northern Atlantic Coastal Plain Stream and River (CES203.070)
- Texas-Louisiana Coastal Prairie Slough (CES203.542)
- West Gulf Coastal Plain Small Stream and River Forest (CES203.487)

SPATIAL CHARACTERISTICS

Size: These systems occur in narrow bands, from a few hundred feet to possibly as much as a mile in width, and often several to many miles long. Natural limitations on development and conversion often result in contiguous patches that may be hundreds or even thousands of acres. However, because of relatively easy accessibility compared to larger floodplains, patches of mature vegetation are often small.

DISTRIBUTION

Range: This systems group ranges along the Atlantic and Gulf coastal plains from the Chesapeake Bay south to central Florida and west to eastern Texas, with peripheral examples extending north to southern New Jersey.

Divisions: 203:C

Nations: US

Subnations: AL, AR, DE, FL, GA, KY, LA, MD, MS, NC, NJ, OK, SC, TN, TX, VA

Map Zones: 36:C, 37:C, 44:C, 45:C, 46:C, 55:C, 56:C, 58:C, 60:C, 98:C, 99:C

TNC Ecoregions: 31:C, 40:C, 41:C, 43:C, 53:C, 56:C, 57:C, 58:C, 62:C

SOURCES

References: Drew et al. 1998, Evans 1991, FNAI 1990, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.784938#references

Description Author: M. Pyne, mod. S.C. Gawler

Version: 26 Jul 2007

Concept Author: Southeastern Ecology Group

Stakeholders: East, Southeast

ClassifResp: Southeast

1480 GULF AND ATLANTIC COASTAL PLAIN SWAMP SYSTEMS (CES203.636)

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch, Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Temperate; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2480; ESLF 9149; ESP 1480

CONCEPT

Summary: This systems group consists of poorly drained, organic or mineral soil flats and basins of the Atlantic and Gulf coastal plains. These areas are saturated by rainfall and seasonal high water tables. Most are not associated with river floodplains, although one component system is a tidal swamp. Dominant tree species vary with geography. South of Virginia, *Taxodium distichum* and *Nyssa* spp. are the most characteristic trees in many of these swamps. In the North Atlantic Coastal Plain, *Chamaecyparis thyoides*, *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa sylvatica*, *Quercus phellos*, and *Fraxinus pennsylvanica* are characteristic dominants. Tidal wooded swamps from Virginia to Florida are dominated by *Taxodium*, *Nyssa*, or *Fraxinus*. In the Mississippi River Valley, along with *Taxodium distichum* and *Nyssa* spp., characteristic trees include *Acer rubrum*, *Carya aquatica*, *Fraxinus profunda*, *Gleditsia aquatica*, *Planera aquatica*, *Quercus lyrata*, *Quercus palustris*, and *Salix nigra*. At the southern edge of this group's range, hydric hammocks in northern to central Florida are characterized by *Chamaecyparis thyoides* and *Sabal palmetto*. Important wetland oaks throughout much of the range include *Quercus michauxii*, *Quercus pagoda*, *Quercus phellos*, and *Quercus laurifolia*.

MEMBERSHIP

Standard Ecological Systems:

- East Gulf Coastal Plain Northern Seepage Swamp (CES203.554)
- East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299)
- Mississippi River Bottomland Depression (CES203.490)
- Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522)
- Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest (CES203.520)
- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)
- Southern Coastal Plain Hydric Hammock (CES203.501)
- Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)
- West Gulf Coastal Plain Near-Coast Large River Swamp (CES203.459)

DISTRIBUTION

Range: This systems group occurs along the Gulf and Atlantic coastal plains from Massachusetts to Texas, extending up the Mississippi River to the southernmost part of Illinois. They are also found rarely north to southern Maine.

Divisions: 203:C

Nations: US

Subnations: AL, AR, CT, DE, FL, GA, IL, KY, LA, MA, MD, ME, MO, MS, NC, NJ, NY, SC, TN, TX, VA

Map Zones: 36:C, 37:C, 44:C, 45:C, 46:C, 55:C, 56:C, 58:C, 60:C, 65:C, 66:C, 98:C, 99:C

USFS Ecomap Regions: 221A:CC, 232A:CC

TNC Ecoregions: 31:?, 40:C, 41:C, 42:C, 43:C, 53:C, 55:C, 56:C, 57:C, 58:C, 62:C

SOURCES

References: Evans 1991, FNAI 1990, FNAI 1997, Marks and Harcombe 1981, Nelson 1986, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.784944#references

Description Author: S.C. Gawler

Version: 20 Aug 2007

Concept Author: Southeastern Ecology Group

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

HIGH ALLEGHENY WETLAND (CES202.069)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: >180-day hydroperiod; Bog and Fen Mosaic; Fen; Montane; Marsh; Swamp; Peat and mud; Temperate; Extensive Wet Flat; Depressional; Unglaciaded; Palustrine; Bog; Depression

National Mapping Codes: ESLF 9356

CONCEPT

Summary: This system occurs along the high plateau of the Allegheny Mountains, immediately west of the Allegheny Front at elevations between 730 and 1430 m. Wetlands in this system are drained by low-gradient, meandering, intermittent to small headwater streams. Drainage is impounded in high, flat-lying basins by natural dams or "knickpoints" of resistant sandstone. In addition to poor moisture drainage, cold air drains from the surrounding uplands to pool in the flat basins, which function as frost pockets. Rainfall is plentiful, averaging about 1300 mm/year. Communities in this system may have substrates of shallow to deep peat or, less commonly, mineral soil. Soils are acidic to circumneutral. These high Allegheny wetlands form complex mosaics ranging in size from a few hectares to 6000 hectares. Forested swamps occupy the less disturbed margins or slightly higher "islands." Ombrotrophic bogs are rare but occur in undisturbed portions of a few of the larger wetlands. The more central, flood- or beaver-influenced portions contain shrub swamps, sedge fens, wet meadows, and open marshes. Forested swamps are dominated by *Picea rubens*, with varying cover by *Acer rubrum*, *Tsuga canadensis*, and *Betula alleghaniensis* var. *alleghaniensis*. Where limestone or calcareous shale influences seepage water, *Abies balsamea* and *Fraxinus nigra* are typical canopy dominants. Common shrub species are *Viburnum nudum* var. *cassinoides*, *Rhododendron maximum*, *Vaccinium myrtilloides*, *Alnus incana* ssp. *rugosa*, *Hypericum densiflorum*, *Ilex verticillata*, and *Photinia melanocarpa*. Herbaceous species frequently include *Rubus hispidus*, *Solidago uliginosa*, *Juncus effusus*, *Eriophorum virginicum*, *Osmunda cinnamomea* var. *cinnamomea*, *Polygonum sagittatum*, *Carex folliculata*, *Carex gynandra*, *Leersia oryzoides*, *Galium tinctorium*, *Solidago rugosa*, *Symplocarpus foetidus*, *Lycopus uniflorus* var. *uniflorus*, *Scirpus cyperinus*, *Carex scoparia* var. *scoparia*, and *Carex trisperma* var. *trisperma*. *Sphagnum* spp. and *Polytrichum* spp. dominate the bryophyte layer. This system is maintained by a spatially complex mix of seepage, low-energy flooding, beaver activity, and rainfall.

Similar Ecological Systems:

- North-Central Appalachian Acidic Swamp (CES202.604)
- Southern and Central Appalachian Bog and Fen (CES202.300)

DESCRIPTION

Environment: This system occurs along the high plateau of the Allegheny Mountains, immediately west of the Allegheny Front at elevations between 730 and 1430 m. Wetlands in this system are drained by low-gradient, meandering, intermittent to small streams that form the headwaters of larger (often high-gradient) mountain rivers. The system is underlain by gently folded sedimentary rocks of Carboniferous and Devonian age. Drainage is impounded in high, flat-lying basins by natural dams or "knickpoints" of resistant sandstone (Pottsville and Price formations). These sandstone layers come to the surface along the gently dipping axes of breached anticlines or synclines, or occasionally on the gently dipping limb of a fold. Cold air drains from the surrounding uplands to pool in the flat basins, which function as frost pockets. Rainfall is plentiful, averaging about 1300 mm/year. Communities in this system may have substrates of shallow to deep peat (a few centimeters to up to 3 m depth) or, less commonly, mineral soil. Soils are acidic to circumneutral, with pH ranging from 3.1 to 6.5. High values for soil organic matter, total exchange capacity, exchangeable nitrogen, soluble sulphur, and phosphorus are typical. Most soils are low in boron, copper, potassium, and manganese.

Vegetation: These high Allegheny wetlands form complex mosaics of small-patch communities. Forested swamps occupy the less disturbed margins or slightly higher "islands" in the wetland mosaic. Ombrotrophic bogs are rare but occur in undisturbed portions of a few of the larger wetlands. The more central, flood- or beaver-influenced sections contain shrub swamps, sedge fens, wet meadows, and open marshes. A number of species have northern affiliations, including some that are disjunct (e.g., *Abies balsamea*, *Larix laricina*, and *Andromeda polifolia* var. *glaucophylla*). The shrub strata include characteristic central Appalachian species (e.g., *Rhododendron maximum*), Appalachian endemic species (e.g., *Ilex collina*), and species with a more southern affiliation (e.g., *Vaccinium erythrocarpum*). Forested swamps are dominated by *Picea rubens*, with varying cover by *Acer rubrum*, *Tsuga canadensis*, and *Betula alleghaniensis* var. *alleghaniensis*. Where limestone or calcareous shale influences seepage water, *Abies balsamea* and *Fraxinus nigra* are typical canopy dominants. Common shrub species are *Viburnum nudum* var. *cassinoides*, *Rhododendron maximum*, *Vaccinium myrtilloides*, *Alnus incana* ssp. *rugosa*, *Hypericum densiflorum*, *Ilex verticillata*, *Photinia melanocarpa*, *Viburnum recognitum*, and *Kalmia latifolia*. Herbaceous species frequently include *Rubus hispidus*, *Solidago uliginosa*, *Juncus effusus*, *Eriophorum virginicum*, *Osmunda cinnamomea* var. *cinnamomea*, *Polygonum sagittatum*, *Carex folliculata*, *Carex gynandra*, *Leersia oryzoides*, *Galium tinctorium*, *Solidago rugosa*, *Symplocarpus foetidus*, *Lycopus uniflorus* var. *uniflorus*, *Scirpus cyperinus*, *Carex scoparia* var. *scoparia*, *Carex trisperma* var. *trisperma*, *Carex stipata*, and *Calamagrostis canadensis* var. *canadensis*. *Sphagnum* spp. and *Polytrichum* spp. dominate the bryophyte layer.

Dynamics: This system is maintained by a spatially complex mix of seepage, low-energy flooding, beaver activity, and rainfall.

Drainage in the flat headwater basins is partly impounded by resistant sandstone at the basin outlet. Low-gradient, meandering headwater streams provide regular low-energy inundation. Seepage from surrounding forests provides nutrients at the margins of the wetland mosaic, and where limestone or calcareous shale is present, circumneutral wetlands are maintained. Beaver activity encourages the cycling of early- to mid-successional types. In the rare ombrotrophic bogs, rainfall is the only source of moisture. Many of the forested swamps in this system were logged during 1880-1920, and some were subsequently burned and/or heavily grazed. Undisturbed examples exist (e.g., Cranberry Glades), where old-growth swamp buffers the central peatlands, which have been dated to 10,000 years. In presettlement time, some wetland mosaics in this system had significant forested components (e.g., Canaan Valley, Cranesville Swamp), while others (e.g., Cranberry Glades, Big Run Bog) were largely open peatlands with forested swamp only on the margins.

MEMBERSHIP

Associations:

- (*Andromeda polifolia* var. *glaucophylla*) / *Polytrichum strictum* - *Cladina* spp. - *Sphagnum* spp. Nonvascular Vegetation (CEGL006589, G1)
- *Abies balsamea* - *Picea rubens* / *Danthonia compressa* - *Lycopodium* spp. / *Sphagnum* spp. Forest (CEGL006592, G2)
- *Abies balsamea* - *Picea rubens* / *Ilex verticillata* / *Sphagnum* spp. Forest (CEGL006591, G2)
- *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (CEGL006132, GNR)
- *Alnus incana* - *Viburnum recognitum* / *Calamagrostis canadensis* Shrubland [Provisional] (CEGL006546, GNR)
- *Alnus incana* Swamp Shrubland (CEGL002381, G5)
- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549, GNR)
- *Carex echinata* - *Solidago uliginosa* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008534, G2?)
- *Carex gynandra* - *Scirpus cyperinus* - *Eriophorum virginicum* - *Osmunda cinnamomea* Herbaceous Vegetation (CEGL007771, G2)
- *Carex lacustris* Herbaceous Vegetation (CEGL002256, G4G5)
- *Carex stricta* - *Carex vesicaria* Herbaceous Vegetation (CEGL006412, G4G5)
- *Chrysosplenium americanum* Herbaceous Vegetation (CEGL006193, G3G5)
- *Dulichium arundinaceum* - *Carex folliculata* - *Juncus* spp. Herbaceous Vegetation (CEGL006552, GNR)
- *Eriophorum virginicum* - (*Carex folliculata*) / *Sphagnum* spp. - *Polytrichum* spp. Herbaceous Vegetation (CEGL006570, G3)
- *Fraxinus nigra* - *Abies balsamea* / *Rhamnus alnifolia* Forest (CEGL006003, G1)
- *Hypericum densiflorum* / *Rubus hispidus* Shrubland (CEGL006464, GNR)
- *Larix laricina* / *Photinia melanocarpa* / *Sphagnum* spp. Forest (CEGL002472, G4?)
- *Leersia oryzoides* - *Sagittaria latifolia* Herbaceous Vegetation (CEGL006461, GNR)
- *Photinia pyrifolia* - *Ilex verticillata* - *Nemophanthus mucronatus* / *Osmunda cinnamomea* Saturated Shrubland (CEGL006545, GNR)
- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Saturated Forest (CEGL006277, G2?)
- *Picea rubens* - *Acer rubrum* / *Ilex verticillata* Forest (CEGL006556, G3)
- *Picea rubens* / *Carex trisperma* / *Sphagnum* spp. - *Polytrichum* spp. Forest (CEGL006590, G2)
- *Picea rubens* / *Rhododendron maximum* / *Kalmia latifolia* / *Eriophorum virginicum* / *Sphagnum* spp. Forest (CEGL006588, G2G3)
- *Picea rubens* / *Vaccinium erythrocarpum* / *Sphagnum* spp. - *Bazzania trilobata* Forest (CEGL006593, G2)
- *Pinus rigida* / *Vaccinium myrtilloides* / *Sphagnum* spp. Woodland (CEGL006022, G1G2)
- *Populus tremuloides* / *Vaccinium myrtilloides* / *Solidago uliginosa* Forest (CEGL006594, GNR)
- *Salix sericea* Shrubland (CEGL006305, GNR)
- *Schoenoplectus (tabernaemontani, acutus)* Eastern Herbaceous Vegetation (CEGL006275, GNR)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Vegetation (CEGL006349, GNR)
- *Solidago rugosa* - *Euthamia graminifolia* Herbaceous Vegetation (CEGL006568, GNR)
- *Sparganium americanum* - (*Sparganium erectum* ssp. *stoloniferum*) - *Epilobium leptophyllum* Herbaceous Vegetation (CEGL004510, G2G3)
- *Spiraea alba* Shrubland [Provisional] (CEGL006595, GNR)
- *Spiraea tomentosa* - *Rubus* spp. / *Phalaris arundinacea* Shrubland (CEGL006571, GNR)
- *Vaccinium oxycoccos* - (*Vaccinium macrocarpon*) / *Rhynchospora alba* - *Drosera rotundifolia* / *Sphagnum* spp. Dwarf-shrubland (CEGL007856, G2)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex (atlantica, echinata)* - *Eriophorum virginicum* - *Rhynchospora capitellata* - *Solidago patula* Saturated Herbaceous Alliance (A.1450)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)

- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Chrysosplenium americanum* Saturated Herbaceous Alliance (A.1685)
- *Eriophorum* spp. Saturated Herbaceous Alliance (A.2624)
- *Fraxinus nigra* - *Acer rubrum* Saturated Forest Alliance (A.347)
- *Larix laricina* Saturated Forest Alliance (A.349)
- *Leersia oryzoides* - *Glyceria striata* Seasonally Flooded Herbaceous Alliance (A.1399)
- Low Forbs Mixed Herbaceous Alliance (A.3537)
- *Picea rubens* - *Abies balsamea* Saturated Forest Alliance (A.202)
- *Picea rubens* - *Acer rubrum* Saturated Forest Alliance (A.450)
- *Picea rubens* Saturated Forest Alliance (A.198)
- *Pinus rigida* Saturated Woodland Alliance (A.580)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Salix sericea* Seasonally Flooded Shrubland Alliance (A.3028)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Sparganium americanum* Seasonally Flooded Herbaceous Alliance (A.1388)
- *Sphagnum cuspidatum* - *Cladopodiella fluitans* Saturated Nonvascular Alliance (A.3006)
- *Spiraea (alba, tomentosa)* - *Rubus* spp. Seasonally Flooded Shrubland Alliance (A.3022)
- *Vaccinium corymbosum* Saturated Shrubland Alliance (A.1018)
- *Vaccinium macrocarpon* Saturated Dwarf-shrubland Alliance (A.1094)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system of wetland mosaics ranging in size from 5 to 6000 ha. Individual associations comprising the mosaic occur in small patches from 0.05 to 10 ha in size.

Adjacent Ecological Systems:

- Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)
- Central and Southern Appalachian Spruce-Fir Forest (CES202.028)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

Adjacent Ecological System Comments: Occurrences are embedded in Central and Southern Appalachian Spruce-Fir Forest (CES202.028), Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593), or Southern Appalachian Northern Hardwood Forest (CES202.029).

DISTRIBUTION

Range: The system occurs in a southwest/northeast-trending band about 40 km wide and 200 km long along the high, flat plateau of the Allegheny Mountains. The eastern boundary is the Allegheny Front, and the western boundary is the heavily dissected, lower elevation Allegheny Plateau. Minimum elevations range from 730 m in the north (Garrett County, Maryland) to 940 m in the south (Droop Mountain, West Virginia). The maximum elevation is 1422 m on Mount Porte Crayon, West Virginia.

Divisions: 202:C

Nations: US

Subnations: MD, WV

Map Zones: 61:C

USFS Ecomap Regions: M221B:CC

TNC Ecoregions: 59:C

SOURCES

References: Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.800809#references

Description Author: E.A. Byers and S. Gawler

Version: 01 May 2007

Concept Author: E.A. Byers and S. Gawler

Stakeholders: East

ClassifResp: East

1513 LOWER MISSISSIPPI RIVER FLATWOODS (CES203.193)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: EVT 2513; ESLF 9191; ESP 1513

CONCEPT

Summary: This system is comprised of forests, prairies and woodlands on Pleistocene terraces in the Mississippi Alluvial Plain of Arkansas, Missouri and Louisiana. It occurs primarily west of Crowley's Ridge on Pleistocene glacial outwash deposits in Arkansas and Missouri, and on Macon Ridge in Louisiana and adjacent Arkansas. The sites are above modern floodplains, but have poor internal drainage and are flat with poor runoff, leading to very wet conditions in winter and spring. They also often have a claypan that restricts both internal drainage and, later in the year, water availability. Therefore, they are very wet in the winter/spring and very dry in the summer, a moisture regime termed hydroxeric. Because of this moisture regime, the communities are variable, ranging from willow oak flats to post oak flats to prairies. In the 1940s, the Arkansas Game and Fish Commission produced a wildlife habitat map of Arkansas in which these sites were classified as "terrace hardwood forests." These communities have a large variety of upland and lowland tree species, ranging from post oak to overcup oak in a small area. Such species diversity may be explained by regeneration of species with dramatically different moisture tolerances on the same site in dry and wet years on these hydroxeric sites. Because the sites are above current floodplains and susceptible to being drained, they have been cleared at an even greater rate than nearby floodplain forests.

Classification Comments: T. Foti (pers. comm. 2007): "I think it does encompass the Louisiana Mesic Hardwood Flatwoods, and the species listed in that description look good for the whole system. Do we want to leave the potential for prairies in this system or include them in the Grand Prairie system? I am inclined to think that small prairie inclusions should remain in this system and larger, individually definable prairies, such as those formerly across the White River from the Grand Prairie proper, could be included in that system. That distinction might be mentioned in the description. The Grand Prairie should be listed as a similar ecological system."

Similar Ecological Systems:

- Lower Mississippi Alluvial Plain Grand Prairie (CES203.549)
- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)
- West Gulf Coastal Plain Nonriverine Wet Hardwood Flatwoods (CES203.548)

Related Concepts:

- Mesic Hardwood Flatwood (LNHP 2004) Finer
- Wet Hardwood Flatwood (LNHP 2004) Finer

DESCRIPTION

Environment: The sites where this system is found are above modern floodplains, but have poor internal drainage and are flat with poor runoff, leading to very wet conditions in winter and spring. They also often have a claypan that restricts both internal drainage and, later in the year, water availability. Therefore, they are very wet in the winter/spring and very dry in the summer, a moisture regime termed hydroxeric. In Louisiana, distinct mesic and wet community variants are recognized (LNHP 2004).

Vegetation: The communities of this system are variable, ranging from willow oak flats to post oak flats to prairies. In examples on Macon Ridge (Louisiana), overstory dominants include *Carya alba*, *Nyssa sylvatica*, *Quercus alba*, *Quercus pagoda*, *Quercus nigra*, *Quercus michauxii*, and *Liquidambar styraciflua*. In addition, *Quercus shumardii* and *Quercus falcata* are fairly frequent but not usually abundant. Common midstory trees include *Cornus florida*, *Ostrya virginiana*, *Aralia spinosa*, *Ulmus alata*, *Sassafras albidum*, and *Acer rubrum*. Important shrubs/small trees are *Vaccinium arboreum*, *Vaccinium virgatum*, *Viburnum rufidulum*, *Crataegus marshallii*, *Aesculus pavia*, *Frangula caroliniana*, *Asimina triloba*, *Hypericum hypericoides*, and *Euonymus americanus*. Although infrequent, *Hamamelis virginiana* can be locally abundant. Important woody vines include *Toxicodendron radicans*, *Parthenocissus quinquefolia*, *Vitis rotundifolia*, *Vitis aestivalis*, and *Smilax smallii*. *Toxicodendron radicans* and *Parthenocissus quinquefolia* are usually thick on the ground, as well as being represented by high climbing individuals. Common and characteristic herbaceous plants include *Chasmanthium sessiliflorum*, *Dichantherium boscii*, *Podophyllum peltatum*, *Carex cherokeensis*, *Elephantopus carolinianus*, *Elephantopus tomentosus*, *Scleria oligantha*, *Aristolochia serpentaria*, *Botrychium virginianum*, *Passiflora lutea*, *Dioscorea villosa*, *Clitoria mariana*, *Sanicula canadensis*, *Geum canadense*, *Galium circaeans*, *Agrimonia rostellata*, *Spigelia marilandica*, *Clematis virginiana*, *Phryma leptostachya*, *Ruellia caroliniensis*, and *Smallanthus uvedalius* (LNHP 2004).

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)

Adjacent Ecological System Comments: These flatwoods are above existing floodplains and they are ecologically controlled by edaphic factors and precipitation.

DISTRIBUTION

Range: This system is found in the Mississippi Alluvial Plain from the Missouri "bootheel" south to Louisiana. In Louisiana it is found on Macon Ridge (Ecoregion 73j (EPA 2004)). It is not reported from Kentucky, Tennessee, or Mississippi.

Divisions: 203:C

Nations: US

Subnations: AR, LA, MO

Map Zones: 45:C, 98:P

TNC Ecoregions: 42:C

SOURCES

References: EPA 2004, Foti pers. comm., LNHP 2004, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768783#references

Description Author: T. Foti and M. Pyne

Version: 30 Jan 2006

Concept Author: T. Foti and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

MISSISSIPPI RIVER BOTTOMLAND DEPRESSION (CES203.490)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Riverine / Alluvial [Brownwater]; Needle-Leaved Tree; Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 9352

CONCEPT

Summary: This system represents semipermanently flooded to saturated depressional areas of the lower Mississippi River Alluvial Valley.

Related Concepts:

- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: Examples of this system are found in depressions and backswamps of the lower Mississippi River Alluvial Valley. These areas have a distinctly longer hydroperiod than other parts of the landscape.

Vegetation: Typical and characteristic trees in examples of this system include *Acer rubrum* var. *drummondii*, *Carya aquatica*, *Fraxinus profunda*, *Gleditsia aquatica*, *Nyssa aquatica*, *Nyssa biflora*, *Planera aquatica*, *Quercus lyrata*, *Quercus palustris*, *Salix nigra*, and *Taxodium distichum*. Some characteristic shrubs include *Cephalanthus occidentalis*, *Cornus foemina*, *Decodon verticillatus*, *Forestiera acuminata*, *Itea virginica*, and *Planera aquatica*. Herbs are uncommon, but *Ludwigia peploides*, *Sagittaria lancifolia*, *Ceratophyllum* spp., *Elodea* spp., *Potamogeton* spp., and *Lemna minor* may be found.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Gleditsia aquatica* - *Planera aquatica* - *Fraxinus profunda* Forest (CEGL002422, G3G5)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Decodon verticillatus* Seasonally Flooded Shrubland (CEGL003905, G4)
- *Forestiera acuminata* - (*Planera aquatica*, *Cephalanthus occidentalis*) Shrubland (CEGL003911, G3?)
- *Gleditsia aquatica* - *Carya aquatica* Forest (CEGL007426, G3?)
- *Ludwigia peploides* Herbaceous Vegetation (CEGL007835, G4G5)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa aquatica* Floodplain Forest (CEGL007389, GNR)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Vegetation (CEGL004725, G4?)
- *Quercus lyrata* - *Quercus palustris* / *Acer rubrum* var. *drummondii* / *Itea virginica* - *Cornus foemina* - (*Lindera melissifolia*) Forest (CEGL004778, G2?)
- *Salix nigra* / (*Clethra alnifolia*, *Morella cerifera*) / *Nyssa aquatica* Successional Forest (CEGL007411, GNA)
- *Salix nigra* / *Sagittaria lancifolia* Forest (CEGL007436, G4?)
- *Taxodium distichum* - (*Nyssa aquatica*) / *Forestiera acuminata* - *Planera aquatica* Forest (CEGL002421, G3G5)
- *Taxodium distichum* - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Forest (CEGL007422, G4?)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)
- *Taxodium distichum* / *Planera aquatica* - *Forestiera acuminata* Lakeshore Woodland (CEGL007909, GNR)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Forestiera acuminata* Semipermanently Flooded Shrubland Alliance (A.1012)
- *Ludwigia peploides* Semipermanently Flooded Herbaceous Alliance (A.1928)
- *Nyssa* (*aquatica*, *biflora*, *ogeche*) Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)

- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Taxodium distichum* - (*Taxodium ascendens*) Seasonally Flooded Lakeshore Woodland Alliance (A.652)
- *Taxodium distichum* - *Nyssa* (*aquatica*, *biflora*, *ogeche*) Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)

DISTRIBUTION

Range: This system is found in the Mississippi Alluvial Plain from southern Illinois south to Mississippi and Louisiana.

Divisions: 203:C

Nations: US

Subnations: AR, IL, KY, LA, MO, MS, TN

Map Zones: 45:C, 98:C

TNC Ecoregions: 42:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723096#references

Description Author: T. Foti and R. Evans, mod. M. Pyne

Version: 18 Apr 2006

Concept Author: T. Foti and R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

MISSISSIPPI RIVER HIGH FLOODPLAIN (BOTTOMLAND) FOREST (CES203.196)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9180

CONCEPT

Summary: "High bottomlands" are often temporarily flooded on older Holocene point bars and natural levees, with flooding less frequent than every five years. Wetland functions are primarily driven by precipitation and are classed as floodplain flats in a hydrogeomorphic classification (Klimas et al. 2004). They are flooded less frequently than adjacent riparian floodplains or low floodplains. These floodplains are of particular conservation interest because they have been cleared to a greater extent than riparian or low floodplains because of the reduced flooding of these sites. Also, flood control levees protect many of these sites, and with protection from levees, almost all sites are cleared. Thus, most wetlands remaining in large bottomland areas are riparian or low bottomlands, and the species, communities and other characteristics of high bottomlands have been essentially lost. Wildlife agency partners generally would like to see this distinction recognized. Because many of these sites are adjacent to uplands or non-flooded hydroxic flatwoods, both of which have a relatively high fire frequency, and high floodplains are relatively dry, they have a much higher typical fire frequency than lower bottomlands. Therefore, under pre-development conditions, they would have been more open and had a higher ground layer diversity than other floodplain systems.

Similar Ecological Systems:

- Lower Mississippi River Flatwoods (CES203.193)
- Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)
- Mississippi River Riparian Forest (CES203.190)

Related Concepts:

- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Floodplain Ridge/Terrace Forest (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: These "high bottomlands" are often temporarily flooded on older Holocene point bars and natural levees, with flooding less frequent than every five years. Wetland functions are primarily driven by precipitation and are classed as floodplain flats in a hydrogeomorphic classification (Klimas et al. 2004). They are flooded less frequently than adjacent riparian floodplains or low floodplains.

Vegetation: Typical dominant trees in stands of this system include *Liquidambar styraciflua*, *Quercus laurifolia*, *Quercus michauxii*, *Quercus nigra*, *Quercus pagoda*, *Quercus phellos*, *Quercus shumardii*, *Quercus texana*, and *Carya* spp. Southern examples may contain *Quercus virginiana* and/or *Magnolia grandiflora*, northern ones may contain *Quercus palustris*. Wetter inclusions may contain *Quercus lyrata*. Some stands which lack these species may exhibit dominance by *Fraxinus pennsylvanica*, *Ulmus americana* and *Celtis laevigata*. *Gleditsia triacanthos* may also be a component. *Ulmus crassifolia* may be more commonly found west of the Mississippi River. Some small trees and shrubs include *Cornus florida*, *Ilex decidua*, *Ilex opaca* var. *opaca*, *Viburnum dentatum*, and *Carpinus caroliniana*. Southern stands may contain *Sabal minor*. The perennial graminoid bamboo *Arundinaria gigantea* ssp. *gigantea* may dominate the shrub stratum of some forests, or it may form non-forested stands called "canebrakes." *Vitis rotundifolia*, *Ampelopsis arborea*, and *Campsis radicans* are common vines.

Dynamics: Regeneration of remaining examples today are typified by small gap regeneration or large patch regeneration in tornado tracks, but originally, fire may have opened larger patches in which regeneration occurred.

MEMBERSHIP

Associations:

- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Fraxinus pennsylvanica* - *Ulmus crassifolia* - *Celtis laevigata* Forest (CEGL004618, GNR)
- *Liquidambar styraciflua* - *Quercus pagoda* - *Carya* spp. / *Carpinus caroliniana* / *Carex* spp. Forest (CEGL007353, G3G4)
- *Quercus laurifolia* - *Quercus nigra* Mississippi River Alluvial Plain Forest (CEGL007916, GNR)
- *Quercus michauxii* - *Quercus shumardii* - *Liquidambar styraciflua* / *Arundinaria gigantea* Forest (CEGL002099, G3G4)

- *Quercus palustris* - (*Quercus stellata*) - *Quercus pagoda* / *Isoetes* spp. Forest (CEGL002101, G2G3)
- *Quercus phellos* - (*Quercus lyrata*) / *Carex* spp. - *Leersia* spp. Forest (CEGL002102, G3G4Q)
- *Quercus phellos* - (*Quercus similis*) - *Ulmus crassifolia* Forest (CEGL007921, G3G4)
- *Quercus phellos* - *Quercus nigra* - *Liquidambar styraciflua* Mississippi River Alluvial Plain Forest (CEGL007915, G4G5)
- *Quercus texana* - *Celtis laevigata* - *Ulmus (americana, crassifolia)* - (*Gleditsia triacanthos*) Forest (CEGL004619, G4G5)
- *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* / *Sabal minor* Forest (CEGL004648, G2)
- *Quercus virginiana* - *Quercus nigra* - *Liquidambar styraciflua* / *Ilex opaca* var. *opaca* / *Viburnum dentatum* Forest (CEGL007476, G2G3)
- *Quercus virginiana* - *Quercus pagoda* - *Magnolia grandiflora* / *Cornus florida* / *Sanicula* sp. Forest (CEGL007469, G2G3)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Vine-Shrubland (CEGL004620, GNA)

Alliances:

- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Celtis laevigata* - *Ulmus crassifolia* Temporarily Flooded Forest Alliance (A.283)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* Temporarily Flooded Forest Alliance (A.376)
- *Quercus virginiana* - *Quercus nigra* Saturated Forest Alliance (A.379)
- *Quercus virginiana* - *Quercus pagoda* Forest Alliance (A.375)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Seasonally Flooded Vine-Shrubland Alliance (A.993)

SPATIAL CHARACTERISTICS

Size: Large patch.

Adjacent Ecological Systems:

- Lower Mississippi River Flatwoods (CES203.193)
- Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)

DISTRIBUTION

Range: This system is found in the Mississippi Alluvial Plain from southern Illinois south to Mississippi and Louisiana.

Divisions: 203:C

Nations: US

Subnations: AR, IL, KY, LA, MO, MS, TN

Map Zones: 45:C, 98:C

TNC Ecoregions: 42:C

SOURCES

References: Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768761#references

Description Author: T. Foti and M. Pyne

Version: 18 Apr 2005

Concept Author: T. Foti and M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

MISSISSIPPI RIVER LOW FLOODPLAIN (BOTTOMLAND) FOREST (CES203.195)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9183

CONCEPT

Summary: "Low bottomlands" are usually seasonally flooded in backswamps, with flooding more frequent than every five years, usually more frequently than every two years, generally by still water that may be impounded behind natural levees, and are classed as Low Gradient Riverine Backwater wetlands in hydrogeomorphic classifications. Low bottomlands occur along the Mississippi River and its tributaries in the Mississippi River Alluvial Plain ecoregion. Prolonged flooding dominates this system, and its duration is greater than in the adjacent Mississippi River Riparian Forest. Overcup oak is the characteristic dominant species. Soils are clayey with poor internal drainage.

Similar Ecological Systems:

- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)
- Mississippi River Riparian Forest (CES203.190)--Flooding is of lower duration.

Related Concepts:

- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: "Low bottomlands" are usually seasonally flooded in backswamps, with flooding more frequent than every five years, usually more frequently than every two years, generally by still water that may be impounded behind natural levees, and are classed as Low Gradient Riverine Backwater wetlands in hydrogeomorphic classifications (Klimas et al. 2004).

Dynamics: Changes in soils and vegetation of this system are much slower than in the adjacent Mississippi River Riparian Forest. Regeneration is through small treefall gaps or large tornado tracks.

MEMBERSHIP

Associations:

- *Quercus lyrata* - *Carya aquatica* - (*Quercus texana*) / *Forestiera acuminata* Forest (CEGL002423, G3?)
- *Quercus lyrata* - *Liquidambar styraciflua* / *Forestiera acuminata* Forest (CEGL002424, G4?)
- *Quercus texana* - *Quercus lyrata* Forest (CEGL007407, G3G4)

Alliances:

- *Quercus lyrata* - (*Carya aquatica*) Seasonally Flooded Forest Alliance (A.328)
- *Quercus texana* - (*Quercus lyrata*) Seasonally Flooded Forest Alliance (A.331)

SPATIAL CHARACTERISTICS

Size: Large patch.

Adjacent Ecological Systems:

- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)
- Mississippi River Riparian Forest (CES203.190)

Adjacent Ecological System Comments: Flooding is of lower duration in riparian forests and soil deposition is often more rapid, leading to rapid vegetation changes.

DISTRIBUTION

Range: This system is found in the Mississippi Alluvial Plain from southern Illinois south to Mississippi and Louisiana.

Divisions: 203:C

Nations: US

Subnations: AR, IL, KY, LA, MO, MS, TN

Map Zones: 45:C, 98:C

TNC Ecoregions: 42:C

SOURCES

References: Klimas et al. 1981, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768395#references

Description Author: T. Foti and M. Pyne

Version: 17 Feb 2005

Concept Author: T. Foti, M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

MISSISSIPPI RIVER RIPARIAN FOREST (CES203.190)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Brownwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9161

CONCEPT

Summary: This system is comprised of "riverfront" Associations, generally temporarily (but rarely seasonally) flooded on point bars and natural levees adjacent to the river that formed them, with flooding more frequent than every five years, by flowing water directly from the stream. They occur along the lower Mississippi River and its tributaries in the Mississippi River Alluvial Plain ecoregion. They are classed as Low Gradient Riverine Overbank wetlands in a hydrogeomorphic classification. Flooding is of lower duration than on adjacent backswamps where water is impounded behind riverfront natural levees. Flooding is of longer duration than on adjacent high bottomlands that are typically temporarily flooded. Soils are typically sandier than those of low bottomlands. Giant cane (*Arundinaria gigantea*) is a common understory in these forests on natural levees and higher point bars, and may become dominant after thinning or removal of overstory. Willow and cottonwood sandbars may have an open-canopy (woodland-type) structure.

Similar Ecological Systems:

- Mississippi River High Floodplain (Bottomland) Forest (CES203.196)
- Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)

Related Concepts:

- Riparian Forest (Evans 1991) Broader

DESCRIPTION

Environment: Stands of this system are generally temporarily (but rarely seasonally) flooded on point bars and natural levees adjacent to the river that formed them, with flooding more frequent than every five years, by flowing water directly from the stream. They are classed as Low Gradient Riverine Overbank wetlands in a hydrogeomorphic classification (Klimas et al. 2004). Flooding is of lower duration than on adjacent backswamps where water is impounded behind riverfront natural levees. Flooding is of longer duration than on adjacent high bottomlands that are typically temporarily flooded. Soils are typically sandier than those of low bottomlands.

Vegetation: Some of the most typical and characteristic tree species found in stands of this system include *Acer negundo*, *Acer saccharinum*, *Platanus occidentalis*, *Populus deltoides*, and *Salix nigra*. Other trees may include *Celtis laevigata*, *Carya illinoensis*, *Fraxinus pennsylvanica*, *Gleditsia triacanthos*, *Liquidambar styraciflua*, *Quercus nigra*, *Quercus pagoda*, *Quercus texana*, *Ulmus americana*, and *Ulmus crassifolia*. In addition, *Quercus virginiana* may be present within its range. *Arundinaria gigantea* ssp. *gigantea* is a common understory component in these forests on natural levees and higher point bars, and may become dominant after thinning or removal of the overstory.

Dynamics: Often on sites with rapid soil deposition and, therefore, with rapid development of vegetation from low-diversity willow- and cottonwood-dominated communities to more diverse communities dominated by sycamore, pecan, sugarberry, green ash or Nuttall oak. Regeneration is through small treefall gaps or large tornado tracks.

MEMBERSHIP

Associations:

- *Acer negundo* Forest (CEGL005033, G4G5)
- *Acer saccharinum* - *Celtis laevigata* - *Carya illinoensis* Forest (CEGL002431, G3G4)
- *Acer saccharinum* - *Ulmus americana* Forest (CEGL002586, G4?)
- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Carya illinoensis* - *Celtis laevigata* - *Ulmus (americana, crassifolia)* Mississippi River Alluvial Plain Forest (CEGL007912, G2G3)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Platanus occidentalis* - *Fraxinus pennsylvanica* - *Celtis laevigata* - (*Liquidambar styraciflua*) Forest (CEGL007913, G4)
- *Populus deltoides* - *Salix nigra* / *Mikania scandens* Forest (CEGL007346, G4G5)
- *Populus deltoides* - *Salix nigra* Forest (CEGL002018, G3G4)
- *Quercus laurifolia* - *Quercus nigra* Mississippi River Alluvial Plain Forest (CEGL007916, GNR)
- *Quercus texana* - *Celtis laevigata* - *Ulmus (americana, crassifolia)* - (*Gleditsia triacanthos*) Forest (CEGL004619, G4G5)
- *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* / *Sabal minor* Forest (CEGL004648, G2)
- *Quercus virginiana* - *Quercus nigra* - *Liquidambar styraciflua* / *Ilex opaca* var. *opaca* / *Viburnum dentatum* Forest (CEGL007476, G2G3)
- *Quercus virginiana* - *Quercus pagoda* - *Magnolia grandiflora* / *Cornus florida* / *Sanicula* sp. Forest (CEGL007469, G2G3)

- *Salix nigra* / (*Clethra alnifolia*, *Morella cerifera*) / *Nyssa aquatica* Successional Forest (CEGL007411, GNA)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Carya illinoensis* - (*Celtis laevigata*) Temporarily Flooded Forest Alliance (A.282)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* Temporarily Flooded Forest Alliance (A.376)
- *Quercus virginiana* - *Quercus nigra* Saturated Forest Alliance (A.379)
- *Quercus virginiana* - *Quercus pagoda* Forest Alliance (A.375)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)

SPATIAL CHARACTERISTICS

Size: Large patch.

Adjacent Ecological Systems:

- Mississippi River Low Floodplain (Bottomland) Forest (CES203.195)

DISTRIBUTION

Range: This system is found in the Mississippi Alluvial Plain from southern Illinois south to Mississippi and Louisiana.

Divisions: 203:C

Nations: US

Subnations: AR, IL, KY, LA, MO, MS, TN

Map Zones: 45:C, 98:C

TNC Ecoregions: 42:C

SOURCES

References: Klimas et al. 1981, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.768386#references

Description Author: T. Foti and M. Pyne

Version: 30 Jan 2006

Concept Author: T. Foti, M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

NORTH-CENTRAL APPALACHIAN ACIDIC SWAMP (CES202.604)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: 30-180-day hydroperiod; Forest and Woodland (Treed); Extensive Wet Flat; Needle-Leaved Tree

Non-Diagnostic Classifiers: Acidic Water; Shallow (<15 cm) Water; Moderate (100-500 yrs) Persistence; Lowland; Temperate;

Mineral: W/ A-Horizon >10 cm; Broad-Leaved Deciduous Tree

National Mapping Codes: ESLF 9307

CONCEPT

Summary: These swamps are distributed from central New England through the Central Appalachians south to Virginia and west to Ohio. They are found at low to mid elevations (generally <700 m) in basins or on gently sloping seepage lowlands. The acidic substrate is mineral soil, often with a component of organic muck; if peat is present, it usually forms an organic epipedon over the mineral soil rather than a true peat substrate. *Tsuga canadensis* is usually present and may be dominant. It is often mixed with deciduous wetland trees such as *Acer rubrum* or *Nyssa sylvatica*. *Sphagnum* is an important component of the bryoid layer. Basin swamps tend to be more nutrient-poor and less species-rich than seepage swamps; in some settings, the two occur adjacent to each other with the basin swamp vegetation surrounded by seepage swamp vegetation on its upland periphery.

Classification Comments: This system excludes swamps with *Chamaecyparis thyoides*, a tree more characteristic of the Coastal Plain but which sometimes occurs inland. See Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522). Some examples of this system may appear similar to Southern and Central Appalachian Bog and Fen (CES202.300) or North-Central Interior and Appalachian Acidic Peatland (CES202.606); those systems are distinguished by their deeper peat substrate and overall partly forested character compared to the shallower organic soil and generally forested nature of the present system. Wetlands on the Allegheny Plateau, at higher elevations, are a distinct system, High Allegheny Wetland (CES202.069). There are many species with this type, but it is distinguished by occurring as a mosaic of open wetlands and smaller forest patches with a distinctive hydrology.

Similar Ecological Systems:

- High Allegheny Wetland (CES202.069)
- Northern Atlantic Coastal Plain Basin Peat Swamp (CES203.522)
- Piedmont Seepage Wetland (CES202.298)
- Piedmont Upland Depression Swamp (CES202.336)

Related Concepts:

- Mountain / Piedmont Acidic Seepage Swamps (Fleming et al. 2005) Broader. can be attributed to one of two systems depending on their location. Occurrences in the central Appalachians are attributed to this system (CES202.604) while occurrences in the Piedmont are attributed to Piedmont Seepage Wetland (CES202.298).

MEMBERSHIP

Associations:

- *Abies balsamea* - *Picea rubens* / *Danthonia compressa* - *Lycopodium* spp. / *Sphagnum* spp. Forest (CEGL006592, G2)
- *Abies balsamea* - *Picea rubens* / *Ilex verticillata* / *Sphagnum* spp. Forest (CEGL006591, G2)
- *Acer rubrum* - *Fraxinus (pennsylvanica, americana)* / *Lindera benzoin* / *Symplocarpus foetidus* Forest (CEGL006406, G4G5)
- *Acer rubrum* - *Nyssa sylvatica* - *Betula alleghaniensis* / *Sphagnum* spp. Forest (CEGL006014, GNR)
- *Acer rubrum* - *Nyssa sylvatica* High Allegheny Plateau, Central Appalachian Forest (CEGL006132, GNR)
- *Acer rubrum* / *Carex stricta* - *Onoclea sensibilis* Woodland (CEGL006119, G3G5)
- *Acer rubrum* / *Nemopanthus mucronatus* - *Vaccinium corymbosum* Forest (CEGL006220, G4G5)
- *Acer rubrum* / *Rhododendron viscosum* - *Clethra alnifolia* Forest (CEGL006156, GNR)
- *Betula alleghaniensis* - *Acer rubrum* - (*Tsuga canadensis*, *Abies balsamea*) / *Osmunda cinnamomea* Forest (CEGL006380, G4?)
- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Saturated Forest (CEGL006277, G2?)
- *Picea rubens* / *Carex trisperma* / *Sphagnum* spp. - *Polytrichum* spp. Forest (CEGL006590, G2)
- *Picea rubens* / *Rhododendron maximum* - *Kalmia latifolia* / *Eriophorum virginicum* / *Sphagnum* spp. Forest (CEGL006588, G2G3)
- *Picea rubens* / *Vaccinium erythrocarpum* / *Sphagnum* spp. - *Bazzania trilobata* Forest (CEGL006593, G2)
- *Populus tremuloides* / *Vaccinium myrtilloides* / *Solidago uliginosa* Forest (CEGL006594, GNR)
- *Tsuga canadensis* - *Betula alleghaniensis* / *Ilex verticillata* / *Sphagnum* spp. Forest (CEGL006226, G5)
- *Tsuga canadensis* / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL006279, G4?)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Saturated Forest Alliance (A.3035)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Acer rubrum* Seasonally Flooded Woodland Alliance (A.653)

- *Picea rubens* - *Abies balsamea* Saturated Forest Alliance (A.202)
- *Picea rubens* - *Acer rubrum* Saturated Forest Alliance (A.450)
- *Picea rubens* Saturated Forest Alliance (A.198)
- *Populus tremuloides* Temporarily Flooded Forest Alliance (A.300)
- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)
- *Tsuga canadensis* Saturated Forest Alliance (A.201)

DISTRIBUTION

Range: This system occurs from central New England south to West Virginia and western Virginia (the Central Appalachians region) and west to Ohio.

Divisions: 202:C

Nations: US

Subnations: CT, MA, MD, NH, NJ, NY, OH, PA, RI, VA, VT, WV

Map Zones: 53:C, 60:C, 61:C, 62:C, 63:P, 64:C, 65:C, 66:P

TNC Ecoregions: 49:C, 59:C, 60:P, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723005#references

Description Author: S.C. Gawler

Version: 20 Aug 2007

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

NORTH-CENTRAL INTERIOR AND APPALACHIAN ACIDIC PEATLAND (CES202.606)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Acidic Water; >180-day hydroperiod; Shrubland (Shrub-dominated); Organic Peat (>40 cm)

Non-Diagnostic Classifiers: Oligotrophic Water; Long (>500 yrs) Persistence; Lowland; Temperate; Depressional; Isolated Wetland [Partially Isolated]; Unconsolidated

National Mapping Codes: ESLF 9193

CONCEPT

Summary: These *Sphagnum* and shrub peatlands occur in basins south of the Laurentian-Acadian region down to near the glacial boundary in the northeastern and north-central U.S. They are found in colder regions of the division, mostly in areas where glacial stagnation left coarse deposits and glacial depressions (many are "kettleholes"). The basins are generally closed, i.e., without inlets or outlets of surface water. The nutrient-poor substrate and the reduced throughflow of water create oligotrophic conditions fostering the development of *Sphagnum* peat and the growth of peatland vegetation. In deeper basins, the vascular vegetation grows on a *Sphagnum* mat over water, with no mineral soil development. Ericaceous shrubs and dwarf-shrubs (e.g., *Chamaedaphne calyculata*) dominate, with patches of graminoid dominance. Some peatlands may have a sparse tree layer. Although these are often called bogs, in most cases they are technically fens (albeit nutrient-poor ones), as the vegetation remains in contact with the groundwater.

Classification Comments: This system occurs south of the Laurentian-Acadian region, and these acidic peatlands are distinctive and discrete elements of the landscape. They are related to Laurentian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574). There are enough differences in landscape setting and more temperate floristic elements to distinguish them. They include treed, shrub, and graminoid associations. In the Midwest, it may be necessary to split off the shrub/graminoid acid peatland (poor fen) types.

Similar Ecological Systems:

- Northern Appalachian-Acadian Conifer-Hardwood Acidic Swamp (CES201.574)

MEMBERSHIP

Associations:

- *Carex lasiocarpa* - *Carex oligosperma* - (*Lysimachia terrestris*) / *Sphagnum* spp. / *Spiraea tomentosa* Herbaceous Vegetation (CEGL005279, G3G4)
- *Carex oligosperma* - *Carex pauciflora* - *Eriophorum vaginatum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL005256, G4G5)
- *Chamaecyparis thyoides* / *Chamaedaphne calyculata* Woodland (CEGL006321, G3G4)
- *Chamaedaphne calyculata* - (*Gaylussacia dumosa*) - *Decodon verticillatus* / *Woodwardia virginica* Dwarf-shrubland (CEGL006008, G5)
- *Chamaedaphne calyculata* / *Carex oligosperma* - *Eriophorum virginicum* Dwarf-shrubland (CEGL005092, G3G4)
- *Larix laricina* / *Photinia melanocarpa* / *Sphagnum* spp. Forest (CEGL002472, G4?)
- *Myrica gale* - *Chamaedaphne calyculata* / *Carex (lasiocarpa, utriculata)* - *Utricularia* spp. Shrub Herbaceous Vegetation (CEGL006302, G4G5)
- *Myrica gale* - *Chamaedaphne calyculata* / *Carex exilis* Shrub Herbaceous Vegetation (CEGL006392, GNR)
- *Myrica gale* - *Dasiphora fruticosa* ssp. *floribunda* / *Carex lasiocarpa* - *Cladium mariscoides* Shrub Herbaceous Vegetation (CEGL006068, G2G3)
- *Picea mariana* / (*Vaccinium corymbosum*, *Gaylussacia baccata*) / *Sphagnum* sp. Woodland (CEGL006098, G3G5)
- *Pinus rigida* / *Chamaedaphne calyculata* / *Sphagnum* spp. Woodland (CEGL006194, G3G5)
- *Sphagnum (cuspidatum, torreyanum)* - *Vaccinium macrocarpon* Nonvascular Vegetation (CEGL006394, GNR)
- *Vaccinium corymbosum* - *Gaylussacia baccata* - *Photinia melanocarpa* / *Calla palustris* Shrubland (CEGL005085, G2G3)
- *Vaccinium corymbosum* / *Sphagnum* spp. Shrubland (CEGL006190, G3G5)

Alliances:

- *Carex oligosperma* - *Carex lasiocarpa* Saturated Herbaceous Alliance (A.1467)
- *Chamaecyparis thyoides* Saturated Woodland Alliance (A.575)
- *Chamaedaphne calyculata* / *Carex lasiocarpa* Saturated Shrub Herbaceous Alliance (A.1557)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Larix laricina* Saturated Forest Alliance (A.349)
- *Myrica gale* / *Carex lasiocarpa* Saturated Shrub Herbaceous Alliance (A.1563)
- *Picea mariana* Saturated Woodland Alliance (A.585)
- *Pinus rigida* Saturated Woodland Alliance (A.580)
- *Sphagnum cuspidatum* - *Cladopodiella fluitans* Saturated Nonvascular Alliance (A.3006)
- *Vaccinium corymbosum* Saturated Shrubland Alliance (A.1018)

DISTRIBUTION

Range: This system is found from central New England to the Great Lakes and south-central Minnesota southward, generally associated with the glacial terminus or stagnation zones.

Divisions: 202:C

Nations: CA, US

Subnations: CT, IL, IN, MA, ME, MI, MN, NH, NJ, NY, OH, ON, PA, RI, VT, WI

Map Zones: 41:?, 49:P, 50:P, 51:P, 52:P, 61:C, 62:C, 63:P, 64:C, 65:C, 66:P

USFS Ecomap Regions: 222R:CC

TNC Ecoregions: 45:P, 46:P, 48:P, 49:P, 59:?, 60:P, 61:C, 62:C, 64:P

SOURCES

References: Comer et al. 2003, Damman and French 1987

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723003#references

Description Author: S.C. Gawler

Version: 23 Mar 2003

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest, Southeast

ClassifResp: East

NORTH-CENTRAL INTERIOR AND APPALACHIAN RICH SWAMP (CES202.605)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Mesotrophic Water; Saturated Soil; Temperate; Depressional; Broad-Leaved Deciduous Tree

Non-Diagnostic Classifiers: Intermittent Flooding; Moderate (100-500 yrs) Persistence; Lowland; Forest and Woodland (Treed); Extensive Wet Flat; Mineral: W/ A-Horizon >10 cm

National Mapping Codes: ESLF 9306

CONCEPT

Summary: These forested wetlands are scattered throughout the north-central Midwest (south of the Laurentian region), the north-central Appalachians and southern New England at low to mid elevations. They are found in basins where higher pH and/or nutrient levels are associated with a rich flora. Species include *Acer rubrum*, *Fraxinus nigra*, as well as calciphilic herbs. Conifers include *Larix laricina*, but typically not *Thuja occidentalis*, which is characteristic of more northern wetland systems. There may be shrubby or herbaceous openings within the primarily wooded cover. The substrate is primarily mineral soil, but there may be some peat development.

Classification Comments: This system occurs south of the Laurentian-Acadian region, and these circumneutral or enriched swamps are often rather distinctive and discrete elements of the landscape. They are related to Laurentian-Acadian Alkaline Conifer-Hardwood Swamp (CES201.575) but have more temperate elements and generally lack *Thuja occidentalis*. More alkaline shrub/herb fens are treated as part of North-Central Interior Shrub-Graminoid Alkaline Fen (CES202.702).

Similar Ecological Systems:

- Laurentian-Acadian Alkaline Conifer-Hardwood Swamp (CES201.575)
- North-Central Interior Shrub-Graminoid Alkaline Fen (CES202.702)
- Piedmont Seepage Wetland (CES202.298)--ranges north into Virginia.

Related Concepts:

- Mountain / Piedmont Basic Seepage Swamp (Fleming et al. 2005) Intersecting. in Virginia.

MEMBERSHIP

Associations:

- *Acer (rubrum, saccharinum) - Fraxinus spp. - Ulmus americana* Forest (CEGL005038, G4?)
- *Acer rubrum - Fraxinus nigra - (Tsuga canadensis) / Tiarella cordifolia* Forest (CEGL006502, GNR)
- *Fraxinus nigra - Acer rubrum - (Larix laricina) / Rhamnus alnifolia* Forest (CEGL006009, GNR)
- *Fraxinus nigra - Acer rubrum / Rhamnus alnifolia / Carex leptalea* Saturated Forest (CEGL007441, GNR)
- *Larix laricina - Acer rubrum / (Rhamnus alnifolia, Vaccinium corymbosum)* Forest (CEGL005232, G2G3)

Alliances:

- *Acer rubrum - Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Fraxinus nigra - Acer rubrum* Saturated Forest Alliance (A.347)
- *Larix laricina* Saturated Forest Alliance (A.349)

DISTRIBUTION

Range: This system is found from central New England to the southern Great Lakes and south-central Minnesota south to northern Illinois, Indiana, Ohio, Pennsylvania, and perhaps West Virginia. It is not known to extend south into the Southern Blue Ridge.

Divisions: 202:C

Nations: CA, US

Subnations: CT, DE?, IL, IN, MA, MD, MI, MN, NJ, NY, OH, ON, PA, RI, VT, WI, WV?

Map Zones: 41:C, 49:C, 50:C, 51:C, 52:C, 53:C, 61:C, 62:C, 63:C, 64:C, 65:C

USFS Ecomap Regions: 222H:CC, 222J:CC, 222K:CC, 222L:CC, 222M:CC, 222U:CC

TNC Ecoregions: 45:C, 46:C, 48:C, 49:P, 59:C, 60:?, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723004#references

Description Author: S.C. Gawler

Version: 01 Feb 2007

Concept Author: S.C. Gawler

Stakeholders: Canada, East, Midwest, Southeast

ClassifResp: East

1518 NORTH-CENTRAL INTERIOR WET FLATWOODS (CES202.700)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Saturated Soil; Flat; Forest and Woodland (Treed); Extensive Wet Flat; Isolated Wetland [Partially Isolated]

National Mapping Codes: EVT 2518; ESLF 9186; ESP 1518

CONCEPT

Summary: This small-patch system is found throughout the northern glaciated Midwest ranging east into Lower New England. It usually occurs on poorly drained uplands or in depressions associated with glacial features such as tillplains, lakeplains or outwash plains. Soils often have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding common during wetter seasons, and drought possible during the summer and autumn months. These fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system. *Quercus palustris* typically dominates and is often associated with *Quercus bicolor* and *Acer rubrum*. *Liquidambar styraciflua* and *Nyssa sylvatica* are also common associates. Understory herbaceous and shrub species present in examples of this system can vary. Stands with more dense tree cover have less shrub and herbaceous cover, while those with moderate tree canopy cover tend to have a dense understory. Some common species include *Carex* spp., *Osmunda cinnamomea*, *Cephalanthus occidentalis*, *Alnus* spp., and *Ilex* spp. Flooding, drought and fire can influence this system.

Classification Comments: These are mostly north of the glacial line, but one association is in the Interior Low Plateau and that placement may need to be reviewed. Some examples in Michigan, Indiana, Ohio, and southern Ontario are dominated by *Fagus grandifolia* associated with oak (*Quercus* spp.) and maple species (*Acer* spp.).

DESCRIPTION

Environment: This system usually occurs on poorly drained uplands or in depressions associated with glacial features such as tillplains, lakeplains or outwash plains. Soils often have an impermeable or nearly impermeable clay layer that can create a shallow, perched water table. Saturation can vary, with ponding common during wetter seasons, and drought possible during the summer and autumn months. These fluctuating moisture levels can lead to complexes of forest upland and wetland species occurring within this system.

Vegetation: *Quercus palustris* typically dominates and is often associated with *Quercus bicolor* and *Acer rubrum*. *Liquidambar styraciflua* and *Nyssa sylvatica* are also common associates. Some examples in Michigan, Indiana, Ohio, and southern Ontario are dominated by *Fagus grandifolia* associated with oak (*Quercus* spp.) and maple species (*Acer* spp.). Understory herbaceous and shrub species present in examples of this system can vary. Stands with more dense tree cover have less shrub and herbaceous cover, while those with moderate tree canopy cover tend to have a dense understory. Some common species include *Carex* spp., *Osmunda cinnamomea*, *Cephalanthus occidentalis*, *Alnus* spp., and *Ilex* spp.

Dynamics: Flooding, drought and fire can influence this system.

MEMBERSHIP

Associations:

- *Cephalanthus occidentalis* / *Carex* spp. Northern Shrubland (CEGL002190, G4)
- *Fagus grandifolia* - *Acer saccharum* - *Quercus bicolor* - *Acer rubrum* Flatwoods Forest (CEGL005173, G2G3)
- *Fagus grandifolia* - *Quercus alba* - (*Quercus michauxii*) - *Acer rubrum* Flatwoods Forest (CEGL005015, G3)
- *Quercus falcata* Flatwoods Forest (CEGL004412, G2?)
- *Quercus palustris* - (*Quercus bicolor*) - *Acer rubrum* / *Vaccinium corymbosum* / *Osmunda cinnamomea* Forest (CEGL006240, GNR)
- *Quercus palustris* - (*Quercus stellata*) - *Quercus pagoda* / *Isoetes* spp. Forest (CEGL002101, G2G3)
- *Quercus palustris* - *Quercus bicolor* - (*Liquidambar styraciflua*) Mixed Hardwood Forest (CEGL002432, G3G4)
- *Quercus palustris* - *Quercus bicolor* - *Acer rubrum* Flatwoods Forest (CEGL005037, G2G3)
- *Quercus palustris* - *Quercus bicolor* - *Nyssa sylvatica* - *Acer rubrum* Sand Flatwoods Forest (CEGL002100, G2?)

Alliances:

- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Fagus grandifolia* - *Quercus* spp. - *Acer* spp. Forest Alliance (A.230)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- North-Central Interior Beech-Maple Forest (CES202.693)

DISTRIBUTION

Range: This system is found in the northern Midwest, southern Ontario, and southern portions of the northeastern U.S.

Divisions: 201:P; 202:C

Nations: CA, US

Subnations: CT, IA, IL, IN, MA, MI, MO, NY, OH, ON, PA

Map Zones: 41:?, 42:C, 43:C, 44:P, 47:C, 49:?, 50:?, 51:C, 52:C, 53:P, 61:C, 62:P, 63:C, 64:P, 65:C

USFS Ecomap Regions: 211F:CP, 221A:CC

TNC Ecoregions: 36:C, 44:C, 45:C, 47:?, 48:C, 49:P, 59:P, 60:P, 61:C

SOURCES

References: Braun 1950, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722960#references

Description Author: S. Menard, mod. J. Drake

Version: 11 Apr 2007

Concept Author: S. Menard

Stakeholders: Canada, East, Midwest, Southeast

ClassifResp: Midwest

NORTHERN ATLANTIC COASTAL PLAIN BASIN PEAT SWAMP (CES203.522)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Depressional [Peaty]; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9343

CONCEPT

Summary: This system is comprised of acidic peat swamps formed in basins of various sizes, predominantly Atlantic white-cedar swamps, occurring on the northern portion of the Atlantic Coastal Plain from Massachusetts south to Virginia. The hydrology is saturated, as evidenced by *Sphagnum*-dominated hummock-and-hollow microtopography. *Chamaecyparis thyoides* is characteristic and often dominant. *Acer rubrum* may also be an important species, especially after logging.

Similar Ecological Systems:

- North-Central Appalachian Acidic Swamp (CES202.604)

MEMBERSHIP

Associations:

- *Acer rubrum* - *Nyssa sylvatica* - *Magnolia virginiana* / *Viburnum nudum* var. *nudum* / *Osmunda cinnamomea* - *Woodwardia areolata* Forest (CEGL006238, G3?)
- *Acer rubrum* / *Alnus maritima* Woodland [Provisional] (CEGL006317, GNR)
- *Acer rubrum* / *Rhododendron maximum* Forest (CEGL006396, GNR)
- *Chamaecyparis thyoides* - *Acer rubrum* - *Magnolia virginiana* Forest (CEGL006078, GNR)
- *Chamaecyparis thyoides* - *Acer rubrum* / *Lycopus* spp. Forest (CEGL006364, GNR)
- *Chamaecyparis thyoides* / *Alnus maritima* Woodland (CEGL006307, GNR)
- *Chamaecyparis thyoides* / *Ilex glabra* - *Rhododendron viscosum* Forest (CEGL006188, G3)
- *Chamaecyparis thyoides* / *Rhododendron maximum* Forest (CEGL006355, G2G3)
- *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Shrubland (CEGL006371, G4)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Acer rubrum* Saturated Woodland Alliance (A.657)
- *Chamaecyparis thyoides* - *Acer rubrum* Saturated Forest Alliance (A.448)
- *Chamaecyparis thyoides* - *Acer rubrum* Seasonally Flooded Forest Alliance (A.3008)
- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Chamaecyparis thyoides* Seasonally Flooded Woodland Alliance (A.571)
- *Vaccinium formosum* - *Vaccinium fuscum* - *Vaccinium corymbosum* Seasonally Flooded Shrubland Alliance (A.992)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269)

DISTRIBUTION

Range: This system occurs on the northern portion of the Atlantic Coastal Plain from Massachusetts south to Virginia.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, NJ, NY, VA

Map Zones: 60:C, 65:C

USFS Ecomap Regions: 221A:CC

TNC Ecoregions: 58:C, 60:P, 62:C

SOURCES

References: Comer et al. 2003, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723070#references

Description Author: R. Evans, mod. S.C. Gawler

Version: 02 Feb 2007

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN BASIN SWAMP AND WET HARDWOOD FOREST (CES203.520)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); North Atlantic Coastal Plain; Seepage-Fed Sloping

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9342

CONCEPT

Summary: This system is comprised of non-riverine hardwood swamps of seasonally flooded habitats, including relatively shallow groundwater-influenced depressions and other topographic depressions. It ranges from Long Island, New York, south to Virginia. Although supporting some seepage indicators, it is also affected by overland flow. The substrate is mineral soil overlain by a variable organic but non-peaty layer. Characteristic tree species include *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa sylvatica*, *Quercus phellos*, and *Fraxinus pennsylvanica*. *Pinus taeda* is not uncommon south of Delaware Bay.

Classification Comments: Vegetation along streams is accommodated in a new system, Northern Atlantic Coastal Plain Stream and River (CES203.070).

Similar Ecological Systems:

- Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)

DESCRIPTION

Vegetation: Characteristic tree species include *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa sylvatica*, *Quercus phellos*, and *Fraxinus pennsylvanica*. *Pinus taeda* is not uncommon south of Delaware Bay.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus pennsylvanica* / *Saururus cernuus* Forest (CEGL006606, GNR)
- *Acer rubrum* - *Nyssa sylvatica* - *Liquidambar styraciflua* - *Populus heterophylla* Forest (CEGL006013, G1)
- *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa biflora* / *Carex jorii* Forest (CEGL006223, G1G2)
- *Liquidambar styraciflua* - *Acer rubrum* - *Quercus phellos* / *Leucothoe racemosa* Forest (CEGL006110, G4G5)
- *Pinus taeda* / *Morella cerifera* / *Osmunda regalis* var. *spectabilis* Forest (CEGL006137, G3)
- *Quercus* (*phellos*, *pagoda*, *michauxii*) / *Ilex opaca* var. *opaca* / *Clethra alnifolia* / *Woodwardia areolata* Forest (CEGL004644, G2?)
- *Quercus falcata* - *Quercus phellos* / *Ilex opaca* Forest (CEGL006390, GNR)
- *Quercus palustris* - (*Quercus bicolor*) - *Acer rubrum* / *Vaccinium corymbosum* / *Osmunda cinnamomea* Forest (CEGL006240, GNR)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Pinus taeda* Saturated Forest Alliance (A.3009)
- *Quercus falcata* Forest Alliance (A.243)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)

DISTRIBUTION

Range: It ranges from Long Island, New York, south to Virginia.

Divisions: 203:C

Nations: US

Subnations: DE, MD, NJ, NY, VA

Map Zones: 60:C, 65:C

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723072#references

Description Author: R. Evans, mod. J. Teague and M. Pyne

Version: 02 Feb 2007

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

1456 NORTHERN ATLANTIC COASTAL PLAIN PITCH PINE LOWLAND (CES203.374)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Woody-Herbaceous; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2456; ESLF 9125; ESP 1456

CONCEPT

Summary: This system is comprised of wetland pine barrens vegetation, best developed in the New Jersey Pine Barrens. Although this system can be extensive, components of this system often co-occur as a mosaic with upland pine barrens vegetation as well. The vegetation is characterized by associations having variable hydroperiods, occurring on a range of substrates from saturated deep peats to seasonally saturated mineral soils. Physiognomy of the component associations is similarly widely variable, ranging from wet grasslands dominated by *Calamovilfa brevipilis* to seasonally saturated pine forests characterized by mesic species. Fire frequency, as well as hydrology, has a profound influence on the vegetation. Where fire frequency is high, woody vegetation is impeded, favoring the development of large wet grasslands.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Nyssa sylvatica* - *Magnolia virginiana* / *Viburnum nudum* var. *nudum* / *Osmunda cinnamomea* - *Woodwardia areolata* Forest (CEGL006238, G3?)
- *Chamaedaphne calyculata* / *Carex striata* Dwarf-shrubland (CEGL006208, GNR)
- *Fraxinus pennsylvanica* - *Juglans nigra* - *Ulmus americana* / *Cornus amomum* / *Onoclea sensibilis* Forest (CEGL006918, GNR)
- *Gaylussacia dumosa* / *Calamovilfa brevipilis* Shrub Herbaceous Vegetation (CEGL006397, G1)
- *Nyssa sylvatica* - *Magnolia virginiana* - (*Pinus rigida*) / *Rhododendron viscosum* - *Toxicodendron vernix* / *Smilax pseudochina* Woodland (CEGL006219, G1)
- *Panicum virgatum* Seasonally Flooded Herbaceous Vegetation (CEGL004128, GNR)
- *Pinus rigida* / *Chamaedaphne calyculata* / *Sphagnum* spp. Woodland (CEGL006194, G3G5)
- *Pinus rigida* / *Gaylussacia baccata* - *Kalmia angustifolia* Woodland (CEGL006387, GNR)
- *Pinus rigida* / *Gaylussacia dumosa* / *Calamovilfa brevipilis* Woodland (CEGL006388, G1)
- *Pinus rigida* / *Vaccinium corymbosum* - *Leucothoe racemosa* / *Sphagnum* spp. Woodland (CEGL006195, G3)
- *Vaccinium corymbosum* / *Sphagnum* spp. Shrubland (CEGL006190, G3G5)

Alliances:

- *Acer (rubrum, saccharinum)* - *Ulmus americana* Temporarily Flooded Forest Alliance (A.299)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Calamovilfa brevipilis* Saturated Shrub Herbaceous Alliance (A.3007)
- *Chamaedaphne calyculata* Saturated Dwarf-shrubland Alliance (A.1092)
- *Panicum virgatum* Seasonally Flooded Herbaceous Alliance (A.1362)
- *Pinus rigida* Saturated Woodland Alliance (A.580)
- *Vaccinium corymbosum* Saturated Shrubland Alliance (A.1018)

DISTRIBUTION

Range: This system is best developed in the New Jersey Pine Barrens, but occurrences are present south to the inner Coastal Plain of Maryland.

Divisions: 203:C

Nations: US

Subnations: MD, NJ

Map Zones: 60:C

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723142#references

Description Author: R. Evans and L. Sneddon

Version: 02 Feb 2007

Concept Author: R. Evans and L. Sneddon

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN TIDAL SWAMP (CES203.282)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Tidal / Estuarine

National Mapping Codes: ESLF 9303

CONCEPT

Summary: This system encompasses tidally flooded deciduous forests and shrublands in lower river floodplains and edges of estuaries of the North Atlantic Coastal Plain. This system is restricted to narrow zones along upper tidal reaches of Inner Coastal Plain rivers and tributaries which have sufficient volumes of fresh water and short flooding to be able to support tree canopies. According to Fleming et al. (2001) these areas are influenced by lunar tides up to 1 m (3 feet), but diluting freshwater flows from upstream keep salinity levels below 0.5 ppt. Deciduous hardwood species predominate, especially *Nyssa* and/or *Fraxinus*.

Classification Comments: The range of this system is generally conceived as Chesapeake Bay and northward (e.g., in the Coastal Plain from the James River, Virginia, northward to New Jersey). Examples of tidal swamp forests south of this region are treated under Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240); the boundaries may overlap somewhere in Virginia.

Similar Ecological Systems:

- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus pennsylvanica* / *Polygonum* spp. Forest (CEGL006165, G2)
- *Alnus (incana ssp. rugosa, serrulata)* - *Cornus amomum* Shrubland (CEGL006337, GNR)
- *Fraxinus profunda* - *Nyssa biflora* - (*Fraxinus pennsylvanica*) / *Ilex verticillata* / *Polygonum arifolium* Forest (CEGL006287, G3)
- *Nyssa biflora* - (*Nyssa aquatica, Taxodium distichum*) Tidal Forest (CEGL004484, G3G4)
- *Pinus taeda* - *Nyssa biflora* - *Taxodium distichum* / *Morella cerifera* / *Osmunda regalis* var. *spectabilis* Forest (CEGL004651, G2?)
- *Taxodium distichum* / *Carex hyalinolepis* Woodland (CEGL004654, G2?)
- *Taxodium distichum* / *Pontederia cordata* - *Peltandra virginica* Tidal Woodland (CEGL006059, GNR)

Alliances:

- *Alnus (incana, serrulata, maritima)* Tidal Shrubland Alliance (A.1024)
- *Fraxinus pennsylvanica* - *Acer rubrum* - *Ulmus americana* Tidal Forest Alliance (A.356)
- *Nyssa biflora* - (*Nyssa aquatica, Taxodium distichum*) Tidal Forest Alliance (A.357)
- *Taxodium distichum* Tidal Woodland Alliance (A.659)

DISTRIBUTION

Range: This system ranges from the James River, Virginia, northward to the New Jersey Coastal Plain. Examples are probably most common in the Chesapeake Bay region.

Divisions: 203:C

Nations: US

Subnations: DE, MD, NJ, NY, VA

Map Zones: 60:C, 65:C

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723205#references

Description Author: R. Evans and P. Coulling

Version: 18 Nov 2002

Concept Author: R. Evans and P. Coulling

Stakeholders: East, Southeast
ClassifResp: East

PIEDMONT SEEPAGE WETLAND (CES202.298)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Seepage-Fed Sloping

National Mapping Codes: ESLF 9308

CONCEPT

Summary: This Piedmont system consists of seepage-fed wetlands on gentle slopes, with substantial seepage flow. Vegetation is variable, both within and among examples. Included are hillside seepage bogs with substantial boggy flora and with strong influence by fire, and lower slope and floodplain edge seeps with forb-dominated vegetation.

Classification Comments: This system is fairly heterogeneous, covering a broad range of environments and vegetation. Two distinct subtypes can be recognized, which may warrant separating into different systems. Seepage bogs have a very distinctive flora, appear to be naturally influenced by fire, and usually occur in more upland settings, often with upland systems completely surrounding them. Some are related to the Atlantic Coastal Plain Sandhill Seep (CES203.253). Non-boggy seeps have a non-fire-tolerant flora and occur in lower topographic settings. Between these two extremes are seepage bogs with less Coastal Plain character, though they still have *Sarracenia* spp. There are also streamhead seeps, which have some bog flora and have Coastal Plain species, but which occur along drainages. They are transitional to Southern Piedmont Small Floodplain and Riparian Forest (CES202.323), but are also related to the Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252). These different Piedmont wetland communities are put into one system, rather than separated as in the Coastal Plain, because the differences are not as sharp and the range of variation smaller within each. This system is readily distinguished from adjacent upland systems by the presence of wetland flora and soils, as well as seepage. They are somewhat less clearly distinguished from adjacent floodplain systems, but are distinctly wetter most of the time. They are saturated without having standing water as floodplain pools do. These differences are reflected in the vegetation.

Piedmont seepage wetlands are separated from Southern Appalachian Seepage Wetland (CES202.317) by floristic differences. A few examples in the upper Piedmont may be better placed with the southern Appalachian system, but most are geographically separated.

Similar Ecological Systems:

- Atlantic Coastal Plain Sandhill Seep (CES203.253)
- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)
- East Gulf Coastal Plain Northern Seepage Swamp (CES203.554)
- North-Central Appalachian Acidic Swamp (CES202.604)--ranges south to northern Virginia.
- North-Central Interior and Appalachian Rich Swamp (CES202.605)--ranges south to northern Virginia.
- Southern Appalachian Seepage Wetland (CES202.317)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

DESCRIPTION

Environment: Occurs in small patches where seepage water creates wetland conditions. Seepage commonly occurs at the base of slopes on the edge of bottomlands or in headwaters of small streams. Others occur on gently sloping hillsides where impermeable soils and slope force shallow groundwater to the surface. The soil is saturated seasonally to permanently, but has no substantial amount of standing water.

Vegetation: Vegetation generally is patchy and heterogeneous in structure. Most examples do not have closed tree canopies, and well-developed shrub or herb layers are almost always present. The trees are often not very distinctive, consisting of widespread wetland species, such as *Acer rubrum*, or of non-wetland species shared with adjacent communities. Often tree cover comes primarily from trees rooted in adjacent communities. The shrub layer normally consists of wetland species. *Alnus serrulata*, *Viburnum nudum*, *Vaccinium* spp., and other ericaceous species are most common. The herb layer is quite variable. Large wetland ferns such as *Osmunda cinnamomea* are often prominent. Various wetland grasses, sedges, and rushes may be abundant, and forbs such as *Impatiens capensis*, *Saururus cernuus*, *Boehmeria cylindrica*, and *Rudbeckia laciniata* are also often prominent. A distinct subtype is boggy in character, with substantial amounts of *Sphagnum*. The boggy seeps often have a number of species characteristic of Coastal Plain wetlands and otherwise absent in the Piedmont, such as *Sarracenia purpurea*, *Sarracenia flava*, *Smilax laurifolia*, and *Cyrtilla racemiflora*. Examples from the southwestern end of this system's range (e.g., in Alabama's Talladega Ridge Subsection [231Dd] or level IV ecoregion 45d), contain *Magnolia virginiana*, which is more typical of the Coastal Plain.

Dynamics: The presence of seepage is the primary determinant of this system. Long-term droughts that affect seepage flow presumably have an effect. Canopy dynamics are not well known and potentially may vary substantially over short distances in response to wetness. Wetness clearly limits recruitment of most tree and shrub seedlings to drier microsites in the wettest examples. Fire is an important influence in some examples. Many of the boggy seeps are associated with Southeastern Interior Longleaf Pine Woodland (CES202.319) and have a substantial fire-tolerant flora. At the other end of the spectrum, floodplain edge seeps may seldom if ever have burned. Long-term geomorphic processes may be important in these systems. Headward erosion by small streams,

or meandering by larger stream channels, sometimes drains seeps and eliminates the wetland vegetation. Piedmont Seepage Wetland (CES202.298) are often left undisturbed when surrounding forests are logged. Effects of logging on water infiltration or surface flow may have significant indirect effects.

MEMBERSHIP

Associations:

- *Acer rubrum* var. *trilobum* - *Liriodendron tulipifera* / *Ilex opaca* var. *opaca* / *Osmunda cinnamomea* Forest (CEGL004551, G2G3)
- *Acer rubrum* var. *trilobum* / *Morella caroliniensis* - *Gaylussacia frondosa* / *Andropogon glomeratus* - (*Sarracenia flava*) Woodland (CEGL004781, G2)
- *Acer rubrum* var. *trilobum* / *Viburnum nudum* var. *nudum* / *Osmunda cinnamomea* - *Saururus cernuus* - *Impatiens capensis* Forest (CEGL004426, G3?)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Acer rubrum* Saturated Woodland Alliance (A.657)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, usually less than one acre.

Size: Occurs as small patches, most less than one acre in size. A few stream seepage wetlands may cover a couple of acres in branching linear bodies. Occasionally two or three patches will occur close enough together to be treated as a single occurrence, but most examples are isolated.

Adjacent Ecological Systems:

- Southeastern Interior Longleaf Pine Woodland (CES202.319)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

Adjacent Ecological System Comments: This system may be embedded in a variety of other systems. Most common are Southern Piedmont Dry Oak-(Pine) Forest (CES202.339), Southeastern Interior Longleaf Pine Woodland (CES202.319), Southern Piedmont Small Floodplain and Riparian Forest (CES202.323), and Southern Piedmont Large Floodplain Forest (CES202.324).

DISTRIBUTION

Range: This system ranges throughout the Piedmont, from Alabama to North Carolina and possibly the southeastern corner of Virginia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA?

Map Zones: 54:C, 59:C

TNC Ecoregions: 50:P, 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723193#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 01 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

PIEDMONT UPLAND DEPRESSION SWAMP (CES202.336)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated); Isolated Wetland [Strictly Isolated]

National Mapping Codes: ESLF 9302

CONCEPT

Summary: This system represents isolated wetlands primarily of the Piedmont in small, shallow basins in upland settings where water pools due to limited soil drainage. Most known examples occur on mafic rocks. The typical hydrology is seasonally flooded. Most examples consist of forests of wetland oaks, but a few are treeless or open-canopied ponds. Vegetation is zoned with an outer ring of trees, a more interior ring of shrubs, herbs and vines, and a central area with or without standing water year round depending on precipitation. This system also includes the wet hardwood forests ("Iredell Flatwoods" or "Gabbro Glades") which occur on gently sloping terrain or shallowly depressed upland flats over gabbro-derived clays in the Piedmont of Georgia and South Carolina. A few examples occur in the adjacent Southern Blue Ridge; these are only extremely rare and small-patch examples.

Classification Comments: This system is distinct from all other Piedmont systems in its ponded wetland hydrology in upland settings. The vegetation is generally also distinct from all other Piedmont systems. Though apparently quite different, Piedmont Hardpan Woodland and Forest (CES202.268) is closely related by the importance of an impermeable clay hardpan, and some intermediate gradations occur. A few examples of this system (CES202.336) appear to be closely related to Coastal Plain depressional wetlands, sharing some flora, but most are more distinct. The system has significant variation in vegetation and environment. The forested swamps and open pools represent well-marked subtypes. There is a more subtle distinction between the basic and acidic soil swamps. There is substantial variation among the pools, related to substrate, basin morphology, and geographic location. A few disjunct examples may occur in the Southern Blue Ridge because of similarity in topographic setting and general structure. They do, however, occur on different substrates (quartzite and sandstone) than any examples in the Piedmont. Their vegetation is different from other examples but not in having more montane flora. Their vegetation is no more different than most other pools are from each other.

Similar Ecological Systems:

- Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018)
- North-Central Appalachian Acidic Swamp (CES202.604)--replaces CES202.336 to the north?
- Piedmont Hardpan Woodland and Forest (CES202.268)

Related Concepts:

- Upland Swamp Glades (Wharton 1978) Finer

DESCRIPTION

Environment: This system occurs in small, shallow basins or gentle swales on flat to rolling upland sites, and occasionally in depressions on narrow, steeper ridgetops. Soils have a dense clay hardpan or some other impermeable layer that limits internal drainage. Rainwater accumulates in the basins and persists through the wet season, occasionally persisting all year. Only a few kinds of rock are known to form these depressions. Most examples occur on mafic rocks such as gabbro or diabase, but a few occur on slates or on mafic to felsic tuffs where a dense clay hardpan has formed. A few occur over bedrock of other kinds. Rock chemistry affects soil chemistry and influences variation in vegetation, but hydroperiod is a more important influence.

Vegetation: Vegetation consists either of swamps dominated by wetland oaks, or of more open-canopy pools with sparse trees and with substantial shrub or herbaceous vegetation. Swamps are most often dominated by *Quercus phellos*, with a substantial minority dominated by *Quercus lyrata* and a few having *Quercus bicolor*, *Quercus michauxii*, or other species. Examples that have been logged or cleared may be dominated by *Acer rubrum* or *Liquidambar styraciflua*. Lower strata are generally sparse in the swamps, often just a few shrubs such as *Vaccinium* spp., patches of *Smilax*, and a few wetland herbs. Open ponds may have the same canopy species on the edges, but a few have *Nyssa sylvatica* or other wetland species. The lower strata are better developed in the open pools, with *Cephalanthus occidentalis*, *Leucothoe racemosa*, *Vaccinium* spp., or other wetland species occurring as thickets along the edge or scattered in the interior. Large *Smilax* tangles sometimes occur. Herbs are usually still sparse or patchy, but may include dense beds of various graminoids or ferns, as well as scattered clumps. *Sphagnum* is sometimes extensive in parts of the pools. These isolated seasonal wetlands are often important breeding sites for amphibians.

Dynamics: The dynamics of water levels are the most important factor in these systems, differentiating them from the surrounding uplands and differentiating the various communities within the system. Most basins have almost no watershed, so water comes largely from rainfall. Variation in rainfall patterns will drive variation in duration of flooding, though most basins have an outlet that limits water depth. Fire is presumably naturally rare in these systems. Though they would naturally be exposed to fires in the surrounding uplands, standing water and lack of continuous fuel would limit fires to the edges, expect perhaps in early fall. Presumably important as a dynamic process is the migration of amphibians, which concentrate in these systems for breeding. Ecosystem dynamics may be strongly affected by the suitability of surrounding uplands for amphibian adult habitat.

MEMBERSHIP

Associations:

- *Cephalanthus occidentalis* - (*Leucothoe racemosa*) / *Carex jorii* Shrubland (CEGL004075, G1)
- *Leucothoe racemosa* - *Vaccinium fuscatum* - *Smilax walteri* Shrubland (CEGL004533, G1?)
- *Liquidambar styraciflua* - *Acer rubrum* / *Carex* spp. - *Sphagnum* spp. Forest (CEGL007388, G2G3Q)
- *Nyssa biflora* / *Cephalanthus occidentalis* - *Leucothoe racemosa* Forest (CEGL004550, G1)
- *Quercus* (*pagoda*, *phellos*, *shumardii*) - *Celtis laevigata* / *Cornus foemina* / *Podophyllum peltatum* - *Hymenocallis occidentalis* Flatwoods Forest (CEGL003880, G2?)
- *Quercus palustris* - *Quercus bicolor* / *Viburnum prunifolium* / *Leersia virginica* - *Impatiens capensis* Forest (CEGL004643, G2)
- *Quercus phellos* - *Quercus* (*michauxii*, *shumardii*) - *Fraxinus americana* / (*Quercus oglethorpensis*) / *Zephyranthes atamasca* Gabbro Upland Depression Forest (CEGL008484, G2?)
- *Quercus phellos* / *Carex* (*albolutescens*, *intumescens*, *joorii*) / *Climacium americanum* Forest (CEGL007403, G2G3)
- *Scirpus cyperinus* - *Dulichium arundinaceum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL004134, G1Q)

Alliances:

- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Nyssa* (*aquatica*, *biflora*, *ogeche*) Pond Seasonally Flooded Forest Alliance (A.324)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Vaccinium formosum* - *Vaccinium fuscatum* - *Vaccinium corymbosum* Seasonally Flooded Shrubland Alliance (A.992)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, occurring as isolated bodies surrounded by upland systems. Open pools are usually less than one acre, while swamps may be up to several acres in size.

Size: Occurs as small patches. Pools are usually less than one acre, and may be substantially smaller. Swamps range up to several acres, a few to ten or more acres. Most examples occur as isolated patches, but a few occur as small groups. Extensive mafic rock areas may support a number of swamps, but most are probably not close enough together to be treated as single occurrences. Most remaining examples are of natural size.

Adjacent Ecological Systems:

- Piedmont Hardpan Woodland and Forest (CES202.268)
- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Adjacent Ecological System Comments: Most examples are surrounded by Southern Piedmont Dry Oak-(Pine) Forest (CES202.339) or Piedmont Hardpan Woodland and Forest (CES202.268).

DISTRIBUTION

Range: This system ranges throughout the Piedmont, from Virginia to Alabama. A few examples attributable to this system are found in the adjacent Southern Blue Ridge.

Divisions: 202:C

Nations: US

Subnations: AL, GA, MD, NC, SC, VA

Map Zones: 54:C, 57:C, 59:C, 60:C, 61:C

TNC Ecoregions: 51:C, 52:C, 59:?

SOURCES

References: Comer et al. 2003, Wharton 1978

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723169#references

Description Author: M.P. Schafale, mod. M. Pyne

Version: 01 Feb 2007

Concept Author: M. Schafale

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTH FLORIDA BAYHEAD SWAMP (CES411.366)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Depressional; Broad-Leaved Evergreen Tree

National Mapping Codes: ESLF 9317

CONCEPT

Summary: This system consists of predominately broad-leaved hardwoods emergent amidst marshes of the south Florida Everglades region. These areas are often called tree islands as they occur on slightly elevated sites above the low-relief marshes and have been considered "perhaps the most striking botanical feature in the Everglades" (Loveless 1959). Individual islands often have a characteristic shape depending upon the size; large islands are often teardrop-shaped, smaller islands are circular (Loveless 1959, Gunderson and Loftus 1993). Patches range in size from \hat{A} ¼ acre to exceeding 300 or more acres. These islands often form an abrupt ecotone with adjacent fire-prone marshes. Fires enter bayhead swamps only under extreme drought conditions and may kill much of the bayhead vegetation and heavily reduce peat accumulation. If left long unburned, bayheads may succeed to hardwood hammocks.

Related Concepts:

- Baygall (FNAI 1990) Undetermined
- Hydric Hammock (FNAI 1990) Undetermined

DESCRIPTION

Environment: This system occurs on sites elevated above surrounding marshes; they are inundated 2-6 months during the year, and often found on Gandy Peat soils (Gunderson and Loftus 1993). Tree islands in the northern Everglades occur on acidic, deep peat sites, while southern examples are higher in pH, and shallower peat.

Vegetation: Although plant communities in this system have quite similar floristic composition across the Everglades region, there are suggestions that pH and peat depth vary between northern and southern examples, factors which may influence species composition (Loveless 1959). Stands often support a luxuriant ground layer of ferns.

Dynamics: These islands often form an abrupt ecotone with adjacent marshes. Although fires often burn through the marshes, they enter bayhead swamps only under extreme drought conditions. Under these conditions, fires may kill much of the bayhead vegetation and heavily reduce peat accumulation. If left long unburned, bayheads may succeed to hardwood hammocks.

MEMBERSHIP

Associations:

- *Conocarpus erectus* - *Metopium toxiferum* - *Acoelorrhaphe wrightii* / *Chrysobalanus icaco* Forest (CEGL007057, G1?)
- *Magnolia virginiana* - *Persea palustris* - *Chrysobalanus icaco* / *Acrostichum danaeifolium* - *Nephrolepis exaltata* Forest (CEGL007015, G1)
- *Magnolia virginiana* - *Persea palustris* - *Chrysobalanus icaco* / *Cladium mariscus* ssp. *jamaicense* Woodland (CEGL007016, G1)
- *Quercus laurifolia* - *Sabal palmetto* / *Myrsine floridana* - *Psychotria nervosa* Forest (CEGL007060, G1?)
- *Rhizophora mangle* - *Taxodium distichum* - *Metopium toxiferum* / *Chrysobalanus icaco* / *Apteris aphylla* Forest (CEGL007454, G1)
- *Roystonea elata* - *Taxodium distichum* - *Quercus laurifolia* / *Psychotria nervosa* / *Nephrolepis* spp. Forest (CEGL007455, G1)
- *Taxodium distichum* / *Persea palustris* - *Fraxinus caroliniana* - *Chrysobalanus icaco* / *Blechnum serrulatum* Forest (CEGL007440, G2?)

Alliances:

- *Conocarpus erectus* - *Metopium toxiferum* Saturated Forest Alliance (A.77)
- *Magnolia virginiana* - *Persea palustris* - *Chrysobalanus icaco* Seasonally Flooded Woodland Alliance (A.474)
- *Magnolia virginiana* - *Persea palustris* Saturated Forest Alliance (A.60)
- *Sabal palmetto* - *Quercus virginiana* Saturated Forest Alliance (A.61)
- *Taxodium distichum* - *Persea palustris* - *Chrysobalanus icaco* Seasonally Flooded Forest Alliance (A.366)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Gunderson and Loftus 1993, Loveless 1959

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723150#references

Description Author: R. Evans

Version: 14 Dec 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1447 SOUTH FLORIDA CYPRESS DOME (CES411.365)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2447; ESLF 9116; ESP 1447

CONCEPT

Summary: This system is found primarily in the Everglades and Big Cypress regions. This system consists of small forested wetlands in poorly drained depressions which are underlain by an impervious layer that impedes drainage and traps precipitation. They receive their common name from the unique dome-shaped appearance in which trees in the center are higher than those around the sides (Monk and Brown 1965). *Taxodium ascendens* is the dominant tree, with the oldest and largest individuals characteristically occupying the center, and smaller and younger individuals around the margins. Pools of stagnant, highly acid water may stand in the center of these depressions ranging from 1-4 feet in depth, but becoming increasingly shallow along the margins. The understory flora is typified by species with tropical affinities.

Related Concepts:

- Dome Swamp (FNAI 1990) Broader

DESCRIPTION

Environment: This system occurs in areas of low relief, occupying poorly drained to permanently wet depressions. Pools of stagnant, highly acid water may stand in the center of these depressions ranging from 1-4 feet in depth, but becoming increasingly shallow along the margins.

Vegetation: In addition to *Taxodium ascendens*, other taxa that may be present include *Annona glabra*, *Chrysobalanus icaco*, *Ficus aurea*, *Persea palustris*, and *Bacopa caroliniana*.

MEMBERSHIP

Associations:

- *Taxodium ascendens* / *Annona glabra* / *Bacopa caroliniana* Forest (CEGL007414, G2?)
- *Taxodium ascendens* / *Chrysobalanus icaco* - *Ficus aurea* - *Persea palustris* Forest (CEGL007416, G2?)

Alliances:

- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Monk and Brown 1965

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723151#references

Description Author: R. Evans, mod. M. Pyne

Version: 11 Dec 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1445 SOUTH FLORIDA DWARF CYPRESS SAVANNA (CES411.290)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Woody-Herbaceous; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2445; ESLF 9114; ESP 1445

CONCEPT

Summary: The scrub or dwarf cypress system covers extensive areas of south Florida, especially in the Big Cypress Swamp region of southwest Florida. These stunted stands of *Taxodium ascendens* grow on shallow sands or marl soils above limestone bedrock. Individual trees are usually quite small and widely scattered, with canopy coverage ranging from 30-45% (Flohrschutz 1978). The understory shares much overlap with wet prairies of the region (Drew and Schomer 1984) and is dominated by the following genera: *Rhynchospora*, *Cyperus*, *Muhlenbergia*, and *Cladium*. The open, stunted aspect is maintained in part by stresses imposed by extreme seasonal water level changes and low-nutrient soils (Anonymous 1978). Ewel (1990b) suggests a hydroperiod of approximately 6 months for this type.

Classification Comments: Related vegetation occurs in north Florida on clay soils of Tates Hell Swamp.

Related Concepts:

- Marl Prairie (FNAI 1990) Broader

MEMBERSHIP

Associations:

- *Taxodium ascendens* / *Muhlenbergia filipes* - *Rhynchospora microcarpa* Woodland (CEGL003681, G3)
- *Taxodium ascendens* / *Paspalum monostachyum* - *Rhynchospora microcarpa* - *Cladium mariscus* ssp. *jamaicense* Woodland (CEGL003996, G2G3)
- *Taxodium ascendens* / *Rhynchospora microcarpa* - *Schizachyrium rhizomatum* - *Muhlenbergia filipes* Woodland (CEGL003997, G2G3)

Alliances:

- *Taxodium ascendens* Seasonally Flooded Woodland Alliance (A.651)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Anonymous 1978, Comer et al. 2003, Drew and Schomer 1984, Ewel 1990b, Flohrschutz 1978, Lodge 1994

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723198#references

Description Author: R. Evans

Version: 14 Dec 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH FLORIDA HYDRIC HAMMOCK (CES411.273)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)
Land Cover Class: Woody Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
National Mapping Codes: ESLF 4330

CONCEPT

Summary: This system includes wet hardwood-dominated hammocks occupying flat lowlands in extreme southern Florida. Examples are underlain by limestone substrate. They are wetlands with high water tables and/or ponded surface water, and often mucky soils. Although often found within or adjacent to floodplains, examples of this system are only infrequently subject to overbank flooding. Like other hydric hammocks of Florida, the vegetation is characterized by mixed hardwood species (FNAI 1997), although examples of this type have somewhat depauperate canopies when compared with more northern examples (A. Johnson pers. comm.). *Quercus virginiana*, *Sabal palmetto*, and *Acer rubrum* may be diagnostic; presumably the flora includes some tropical elements that are likely absent from more northern examples.

Classification Comments: This concept apparently includes low hammocks of Taylor Alexander (A. Johnson pers. comm.).

Related Concepts:

- Hydric Hammock (FNAI 1990) Broader
- Prairie Hammock (FNAI 1990) Finer

DESCRIPTION

Environment: Examples of this system are associated with limestone-rich sites in southern Florida, often adjacent to floodplains.

MEMBERSHIP

Associations:

- *Quercus laurifolia* - *Sabal palmetto* / *Myrsine floridana* - *Psychotria nervosa* Forest (CEGL007060, G1?)
- *Sabal palmetto* - *Quercus laurifolia* - *Quercus virginiana* - *Magnolia virginiana* - *Ulmus americana* Forest (CEGL004674, G2G3)
- *Sabal palmetto* - *Quercus virginiana* - *Ulmus americana* - *Ficus aurea* / *Acrostichum danaeifolium* - *Nephrolepis exaltata* Forest (CEGL004409, G2?)

Alliances:

- *Sabal palmetto* - *Quercus laurifolia* - *Quercus virginiana* - *Magnolia virginiana* - *Ulmus americana* Saturated Forest Alliance (A.380)
- *Sabal palmetto* - *Quercus virginiana* Saturated Forest Alliance (A.61)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Alexander 1967, FNAI 1990, FNAI 1997, Johnson pers. comm., Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.732403#references

Description Author: R. Evans

Version: 25 Mar 2004

Concept Author: R. Evans and A. Johnson

Stakeholders: Southeast
ClassifResp: Southeast

SOUTH FLORIDA MANGROVE SWAMP (CES411.289)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Tidal / Estuarine

National Mapping Codes: ESLF 9304

CONCEPT

Summary: This swamp system occurs along intertidal and supratidal shorelines in southern Florida. The primary species comprising this system are *Rhizophora mangle*, *Avicennia germinans*, *Laguncularia racemosa*, and *Conocarpus erectus*, each with essentially tropical affinities and poor survival in cold temperatures. This system attains best development in low wave-energy, depositional environments. Examples occur on soils generally saturated with brackish water at all times and which become inundated during high tides. The brackish environment tends to limit competition from other species. Although at least three broad variants of this system can be recognized, i.e., riverine mangrove forests, fringe mangrove forests, and basin mangrove forests (Lugo et al. 1988), all are included here for now.

Related Concepts:

- Tidal Swamp (FNAI 1990) Equivalent

DESCRIPTION

Environment: Mangroves are essentially tropical species that occur only infrequently in areas where the average annual temperature is below 19 degrees Celsius; fluctuations greater than 10 degrees Celsius and short-duration freezes are detrimental to all species. Low-temperature stress leads to decreased height, leaf area, and increased tree density (Odum and McIvor 1990). *Avicennia* is apparently the most cold hardy species, extending as far north as the Gulf Coast (Sherrod and McMillan 1985) and on the Atlantic Coast nearly to the Florida stateline (30 degrees N latitude) (Savage 1972, Odum et al. 1982). *Rhizophora* and *Laguncularia* reach approximately 29 degrees N latitude on both coasts of Florida (Rehm 1976, Teas 1977, Odum et al. 1982). However, the northern limits of all species fluctuate due to short-term climatic swings making exact delineations impossible. Mangroves are also affected by substrate type and wave energy, with best development in low wave-energy, depositional environments; high wave energy prevents establishment and may destroy their shallow root systems (Odum and McIvor 1990). Examples occur on soils generally saturated with brackish water at all times, and which become inundated during high tides (FNAI 1990). The species sometimes sort along salinity gradients, with *Rhizophora* limited to salinities below 60-65 ppt, while *Avicennia* and *Laguncularia* tolerate levels above 80-95 ppt [see references in Odum and McIvor (1990)]. The species employ different strategies to cope with fluctuations and extremes in salinity. Red mangroves exclude salt by a reverse osmosis process, while black and white mangroves use salt glands to excrete excess salts. However, most species may use combined strategies of salt exclusion and excretion (Albert 1975).

Vegetation: The primary species comprising this system are the true mangroves, *Rhizophora mangle*, *Avicennia germinans*, and *Laguncularia racemosa*, as well as the close associate *Conocarpus erectus*. The combined stresses of flooding and salinity tend to result in limited competition (FNAI 1990), lack of plant species richness, and relatively simple stand structure (Mendelssohn and McKee 1988). However, other salt-tolerant species may also be present. Broad classifications of mangroves have included six types (Lugo and Snedaker 1974) and more recently three broad variants (Lugo et al. 1988), i.e., riverine mangrove forests, fringe mangrove forests, and basin mangrove forests [see also Mendelssohn and McKee (1988)].

MEMBERSHIP

Associations:

- *Avicennia germinans* / *Sarcocornia perennis* Shrubland (CEGL003802, G3?)
- *Avicennia germinans* Forest (CEGL004827, G5)
- *Conocarpus erectus* - (*Avicennia germinans*) / *Borrchia arborescens* - *Borrchia frutescens* / *Sporobolus virginicus* - *Monanthochloe littoralis* Shrubland (CEGL003805, G3?)
- *Conocarpus erectus* - (*Laguncularia racemosa*) / *Batis maritima* - *Borrchia frutescens* / *Sesuvium portulacastrum* - *Suaeda linearis* Shrubland (CEGL003806, G2?)
- *Conocarpus erectus* - (*Laguncularia racemosa*) / *Cladium mariscus* ssp. *jamaicense* Shrubland (CEGL003798, G2?)
- *Conocarpus erectus* - *Metopium toxiferum* - *Acoelorrhaphe wrightii* / *Chrysobalanus icaco* Forest (CEGL007057, G1?)
- *Conocarpus erectus* - *Rhizophora mangle* - *Laguncularia racemosa* - *Metopium toxiferum* / *Tillandsia* spp. Woodland (CEGL003505, G2)
- *Conocarpus erectus* / *Sporobolus virginicus* - *Spartina spartinae* Woodland (CEGL003506, G1?)
- *Conocarpus erectus* Forest (CEGL007600, G3G5)
- *Laguncularia racemosa* - *Rhizophora mangle* - *Avicennia germinans* - *Conocarpus erectus* Forest (CEGL007601, GNR)
- *Laguncularia racemosa* Basin Forest (CEGL007063, G3?)
- *Rhizophora mangle* - (*Avicennia germinans*, *Laguncularia racemosa*) / *Acrostichum* spp. Forest (CEGL007067, G2G3)
- *Rhizophora mangle* - (*Avicennia germinans*, *Laguncularia racemosa*) Riverine Forest (CEGL007066, G4)

- *Rhizophora mangle* - *Laguncularia racemosa* - *Avicennia germinans* - *Conocarpus erectus* / *Jacquinia keyensis* Forest (CEGL007053, G2?)
- *Rhizophora mangle* / *Eleocharis cellulosa* Shrubland (CEGL003800, G3?)
- *Rhizophora mangle* Fringe Forest (CEGL004764, G3G5)
- *Rhizophora mangle* Medium Island Forest (CEGL007603, G5)
- *Rhizophora mangle* Overwash Island Forest (CEGL004765, G3G5)
- *Rhizophora mangle* Shrubland (CEGL003803, G5)
- *Rhizophora mangle* Tall Fringing Forest (CEGL007602, G5)

Alliances:

- *Avicennia germinans* Tidal Forest Alliance (A.80)
- *Avicennia germinans* Tidal Shrubland Alliance (A.733)
- *Conocarpus erectus* - *Metopium toxiferum* Saturated Forest Alliance (A.77)
- *Conocarpus erectus* Saturated Shrubland Alliance (A.732)
- *Conocarpus erectus* Seasonally Flooded Shrubland Alliance (A.729)
- *Conocarpus erectus* Seasonally Flooded Woodland Alliance (A.473)
- *Conocarpus erectus* Tidal Forest Alliance (A.1923)
- *Laguncularia racemosa* Seasonally Flooded Forest Alliance (A.81)
- *Laguncularia racemosa* Tidal Forest Alliance (A.82)
- *Rhizophora mangle* - *Conocarpus erectus* Seasonally Flooded Forest Alliance (A.75)
- *Rhizophora mangle* Semipermanently Flooded Shrubland Alliance (A.731)
- *Rhizophora mangle* Tidal Forest Alliance (A.83)
- *Rhizophora mangle* Tidal Shrubland Alliance (A.735)

DISTRIBUTION

Range: This system is best developed in southern Florida, extending north to approximately 29 degrees N latitude on both coasts.

Divisions: 203:C; 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C, 55:C

SOURCES

References: Albert 1975, Comer et al. 2003, FNAI 1990, Lugo and Snedaker 1974, Lugo et al. 1988, Mendelssohn and McKee 1988, Odum and McIvor 1990, Odum et al. 1982, Rehm 1976, Savage 1972, Sherrod and McMillan 1985, Soil Conservation Service 1981a, Teas 1977

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723199#references

Description Author: R. Evans

Version: 19 Nov 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH FLORIDA POND-APPLE/POPASH SLOUGH (CES411.486)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: >180-day hydroperiod; Forest and Woodland (Treed); Depressional [Peaty]

National Mapping Codes: ESLF 9195

CONCEPT

Summary: This wetland system of south Florida occupies deep muck soils with long hydroperiods. Examples are dominated by *Fraxinus caroliniana* and/or *Annona glabra*. Aquatic herb species that are also found in other wetland systems of south Florida, such as *Crinum americanum*, *Bacopa caroliniana*, and *Sagittaria graminea*, may also be present (Hilsenbeck et al. 1979, Gunderson and Loope 1982). Examples of this system are important nesting, feeding, and roosting habitats for Everglades wading birds (Hilsenbeck et al. 1979). Large areas of this system that formerly occurred around Lake Okeechobee were cleared for farming around 1900 (Craighead 1971); only small examples still persist in Big Cypress National Preserve and portions of the Everglades National Park.

Classification Comments: This system is related to South Florida Slough, Gator Hole, and Willow Head (CES411.485) but occupies lower elevations with longer hydroperiods and has different vegetation. As currently conceived, this system includes the pond-apple - willow forests of Hilsenbeck et al. (1979).

Similar Ecological Systems:

- South Florida Slough, Gator Hole, and Willow Head (CES411.485)

Related Concepts:

- Slough (FNAI 1990) Broader
- Strand Swamp (FNAI 1990) Undetermined

DESCRIPTION

Environment: Examples occupy some of the deepest muck soils and relatively lowest soil elevations in the Big Cypress National Preserve (Gunderson and Loope 1982).

Dynamics: The successional dynamics of this system are not clearly understood.

MEMBERSHIP

Associations:

- *Annona glabra* - *Conocarpus erectus* / *Acrostichum aureum* Forest (CEGL007617, G2G3)
- *Annona glabra* / *Crinum americanum* - *Bacopa caroliniana* Forest (CEGL007055, G1G2)
- *Fraxinus caroliniana* / *Crinum americanum* - *Bacopa caroliniana* Forest (CEGL004478, G2G3)

Alliances:

- *Annona glabra* Semipermanently Flooded Forest Alliance (A.76)
- *Fraxinus caroliniana* Seasonally Flooded Forest Alliance (A.344)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Craighead 1971, Gunderson and Loope 1982b, Hilsenbeck et al. 1979

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723100#references

Description Author: R. Evans and C. Nordman

Version: 05 Feb 2003

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1457 SOUTH-CENTRAL INTERIOR / UPPER COASTAL PLAIN WET FLATWOODS (CES203.480)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Extensive Wet Flat; Broad-Leaved Deciduous Tree

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Deciduous open tree canopy

National Mapping Codes: EVT 2457; ESLF 9126; ESP 1457

CONCEPT

Summary: This system represents predominantly wet flatwoods of limited areas of the most inland portions of the East Gulf Coastal Plain in western Kentucky, as well as related broad, flat areas of the western Interior Low Plateau. This part of the Coastal Plain is referred to as the Jackson Purchase or "Jackson Plain." Flatwoods have long been recognized as a distinctive subdivision within this region (Davis 1923, Bryant and Martin 1988). Examples in the Pennyroyal Plain (of the western Interior Low Plateau) have been known for many years and referred to as "pondywoods" or "crawfishy land" (Chester et al. 1995). They are also known from the Shawnee Hills of Kentucky, on Periglacial lakebeds (M. Evans pers. comm. 2006), and from the Moulton Valley of Alabama (A. Schotz pers. comm. 2006). They tend to be confined to relatively small areas near the eastern flank of the region where loess deposits thin out. Unlike South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479) of the same general region (which is typified by complex microtopography), this system occupies broad flats underlain by fragipans. These fragipans impede the downward migration of water, resulting in wet conditions for portions of the year. Fire was an important natural process in this system, probably maintaining relatively open-canopied stands (M. Evans pers. comm.). Stands are dominated by hardwood trees, including *Quercus* spp., *Liquidambar styraciflua*, *Carya* spp., and *Acer rubrum* (Chester et al. 1995). Related wet flatwoods are apparently present in the Moulton Valley of Alabama and these are provisionally placed here.

Classification Comments: The primary range of this system is limited areas of the "Jackson Purchase" or "Jackson Plain" of Kentucky and possibly related areas in adjacent western Tennessee, as well as related broad, flat areas of the western Interior Low Plateau. According to Bryant and Martin (1988) the "Flatwoods" portion of the Jackson Purchase (which is primarily where the "Wet Flatwoods" are located in that area) occupies less than 2% of the total area, but localized occurrences could have been present in other parts of the region. These apparently related wet flatwoods in the western end Moulton Valley of Alabama are found in northeastern Franklin and extreme western Lawrence counties, from 10 to 20 km east of Russellville. More information is needed. In Alabama, this system is apparently found in the Moulton Valley region (A. Schotz pers. comm. 2006), which is technically part of TNC Ecoregion 50 but ambiguously placed there.

Similar Ecological Systems:

- South-Central Interior / Upper Coastal Plain Flatwoods (CES203.479)

Related Concepts:

- Flatwoods (Evans 1991) Intersecting

DESCRIPTION

Environment: These flatwoods have long been recognized as the primary vegetation type of a distinctive subdivision within the Upper East Gulf Coastal Plain region (Davis 1923, Bryant and Martin 1988), as well as related areas of the western Interior Low Plateau. Within the "Jackson Plain" portion of the Upper East Gulf Coastal Plain, these flatwoods tend to be confined to relatively small areas near the eastern flank of the "Jackson Plain" region where the loess deposits thin out. Unlike drier Post Oak Flatwoods of these areas (which are typified by microtopographic variation), this system occupies broad flats underlain by fragipans. These fragipans impede the downward migration of water resulting in wet conditions for portions of the year. Fire is probably relatively infrequent in this system (M. Evans pers. comm.). In the Pennyroyal Plain, this system occurs on upland flats and depressions with poor drainage, underlain by limestone; soils include Robertsville silt loam (Chester et al. 1995) and Henry silt loam (M. Evans pers. comm.).

Vegetation: Stands are typically dominated by various combinations of oaks and other hardwoods, including *Quercus pagoda*, *Quercus palustris*, *Quercus michauxii*, *Quercus alba*, *Liquidambar styraciflua*, *Carya* spp., *Nyssa sylvatica*, and *Acer rubrum* (Chester et al. 1995). Most stands of this system have been severely altered or destroyed, and the characteristic herbs are poorly known. *Campsis radicans* may be found, along with *Carex* spp., including *Carex leptalea* and *Carex cherokeensis*. Other herbs may include *Leersia* spp. and *Cardamine bulbosa*. *Quercus phellos* and/or *Quercus lyrata* may also be present in stands of this system in Kentucky (M. Evans pers. comm. 2006). Some stands placed here are dominated by *Quercus falcata* (e.g., at Shiloh National Military Park), others (e.g., in the Moulton Valley of Alabama) by a combination of *Quercus phellos* and *Quercus nigra* (A. Schotz pers. comm. 2006).

Dynamics: Most historic occurrences have been cleared, drained and tilled, and remaining sites are small and degraded. Fire was an important natural process in this system probably maintaining relatively open-canopied stands (M. Evans pers. comm.).

MEMBERSHIP

Associations:

- *Quercus falcata* Flatwoods Forest (CEGL004412, G2?)
- *Quercus palustris* - (*Quercus stellata*) - *Quercus pagoda* / *Isoetes* spp. Forest (CEGL002101, G2G3)
- *Quercus phellos* - (*Quercus lyrata*) / *Carex* spp. - *Leersia* spp. Forest (CEGL002102, G3G4Q)

Alliances:

- *Quercus falcata* Forest Alliance (A.243)
- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)

SPATIAL CHARACTERISTICS**Adjacent Ecological Systems:**

- East Gulf Coastal Plain Northern Loess Plain Oak-Hickory Upland (CES203.482)

DISTRIBUTION

Range: The primary range of this system is limited areas of the "Jackson Purchase" or "Jackson Plain" of Kentucky and possibly related areas in adjacent western Tennessee, as well as related broad, flat areas of the western Interior Low Plateau. It is assumed to cross the Ohio River into adjacent Indiana. It has been discerned from wetland modeling and confirmed by observation in the Moulton Valley of Alabama.

Divisions: 203:C

Nations: US

Subnations: AL, IL?, IN?, KY, TN

Map Zones: 46:?, 47:C, 48:C, 49:?

TNC Ecoregions: 43:C, 44:C, 50:C

SOURCES

References: Bryant and Martin 1988, Chester et al. 1995, Comer et al. 2003, Davis 1923, Evans 1991, Hendricks et al. 1991, M. Evans pers. comm., NatureServe Ecology - Southeastern U.S. unpubl. data, Schotz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723106#references

Description Author: R. Evans and M. Evans, mod. M. Pyne

Version: 23 Oct 2006

Concept Author: R. Evans and M. Evans, mod. M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

SOUTHEASTERN COASTAL PLAIN NATURAL LAKESHORE (CES203.044)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Woody-Herbaceous; Depressional [Pond]; Coastal plain

National Mapping Codes: ESLF 9167

CONCEPT

Summary: This system consists of wetland vegetation along large natural lakeshores in the Outer Coastal Plain of the southeastern United States. Natural lakes are generally rare features throughout most of this region. However, examples range northward to the Atlantic Coastal Plain in southeastern Virginia and North Carolina, but no examples are known from South Carolina and Georgia. However examples are present in Florida, where they are apparently found on smaller lakes than those to the north. Hydroperiod remains relatively constant from year to year, especially when compared to smaller limesink depressions of the region. Vegetation may appear to be zonal in relationship to distance from the lakeshore and may range from open water or floating-leaved aquatics in the deeper waters of the lakes, to emergent marsh zones along the edges. In some cases there are wet hardwood swamps present.

Classification Comments: This system is related to Southern Atlantic Coastal Plain Depression Pondshore (CES203.262) which is found primarily on limesink depressions that are smaller in scale and have greater hydrologic fluctuation. This system is also related to Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245) in that some of the natural lake basins it occurs on are thought to be Carolina bays.

Similar Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)

Related Concepts:

- Clastic Upland Lake (FNAI 1990) Intersecting
- Flatwoods/Prairie/Marsh Lake (FNAI 1990) Intersecting
- Sinkhole Lake (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- *Cyrilla racemiflora* - *Lyonia lucida* Shrubland (CEGL003844, G3?)
- *Liquidambar styraciflua* / *Persea palustris* Forest (CEGL004481, G1)
- *Nymphaea odorata* - *Nuphar lutea* ssp. *advena* - (*Nymphoides aquatica*, *Xyris smalliana*) Herbaceous Vegetation (CEGL004326, G3?)
- *Panicum hemitomon* - *Eleocharis equisetoides* - *Rhynchospora inundata* Herbaceous Vegetation (CEGL004127, G3)
- *Panicum hemitomon* - *Pluchea (camphorata, rosea)* - *Ludwigia* spp. Herbaceous Vegetation (CEGL007792, G3)
- *Taxodium distichum* - *Liquidambar styraciflua* - *Platanus occidentalis* / *Asimina triloba* Forest (CEGL004424, G1?)
- *Taxodium distichum* - *Taxodium ascendens* / *Panicum hemitomon* - *Sclerolepis uniflora* Woodland (CEGL004465, G1)
- *Taxodium distichum* - *Taxodium ascendens* / *Panicum hemitomon* Woodland (CEGL004466, G3?)
- *Taxodium distichum* / *Cephalanthus occidentalis* / *Juncus repens* Woodland (CEGL004653, G1?)

Alliances:

- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Liquidambar styraciflua* - *Taxodium distichum* Seasonally Flooded Forest Alliance (A.322)
- *Nymphoides aquatica* Permanently Flooded Herbaceous Alliance (A.1751)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Taxodium distichum* - (*Taxodium ascendens*) Seasonally Flooded Lakeshore Woodland Alliance (A.652)

DISTRIBUTION

Range: This system is found in the Outer Coastal Plain of Virginia (apparently from a single site, Lake Drummond) and North Carolina, apparently absent from South Carolina and Georgia, but examples are present in Florida (i.e., Ocean Pond on Osceola National Forest).

Divisions: 203:C

Nations: US

Subnations: FL, GA?, NC, SC?, VA

Map Zones: 55:C, 56:C, 58:C, 60:C, 99:C

TNC Ecoregions: 53:?, 55:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722665#references

Description Author: M. Schafale and R. Evans

Version: 31 Mar 2003

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN AND CENTRAL APPALACHIAN BOG AND FEN (CES202.300)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Fen; Shrubland (Shrub-dominated); Depressional; Bog

Non-Diagnostic Classifiers: Graminoid

National Mapping Codes: ESLF 9309

CONCEPT

Summary: This system consists of wetlands associated with flat sites in the Southern Blue Ridge, Central Appalachians, Cumberland Mountains, and possibly upper Piedmont and adjacent Ridge and Valley. These sites occur at elevations below 1220 m (4000 feet) in poorly drained bottomlands on soils which are often saturated and mucky. Wetness results from a combination of groundwater input, seepage from adjacent slopes, rainfall and impeded drainage. The amount of seepage water input is variable among examples, and these wetlands are typically primarily depressional. Vegetation is at least partially open, with herbaceous-dominated areas as well as shrub thickets and often forested zones. Vegetation is a complex of zones or patches with a mix of physiognomies. The wettest areas have herbaceous vegetation dominated by *Carex* spp., usually with abundant *Sphagnum*. Scattered trees and shrubs may be present in the herbaceous zones. Most examples also have a dense shrub zone around the edges. Some examples have forest zones as well, around the edges or as a matrix in which numerous small herbaceous openings are embedded. Characteristic tree species are *Tsuga canadensis*, *Acer rubrum*, *Nyssa sylvatica*, and *Pinus rigida*. Characteristic shrubs include *Rhododendron maximum*, *Alnus serrulata*, *Viburnum nudum* var. *nudum*, and *Toxicodendron vernix*.

Classification Comments: This system includes communities locally known as both bogs and fens. The typical distinction between bogs as rainwater-fed wetlands and fens as groundwater-fed is blurred in these systems. Deep weathering of rock in this unglaciated region may make the groundwater more acidic and mineral-poor than in northern fens. Higher rainfall in the southern Appalachians than in adjacent regions may make the role of rainfall greater than in other regions, even where groundwater input occurs. Except for the few examples with clear calcareous groundwater input, the vegetation and flora are more characteristic of northern bogs than of northern fens. However, because of the confusion of the role of groundwater and rainwater, all of these wetlands are placed in the same system.

This system is distinguished from Southern Appalachian Seepage Wetland (CES202.317) by patterns of flora and vegetation. Though both systems have heterogeneous and variable vegetation, they share few or no associations. The setting also differs, with Southern and Central Appalachian Bog and Fen (CES202.300) occurring on flat sites such as valley bottoms, where impeded drainage is important, while the seeps occur on sloping sites where water flow is freer and more groundwater flow is needed to create a wetland. High-elevation wetlands in West Virginia are placed in High Allegheny Wetland (CES202.069).

Similar Ecological Systems:

- High Allegheny Wetland (CES202.069)
- Southern Appalachian Seepage Wetland (CES202.317)

DESCRIPTION

Environment: This system occurs in patches in flat valley bottoms, usually on the outer edges of stream floodplains at elevations below 1220 m (4000 feet). The soil is saturated most or all of the year, at least in the wettest parts, and may be very mucky. Although sites rarely flood, wetness results from a combination of groundwater input, rainfall, seepage from adjacent slopes, and impeded drainage. The groundwater is usually highly acidic and low in dissolved bases, but one or a few examples have somewhat calcareous water input because groundwater flows through mafic rock substrates. Overland flow and stream flooding are presumably only rare events. The geologic substrate is usually alluvium. Often, but not always, there is an adjacent slope with a seep at its base or some visible microtopographic feature, such as a stream levee or ridge, that impedes water drainage out of the area. Some occurrences have substantial microtopography of abandoned stream channels or ridge-and-swale systems that pond water in low areas.

Vegetation: Vegetation is a complex of zones or patches with a mix of physiognomies. The wettest areas have herbaceous vegetation dominated by *Carex* spp., usually with abundant *Sphagnum*. Scattered trees and shrubs may be present in the herbaceous zones. Most examples also have a dense shrub zone around the edges. Some examples have forest zones as well, around the edges or as a matrix in which numerous small herbaceous openings are embedded. Characteristic tree species are *Tsuga canadensis*, *Acer rubrum*, *Nyssa sylvatica*, and *Pinus rigida*. Characteristic shrubs include *Rhododendron maximum*, *Alnus serrulata*, *Viburnum nudum* var. *cassinoides*, *Viburnum nudum* var. *nudum*, and *Toxicodendron vernix*. A number of plant species are shared with northern bogs, including some that are disjunct long distances and occur in the south only in bogs. Other species are narrow endemics, such as *Sarracenia rubra* ssp. *jonesii*. In the more southern examples, some species are shared with bog communities in the Coastal Plain. The very rare richer fen examples have very distinctive vegetation, sharing a number of species with northern rich fens.

Dynamics: The natural dynamics of this system are not well known and are subject to debate. The factors that created and naturally maintain this system are unclear. Most examples show a strong tendency at present for shrubs and trees to increase in density in the open areas, threatening to eliminate the characteristic herb species. This suggests that an important process has been altered or lost.

One hypothesis is that bogs are an ephemeral feature developing from abandoned beaver ponds. Another hypothesis is that they result from a narrow combination of moisture and nutrient conditions, which have been widely altered in an obscure way that has changed ecosystem stability. The cattle grazing that was nearly universal in examples of this system in the past appears to have delayed woody succession but may also have altered the natural characteristics. Fire is sometimes considered as a factor, but most examples do not appear flammable enough to burn. Besides woody encroachment, bogs may be altered by changes in adjacent drainage, such as entrenchment by streams.

MEMBERSHIP

Associations:

- (*Andromeda polifolia* var. *glaucophylla*) / *Polytrichum strictum* - *Cladina* spp. - *Sphagnum* spp. Nonvascular Vegetation (CEGL006589, G1)
- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Osmunda cinnamomea* - *Chasmanthium laxum* - *Carex intumescens* / *Sphagnum lescurii* Forest (CEGL007443, G3?)
- *Alnus serrulata* - *Kalmia carolina* - *Rhododendron catawbiense* - *Spiraea alba* / *Carex folliculata* - *Lilium grayi* Shrubland (CEGL003915, G1G2)
- *Alnus serrulata* - *Lindera benzoin* / *Scutellaria lateriflora* - *Thelypteris noveboracensis* Shrubland (CEGL003909, G2?)
- *Alnus serrulata* - *Rhododendron arborescens* / *Sarracenia oreophila* - *Rhynchospora rariflora* Shrubland (CEGL003914, G1)
- *Alnus serrulata* - *Rhododendron viscosum* - *Rhododendron maximum* / *Juncus gymnocarpus* - *Chelone cuthbertii* Shrubland (CEGL003916, G1G2)
- *Alnus serrulata* - *Viburnum nudum* var. *nudum* - *Chamaedaphne calyculata* / *Woodwardia areolata* - *Sarracenia rubra* ssp. *jonesii* Shrubland (CEGL003918, G1)
- *Alnus serrulata* / *Sanguisorba canadensis* - *Parnassia grandifolia* - *Helenium brevifolium* Shrubland (CEGL003917, G1)
- *Carex (atlantica, echinata, leptalea, lurida)* - *Solidago patula* Herbaceous Vegetation (CEGL004156, G1)
- *Carex atlantica* - *Rhynchospora alba* - *Parnassia asarifolia* / *Sphagnum warnstorffii* Herbaceous Vegetation (CEGL004157, G1)
- *Carex atlantica* - *Solidago patula* var. *patula* - *Lilium grayi* / *Sphagnum bartlettianum* Herbaceous Vegetation (CEGL004158, G1)
- *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549, GNR)
- *Carex echinata* - *Solidago uliginosa* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008534, G2?)
- *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* - *Carex atlantica* / *Sphagnum* spp. Herbaceous Vegetation (CEGL007697, G2)
- *Carex gynandra* - *Scirpus cyperinus* - *Eriophorum virginicum* - *Osmunda cinnamomea* Herbaceous Vegetation (CEGL007771, G2)
- *Carex leptalea* - *Parnassia grandifolia* - *Rhynchospora alba* Herbaceous Vegetation (CEGL004997, G1)
- *Carex stricta* - *Caltha palustris* - *Oxypolis rigidior* - *Symphyotrichum puniceum* Herbaceous Vegetation (CEGL008461, G1?)
- *Cladium mariscoides* - *Sanguisorba canadensis* / *Sphagnum subsecundum* Herbaceous Vegetation (CEGL004167, G1)
- *Dulichium arundinaceum* - *Carex folliculata* - *Juncus* spp. Herbaceous Vegetation (CEGL006552, GNR)
- *Picea rubens* - (*Tsuga canadensis*) / *Rhododendron maximum* Saturated Forest (CEGL006277, G2?)
- *Pinus rigida* / *Toxicodendron vernix* / *Gaylussacia baccata* / *Symplocarpus foetidus* Woodland (CEGL003667, G1)
- *Pinus strobus* - *Acer rubrum* / *Spiraea alba* var. *latifolia* / *Sanguisorba canadensis* Woodland (CEGL004994, G1)
- *Rhododendron (maximum, catawbiense)* - *Ilex collina* - *Salix sericea* / *Carex trisperma* - *Eriophorum virginicum* Shrubland (CEGL003913, G1)
- *Rhododendron maximum* / *Sphagnum* spp. Shrubland (CEGL003849, G2G3Q)
- *Spiraea alba* var. *latifolia* - *Cornus racemosa* / *Calamagrostis canadensis* - *Sanguisorba canadensis* - *Carex scoparia* Shrub Herbaceous Vegetation (CEGL006249, G1)
- *Tsuga canadensis* - *Acer rubrum* - (*Liriodendron tulipifera*, *Nyssa sylvatica*) / *Rhododendron maximum* / *Sphagnum* spp. Forest (CEGL007565, G2)
- *Vaccinium myrtilloides* / *Pteridium aquilinum* / *Polytrichum* spp. Shrubland (CEGL006596, GNR)

Alliances:

- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* - *Salix sericea* - *Rhododendron (catawbiense, maximum)* Saturated Shrubland Alliance (A.1880)
- *Alnus serrulata* - *Spiraea* spp. / *Sanguisorba canadensis* Saturated Shrub Herbaceous Alliance (A.3026)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Carex (atlantica, echinata)* - *Eriophorum virginicum* - *Rhynchospora capitellata* - *Solidago patula* Saturated Herbaceous Alliance (A.1450)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Carex lurida* - *Carex leptalea* - (*Carex atlantica*, *Carex interior*, *Parnassia grandifolia*) Saturated Herbaceous Alliance (A.1452)
- *Carex ruthii* - *Carex gynandra* Saturated Herbaceous Alliance (A.1898)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Cladium mariscoides* Saturated Herbaceous Alliance (A.1447)
- *Picea rubens* Saturated Forest Alliance (A.198)
- *Pinus rigida* Saturated Woodland Alliance (A.580)
- *Pinus strobus* - *Acer rubrum* Saturated Woodland Alliance (A.582)
- *Sphagnum cuspidatum* - *Cladopodiella fluitans* Saturated Nonvascular Alliance (A.3006)
- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)

- *Vaccinium corymbosum* Saturated Shrubland Alliance (A.1018)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, from one to several acres in size.

Size: Occurs as small patches, from about one acre to several acres. The largest examples are swamp forest-bog complexes that may cover 10 or more acres. Except for the small openings in the swamp forest-bog complexes, bog and fen patches tend to occur singly or in small clusters only.

Adjacent Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

Adjacent Ecological System Comments: Usually associated with Southern and Central Appalachian Cove Forest (CES202.373).

DISTRIBUTION

Range: This system ranges from the southern Appalachians of northern Georgia and South Carolina north to Virginia. It is also found in the Cumberland Mountains of Kentucky.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, SC, TN, VA

Map Zones: 53:C, 54:C, 57:C, 59:C, 61:C

TNC Ecoregions: 50:C, 51:C, 52:?, 59:C

SOURCES

References: Comer et al. 2003, M. Evans pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723191#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne and S. Gawler

Version: 23 Jul 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN ATLANTIC COASTAL PLAIN DEPRESSION PONDSHORE (CES203.262)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Woody-Herbaceous; Depressional [Pond]; Coastal plain

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9305

CONCEPT

Summary: This system consists of wetlands in small basins formed in unconsolidated sediments of the Atlantic Coastal Plain, from southeastern Virginia to Florida. Most basins are formed by subsidence of surface sediments caused by solution in underlying limestone. Others may be formed as swales in mainland eolian sands, natural blockage of small drainages by sediment movement, and more obscure causes. Soils are generally sandy, with mucky surfaces in the wettest areas. Vegetation is often zonal in response to variation in duration of flooding in different parts of the depression pond. Vegetation usually ranges from open water or floating-leaved aquatics in the center of the deepest basins, to emergent marsh zones in semipermanent water, to drawdown zones with diverse small graminoid and forb vegetation, to dense shrub or woodland edges. A smaller number of basins may have emergent trees throughout their extent. Hydroperiod can vary substantially from year to year, and vegetation can similarly vary significantly in aspect and dominants. Besides flooding and its variation, fire is an important natural force in the outer drier portions.

Classification Comments: The boundary of this system with adjacent upland or wetland systems occurs where vegetation begins to reflect the influence of regular flooding and basin hydrology. This system shares much of its character with Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245) but generally accommodates all "limesink depressions" as opposed to mineral soil Carolina bay wetlands. Other basins, especially broad, gently sloped basins on the Outer Coastal Plain and steep-sided depressions farther inland, will need to be placed based on the preponderance of evidence. The northern and southern range limits of this system are not well known. It is tentatively placed at the mouth of Chesapeake Bay and in south Georgia. Northern Atlantic Coastal Plain Pondshore (CES203.518) of Virginia and Maryland and the wet prairies of north-central Florida are closely related systems.

Similar Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- East Gulf Coastal Plain Depression Pondshore (CES203.558)
- Northern Atlantic Coastal Plain Pondshore (CES203.518)
- Southeastern Coastal Plain Natural Lakeshore (CES203.044)

Related Concepts:

- Depression Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: This system occurs in small basins, primarily in sandy terrain of the Atlantic Coastal Plain, from southeastern Virginia to Florida. Most basins are formed by subsidence of surface sediments caused by solution in underlying limestone. Others may be formed as dune swales in mainland eolian sands, natural blockage of small drainages by sediment movement, and more obscure causes. Basins often occur in complexes of a few to dozens, which vary in size, depth, and steepness of sides. Most or all of these basins are considered groundwater windows, with water levels matching the level of the local water table. Rainfall is probably also a substantial contributor. The water is acidic and is apparently not influenced by the underlying limestone or deeper groundwater.

Hydroperiods vary substantially, with the deepest ponds having permanent water in the center, and the shallowest normally holding water only in the winter and spring. However, water levels can fluctuate substantially over the course of a year and from year to year in response to rainfall and longer term droughts. Soils have a mucky surface in the centers of basins that hold water most or all of the year and are generally sandy in smaller basins and in the outer drawdown zones that are exposed more of the time. Fire is potentially an important, if infrequent, influence in the system, penetrating the portions that are dry when adjacent communities burn. Its northern range limit is generally consistent with the northern limit of longleaf pine (*Pinus palustris*), although this species is not a component.

Vegetation: This system consists of wetland vegetation that is often strongly zoned within single basins and may vary substantially among basins even in close proximity. Most of the associations are herbaceous, but woody associations may be present. The center of the deepest basins generally is open water or floating-leaved aquatics. Semipermanently flooded zones may have marsh vegetation of medium to large emergents. Outer, mineral soil drawdown zones often have a species-rich flora of small to medium graminoids and forbs. These include a number of specialized species that are rare in states, some that are globally rare, and some that are widespread but nowhere common. The aspect of this vegetation may vary substantially from year to year depending on when water level drops. Some basins have a dense shrubby edge zone. Some trees or shrubs tolerant of standing water, especially bald-cypress (*Taxodium distichum*), pond-cypress (*Taxodium ascendens*) or swamp blackgum (*Nyssa biflora*), may grow within the basins, either as scattered individuals, as a distinct zone, or forming an open canopy over the whole basin. Because the basins are isolated from larger water bodies and most dry out at least occasionally, their aquatic fauna does not include fish unless fish have been artificially introduced. These systems are well known as important breeding sites for amphibians, and may support important aquatic invertebrate

communities as well.

Dynamics: Flooding hydrology is the most important dynamic process. Standing water excludes plants not characteristic of the system. Variation in hydroperiod and drawdown drive vegetation changes from year to year. Because ponds are connected to the local water table, hydroperiods respond to seasonal and long-term cycles in rainfall as much as, perhaps more than, single rainfall events. They may also be affected by regional drainage that lowers the water table.

Fire is also an important dynamic process in the drier portions of this system. Fire may be important for preventing invasion of trees such as loblolly pine (*Pinus taeda*) during long-running droughts, as well as for driving variation in herbaceous species.

MEMBERSHIP

Associations:

- *Amphicarpum muehlenbergianum* - (*Panicum hemitomon*) Herbaceous Vegetation (CEGL008588, G2G3)
- *Carex hyalinolepis* Seasonally Flooded Herbaceous Vegetation (CEGL004724, G1G3)
- *Carex striata* var. *striata* - *Xyris fimbriata* - *Lachnanthes carolina* Herbaceous Vegetation (CEGL007718, G2G3)
- *Cyrilla racemiflora* - *Lyonia lucida* Shrubland (CEGL003844, G3?)
- *Dichantherium wrightianum* - *Dichantherium erectifolium* Herbaceous Vegetation (CEGL004105, G2G3)
- *Nymphaea odorata* - *Nuphar lutea* ssp. *advena* - (*Nymphoides aquatica*, *Xyris smalliana*) Herbaceous Vegetation (CEGL004326, G3?)
- *Nyssa biflora* / *Itea virginica* - *Cephalanthus occidentalis* Depression Forest (CEGL007434, G3G4)
- *Nyssa ogeche* / *Ilex myrtifolia* / *Carex turgescens* - *Carex striata* Forest (CEGL004641, G2?)
- *Panicum hemitomon* - *Eleocharis equisetoides* - *Rhynchospora inundata* Herbaceous Vegetation (CEGL004127, G3)
- *Panicum virgatum* - *Andropogon (capillipes, glaucopsis)* - *Aristida palustris* Herbaceous Vegetation (CEGL004100, G2?)
- *Pinus serotina* / *Cyrilla racemiflora* - *Lyonia lucida* - *Vaccinium fuscum* Woodland (CEGL004434, G2G3)
- *Quercus phellos* - *Nyssa biflora* / *Panicum hemitomon* - *Carex* spp. - *Woodwardia virginica* Forest [Provisional] (CEGL004104, G2G3)
- *Rhynchospora (careyana, inundata)* Seasonally Flooded Herbaceous Vegetation (CEGL004132, G3?)
- *Rhynchospora alba* Saturated Herbaceous Vegetation (CEGL004463, G1?)
- *Rhynchospora filifolia* - *Juncus abortivus* Herbaceous Vegetation (CEGL004131, G2?)
- *Saccharum baldwinii* - *Carex glaucescens* - *Rhynchospora corniculata* Herbaceous Vegetation (CEGL007745, G2G3)
- *Spartina bakeri* - *Woodwardia virginica* - *Saccharum giganteum* Herbaceous Vegetation (CEGL007713, G3?)
- *Sphagnum cuspidatum* Nonvascular Vegetation (CEGL004384, G2?)
- *Taxodium ascendens* / (*Nyssa biflora*) / *Leucothoe racemosa* - *Lyonia lucida* - *Morella cerifera* Depression Forest (CEGL007420, G3)
- *Taxodium ascendens* / *Cyrilla racemiflora* - *Zenobia pulverulenta* Woodland (CEGL003734, G2)
- *Taxodium ascendens* / *Ilex myrtifolia* Depression Forest (CEGL007418, G3?)
- *Vaccinium formosum* - *Vaccinium fuscum* / *Sphagnum cuspidatum* Shrubland (CEGL003907, G3?)
- *Woodwardia virginica* / *Sphagnum cuspidatum* Herbaceous Vegetation (CEGL004475, G2?)

Alliances:

- *Aristida palustris* - *Andropogon (capillipes, glaucopsis)* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1364)
- *Carex hyalinolepis* Seasonally Flooded Herbaceous Alliance (A.1366)
- *Carex striata* Seasonally Flooded Herbaceous Alliance (A.1426)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Dichantherium (erectifolium, wrightianum)* - *Rhynchospora filifolia* Seasonally Flooded Herbaceous Alliance (A.1370)
- *Nymphoides aquatica* Permanently Flooded Herbaceous Alliance (A.1751)
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Pinus serotina* Saturated Woodland Alliance (A.581)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Rhynchospora (careyana, inundata)* Seasonally Flooded Herbaceous Alliance (A.1383)
- *Rhynchospora alba* Saturated Herbaceous Alliance (A.1461)
- *Rhynchospora* spp. - *Panicum (rigidulum, verrucosum)* - *Rhexia virginica* Seasonally Flooded Herbaceous Alliance (A.1384)
- *Spartina bakeri* Seasonally Flooded Herbaceous Alliance (A.1389)
- *Sphagnum cuspidatum* Seasonally Flooded Nonvascular Alliance (A.1821)
- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)
- *Taxodium ascendens* Seasonally Flooded Woodland Alliance (A.651)
- *Vaccinium formosum* - *Vaccinium fuscum* - *Vaccinium corymbosum* Seasonally Flooded Shrubland Alliance (A.992)
- *Woodwardia virginica* Seasonally Flooded Herbaceous Alliance (A.1713)

SPATIAL CHARACTERISTICS

Size: Depressions often occur in complexes, in a matrix of upland or saturated wetland systems. Individual depressions range from about 100 square meters to a hectare or two. Complexes may occupy several hectares within the space of several square kilometers.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)

Adjacent Ecological System Comments: Most often associated with Atlantic Coastal Plain Upland Longleaf Pine Woodland (CES203.281), but any upland or saturated wetland system can potentially surround them.

DISTRIBUTION

Range: This system is found from southeastern Virginia to Florida, primarily in the Outer Coastal Plain, but occasional depressions in the Inner Coastal Plain and Sandhills could be included.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723224#references

Description Author: M. Schafale and R. Evans

Version: 02 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

SOUTHERN ATLANTIC COASTAL PLAIN TIDAL WOODED SWAMP (CES203.240)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Tidal / Estuarine

National Mapping Codes: ESLF 9194

CONCEPT

Summary: This system encompasses the tidally flooded areas in lower river floodplains and edges of estuaries of the Atlantic Coastal Plain from southeastern Virginia southward to northern Florida that have sufficiently fresh water and short enough flooding to be able to support tree canopies. *Taxodium*, *Nyssa*, or *Fraxinus* generally dominate. Swamps may be either regularly flooded by lunar tides or irregularly flooded by wind tides.

Classification Comments: This system is distinguished from all adjacent systems by the combination of tidal flooding and tree-dominated vegetation. It is related to East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299) but is distinguished because of differences in the tidal flooding regime between the Gulf and Atlantic and because of biogeographic differences.

Similar Ecological Systems:

- East Gulf Coastal Plain Tidal Wooded Swamp (CES203.299)
- Northern Atlantic Coastal Plain Tidal Swamp (CES203.282)

DESCRIPTION

Environment: This system occurs in lower reaches of river floodplains and along estuary shorelines, in places regularly or irregularly flooded by lunar or wind tides. The water has little salt content, due to distance from the ocean and/or strong freshwater input. Soils may be mineral or organic. Soils are generally permanently saturated even when the tide is low. The transition of the hydrology to flood dominance rather than tidal dominance may be very gradual.

Vegetation: Vegetation is forest or woodland with canopies of the most water-tolerant tree species, generally *Taxodium distichum*, *Nyssa* spp., or *Fraxinus* spp. Lower strata generally are denser and more species-rich than those of river or nonriverine swamps, containing species from those systems as well as a variety of shrubs and herbs shared with freshwater marshes. *Morella cerifera* and *Rosa palustris* are often characteristic.

Dynamics: Tidal flooding, regular or irregular, is the ecological factor that makes this system distinct. River floods may also seasonally affect this system. Infrequent intrusion of saltier water, which is stressful or fatal to many of the plant species, is an important periodic disturbance created by storms. Natural fire is not frequent in these systems, but may sometimes be important in determining the boundary between tidal swamps and tidal marshes. This system generally appears to be in a shifting relationship with tidal freshwater marshes of the same region. Most marshes have standing dead trees in them, suggesting they recently were swamps. But some marshes are being invaded with trees and may be turning into swamps. Rising sea level is driving shifts in the communities of this system, causing more inland swamps to develop into this system and causing parts of this system to turn into marshes. In areas not too strongly affected by salt intrusion, drowning by rising sea level, or fire, the communities can be expected to exist as old-growth, multi-aged forests.

MEMBERSHIP

Associations:

- *Acer rubrum* / *Sambucus canadensis* / *Ampelopsis arborea* - *Sicyos angulatus* Forest (CEGL004698, G2)
- *Fraxinus pennsylvanica* - *Ulmus americana* / *Morella cerifera* - *Juniperus virginiana* var. *silicicola* Forest (CEGL004483, G1G2)
- *Juniperus virginiana* var. *silicicola* / *Morella cerifera* / *Kosteletzkya virginica* - *Bacopa monnieri* Woodland (CEGL007166, G1?)
- *Morella cerifera* - *Toxicodendron radicans* / *Spartina bakeri* Shrubland (CEGL004789, G3?)
- *Nyssa aquatica* Tidal Forest (CEGL008561, G3?)
- *Nyssa biflora* - (*Nyssa aquatica*, *Taxodium distichum*) Tidal Forest (CEGL004484, G3G4)
- *Nyssa biflora* - *Nyssa aquatica* - *Taxodium distichum* / *Saururus cernuus* Forest (CEGL004696, GNR)
- *Pinus taeda* - *Nyssa biflora* - *Taxodium distichum* / *Morella cerifera* / *Osmunda regalis* var. *spectabilis* Forest (CEGL004651, G2?)
- *Taxodium distichum* / *Carex hyalinolepis* Woodland (CEGL004654, G2?)
- *Taxodium distichum* / *Pontederia cordata* - *Peltandra virginica* Tidal Woodland (CEGL006059, GNR)
- *Taxodium distichum* / *Typha angustifolia* Woodland (CEGL004231, G2G3)
- *Taxodium distichum* / *Zizania aquatica* - *Carex canescens* ssp. *disjuncta* Woodland (CEGL004655, G1Q)
- *Taxodium distichum* Tidal Woodland [Provisional] (CEGL003739, GNR)

Alliances:

- *Fraxinus pennsylvanica* - *Acer rubrum* - *Ulmus americana* Tidal Forest Alliance (A.356)
- *Juniperus virginiana* var. *silicicola* Tidal Woodland Alliance (A.1887)
- *Morella cerifera* - *Rosa palustris* Tidal Shrubland Alliance (A.806)

- *Nyssa biflora* - (*Nyssa aquatica*, *Taxodium distichum*) Tidal Forest Alliance (A.357)
- *Taxodium distichum* Tidal Woodland Alliance (A.659)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurrences are generally large patches, ranging to small patches.

Size: Occurrences tend to be wide to narrow bands along rivers, streams, or shorelines. The largest patches, on large rivers, are thousands of acres, broken only by stream channels. Small occurrences are also common, with a zone of this system occurring in most streams that reach the ocean or estuaries.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (CES203.259)
- Central Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)

Adjacent Ecological System Comments: In most rivers, this system grades upstream to floodplain systems and downstream to fresh or salt marsh systems. In the Embayed Region of North Carolina and Virginia, it often grades to Central Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304) inland within peat-filled drowned river valleys.

DISTRIBUTION

Range: This system is found from southeastern Virginia southward to northern Florida along the Atlantic Coast.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC, VA

Map Zones: 55:C, 58:C, 60:C

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723245#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 02 Feb 2007

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1450 SOUTHERN ATLANTIC COASTAL PLAIN WET PINE SAVANNA AND FLATWOODS (CES203.536)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Woody-Herbaceous; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2450; ESLF 9119; ESP 1450

CONCEPT

Summary: This system of pine-dominated savannas and/or flatwoods ranges from southern South Carolina to northeastern Florida where it was the former matrix system, centered in southeastern Georgia, near the coast. This general area has been referred to as the Longleaf Pine Wiregrass Savannas region (Platt 1999) and the Sea Island Flatwoods Ecoregion (75f of Griffith et al. (2001, 2002)). Examples of this system and component community associations share the common features of wet, seasonally saturated, mineral soils and historic exposure to frequent low-intensity fire. They occur on a wide range of soil textures, which is an important factor in distinguishing different associations. The vegetation is naturally dominated by *Pinus palustris* or, on wetter sites, *Pinus elliottii* or less commonly *Pinus serotina*. Understory conditions may be dramatically altered by fire frequency and seasonality. In natural condition (frequent fires, including a growing-season component) there tends to be a dense ground cover of herbs and low shrubs; grasses can dominate, but there is often a large diversity of other herbs and shrubs.

Similar Ecological Systems:

- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)

Related Concepts:

- Mesic Flatwoods (FNAI 1990) Intersecting
- Wet Flatwoods (FNAI 1990) Intersecting

DESCRIPTION

Environment: This system occurs on wet mineral soil sites, in the middle and outer Coastal Plain. Landforms include low areas in relict beach ridge systems and eolian sand deposits, and poorly drained clayey, loamy, or sandy flats.

Vegetation: The best examples are typically open woodlands naturally dominated by *Pinus palustris* or *Pinus elliottii* and/or *Pinus serotina* on wetter sites. In many areas past logging and subsequent lack of frequent growing-season fire have led to much greater dominance by *Pinus elliottii*. In natural condition, there is typically a dense ground cover of herbs and low shrubs; grasses can dominate, but there is often a large diversity of other herbs and shrubs. The shrubs are mainly *Serenoa repens*, *Ilex glabra*, and *Ilex coriacea* along with various ericaceous species. These shrub species become especially prominent on sites not frequently burned.

Dynamics: Frequent low-intensity fire is important. Lightning has been an important source of ignition for these fires, especially historically.

MEMBERSHIP

Associations:

- *Pinus elliottii* var. *elliottii* - *Taxodium ascendens* / *Hypericum brachyphyllum* / *Sporobolus pinetorum* - *Dichantherium scabriusculum* Woodland (CEGL004969, G2?)
- *Pinus elliottii* var. *elliottii* / *Serenoa repens* - *Ilex glabra* Woodland (CEGL003643, G4?)
- *Pinus palustris* - (*Pinus elliottii* var. *elliottii*) / *Sporobolus pinetorum* - *Oclemena reticulata* - (*Sporobolus curtissii*) Woodland (CEGL004967, G2)
- *Pinus palustris* - *Pinus elliottii* var. *elliottii* / *Ctenium aromaticum* - *Aristida beyrichiana* - (*Sporobolus floridanus*) Woodland (CEGL004790, G1G2)
- *Pinus palustris* - *Pinus elliottii* var. *elliottii* / *Styrax americanus* / *Sporobolus floridanus* Woodland (CEGL004497, G1)
- *Pinus palustris* - *Pinus serotina* / *Ilex glabra* - *Lyonia lucida* - (*Serenoa repens*) Woodland (CEGL004791, G3G4)
- *Pinus palustris* / *Serenoa repens* - *Vaccinium myrsinites* / *Aristida beyrichiana* - *Sporobolus curtissii* Woodland (CEGL004486, G2G3)

Alliances:

- *Pinus elliottii* - *Taxodium ascendens* Saturated Woodland Alliance (A.692)
- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* Woodland Alliance (A.520)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Atlantic Coastal Plain Peatland Pocosin and Canebrake (CES203.267)

DISTRIBUTION

Range: Southern South Carolina to northeastern Florida.

Divisions: 203:C

Nations: US

Subnations: FL, GA, SC

Map Zones: 55:C, 58:C

TNC Ecoregions: 56:C

SOURCES

References: Comer et al. 2003, Griffith et al. 2001, Griffith et al. 2002, Platt 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723066#references

Description Author: R. Evans and C. Nordman

Version: 02 Feb 2007

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN COASTAL PLAIN BLACKWATER RIVER FLOODPLAIN FOREST (CES203.493)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Blackwater]

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9340

CONCEPT

Summary: This system occurs along certain river and stream drainages of the southern Coastal Plain of Florida, Alabama, Mississippi, and southwestern Georgia that are characterized by dark waters high in particulate and dissolved organic materials, and that generally lack floodplain development. In most cases these are streams that have their headwaters in sandy portions of the Outer Coastal Plain. Consequently, they carry little mineral sediment or suspended clay particles and are not turbid except after the heaviest rain events. The water is classically dark in color due to concentrations of tannins, particulates, and other materials derived from drainage through swamps or marshes (FNAI 1990). In comparison with spring-fed rivers and brownwater rivers of the region, this system tends to be much more acidic in nature and generally lacks extensive and continuous floodplain and levees; steep banks alternating with floodplain swamps are more characteristic (FNAI 1990). This system includes mixed rivers, with a mixture of blackwater and spring-fed tributaries such as the Suwannee River. Canopy species typical of this system are obligate to facultative wetland species such as *Taxodium distichum* (bald-cypress), *Nyssa aquatica* (water tupelo), and *Chamaecyparis thyoides* (Atlantic white-cedar).

Classification Comments: A new ecological system is needed for Florida spring-fed streams/rivers, such as the Wakulla River, Ichetucknee River, etc.

Related Concepts:

- Bottomland Forest (FNAI 1990) Intersecting
- Floodplain Forest (FNAI 1990) Intersecting
- Floodplain Swamp (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- *Chamaecyparis thyoides* / *Magnolia virginiana* - *Cliftonia monophylla* / *Orontium aquaticum* - *Sphagnum* spp. Forest (CEGL007151, G2G3)
- *Nyssa aquatica* - *Fraxinus pennsylvanica* - *Taxodium distichum* / *Sabal minor* Forest (CEGL008463, GNR)
- *Nyssa aquatica* - *Nyssa biflora* Forest (CEGL007429, G4G5)
- *Nyssa aquatica* Forest (CEGL002419, G4G5)
- *Nyssa biflora* - *Acer rubrum* var. *rubrum* / *Lyonia lucida* Forest (CEGL007864, G3G4)
- *Nyssa ogeche* - (*Nyssa biflora*, *Taxodium ascendens*) Forest (CEGL007392, G4)
- *Nyssa ogeche* - *Magnolia virginiana* / *Crinum americanum* Forest (CEGL004704, G3?)
- *Pinus elliotii* - *Quercus nigra* - *Chamaecyparis thyoides* / *Cyrilla racemiflora* - *Vaccinium* spp. Forest (CEGL008556, G2)
- *Pinus elliotii* var. *elliottii* / *Cliftonia monophylla* - *Cyrilla racemiflora* Woodland (CEGL003638, G2G3Q)
- *Planera aquatica* Forest (CEGL007394, G4?)
- *Quercus laurifolia* / *Carpinus caroliniana* / *Justicia ovata* Forest (CEGL007348, G4?)
- *Taxodium distichum* - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Forest (CEGL007422, G4?)
- *Taxodium distichum* - *Nyssa aquatica* / *Fraxinus caroliniana* Forest (CEGL007431, G5?)
- *Taxodium distichum* - *Nyssa biflora* / *Sabal palmetto* / *Tillandsia (bartramii, usneoides)* Forest (CEGL003850, G3G4)
- *Taxodium distichum* - *Nyssa ogeche* Forest (CEGL003841, G3G4)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)

Alliances:

- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Magnolia virginiana* - *Nyssa (biflora, ogeche)* Seasonally Flooded Forest Alliance (A.377)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Nyssa aquatica* - (*Taxodium distichum*) Semipermanently Flooded Forest Alliance (A.345)
- *Pinus elliotii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus taeda* - *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.437)
- *Planera aquatica* Seasonally Flooded Forest Alliance (A.326)
- *Quercus (phellos, laurifolia)* Seasonally Flooded Forest Alliance (A.327)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)

DISTRIBUTION

Range: This system is found in the East Gulf Coastal Plain of Alabama, Mississippi, southwestern Georgia, Florida, and adjacent portions of central Florida.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, MS

Map Zones: 46:C, 55:C, 56:C

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Comer et al. 2003, FNAI 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723093#references

Description Author: R. Evans and A. Schotz

Version: 06 Feb 2003

Concept Author: R. Evans and A. Schotz

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN COASTAL PLAIN HYDRIC HAMMOCK (CES203.501)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Seepage-Fed Sloping

National Mapping Codes: ESLF 9192

CONCEPT

Summary: This system occupies flat lowlands along the southern and outermost portions of the Coastal Plain of the southeastern United States, usually over limestone substrates. Vegetation is characterized by mixed hardwood species (FNAI 1997), often with hydric oak species common (A. Johnson pers. comm.). In Florida examples of this system are often found adjacent to the floodplain of spring-fed rivers with relatively constant flows. In some areas, such as the Big Bend region, they occupy large areas of broad, shallow, mucky or seepy wetlands but generally do not receive overbank flooding (A. Johnson pers. comm.). In Alabama, this system is apparently confined to floodplains of the Mobile-Tensaw (A. Schotz pers. comm.), where examples are topographically higher than the surrounding floodplains.

Classification Comments: The original name of this system was too geographically restrictive and was broadened to Southern Coastal Plain to better reflect the range of this system. Confirmed in South Atlantic Coastal Plain portion of Florida by Ann Johnson (pers. comm.).

Similar Ecological Systems:

- Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)
- Southern Coastal Plain Spring-run Stream Aquatic Vegetation (CES203.275)

Related Concepts:

- Hydric Hammock (FNAI 1990) Broader

DESCRIPTION

Environment: Examples of this system are associated with limestone-rich sites. Soils may range from sand to clay to organic (FNAI 1990).

MEMBERSHIP

Associations:

- *Chamaecyparis thyoides* - *Sabal palmetto* Forest (CEGL008598, G2)
- *Sabal palmetto* - *Quercus laurifolia* - *Quercus virginiana* - *Magnolia virginiana* - *Ulmus americana* Forest (CEGL004674, G2G3)
- *Sabal palmetto* - *Quercus virginiana* Saturated Forest (CEGL007040, G3?)
- *Sabal palmetto* / *Ilex cassine* - *Morella cerifera* Saturated Woodland (CEGL003527, G3?)

Alliances:

- *Chamaecyparis thyoides* Saturated Forest Alliance (A.196)
- *Sabal palmetto* - *Quercus laurifolia* - *Quercus virginiana* - *Magnolia virginiana* - *Ulmus americana* Saturated Forest Alliance (A.380)
- *Sabal palmetto* - *Quercus virginiana* Saturated Forest Alliance (A.61)
- *Sabal palmetto* Saturated Woodland Alliance (A.488)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central Florida Pine Flatwoods (CES203.382)
- Southern Coastal Plain Nonriverine Basin Swamp (CES203.384)

DISTRIBUTION

Range: As currently documented this system occurs in Florida, Georgia and rarely in southern Alabama.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, MS?

Map Zones: 55:C, 56:C, 99:C

TNC Ecoregions: 53:C, 55:C, 56:C

SOURCES

References: Comer et al. 2003, FNAI 1990, FNAI 1997, Schotz pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723087#references

Description Author: R. Evans, mod. C.W. Nordman

Version: 08 Jun 2006
Concept Author: R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

SOUTHERN COASTAL PLAIN NONRIVERINE BASIN SWAMP (CES203.384)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Herbaceous; Depressional

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]; Organic Peat (>40 cm)

National Mapping Codes: ESLF 9323

CONCEPT

Summary: This system occupies large, seasonally inundated basins with peaty substrates in the southern and outermost portions of the Coastal Plain of the southeastern United States. These basins are nonriverine and do not receive overbank flooding. The southern range of this system extends into central Florida especially along the Atlantic Coast in Volusia and Brevard counties (A. Johnson pers. comm.). Examples are generally forested; the vegetation is characterized by *Taxodium distichum*, *Nyssa biflora*, evergreen "bay" shrubs and/or mixed hardwoods. Emergent *Pinus elliotii* may also be present. Some characteristic shrubs include *Cliftonia monophylla*, *Cyrilla racemiflora*, *Lyonia lucida*, and *Smilax laurifolia*.

Classification Comments: Manifestations of this in the Atlantic and Gulf coastal plains are not differentiated at this time. There may be some minor floristic differences, particularly between the northernmost and southernmost examples, but these are not thought to warrant any subdivision of the type. Examples of this system differ from Southern Coastal Plain Hydric Hammock (CES203.501) by the absence of oaks (especially swamp laurel oak and live oak) and other less flood-tolerant species such as sweetgum (A. Johnson pers. comm.). In addition, this type is found in basins with peaty substrates as opposed to limestone-influenced substrates.

Similar Ecological Systems:

- Central Atlantic Coastal Plain Nonriverine Swamp and Wet Hardwood Forest (CES203.304)
- Northern Atlantic Coastal Plain Basin Swamp and Wet Hardwood Forest (CES203.520)--has a similar name but only comes south to Virginia.
- Southern Atlantic White-cedar Peatland Forest [Provisional] (CES203.068)
- Southern Coastal Plain Hydric Hammock (CES203.501)

Related Concepts:

- Basin Swamp (FNAI 1990) Equivalent

DESCRIPTION

Environment: This system occupies large, seasonally inundated basins with peaty substrates. These basins are nonriverine and do not receive overbank flooding.

Vegetation: Examples are generally forested; the vegetation is characterized by *Taxodium distichum*, *Nyssa biflora*, evergreen "bay" shrubs, and/or mixed hardwoods (FNAI 1997). Emergent *Pinus elliotii* may also be present. Some characteristic shrubs include *Cliftonia monophylla*, *Cyrilla racemiflora*, *Lyonia lucida*, and *Smilax laurifolia*. Some examples (e.g., Okefenokee Swamp) have extensive open herbaceous areas dominated by various combinations of *Panicum hemitomon*, *Sagittaria* spp., *Dulichium arundinaceum*, *Sarracenia* spp., *Carex glaucescens*, *Carex striata*, *Orontium aquaticum*, *Woodwardia virginica*, *Eriophorum virginicum*, *Eriocaulon compressum*, and *Peltandra virginica*. In addition, other floating and emergent aquatic plants are present including *Nuphar lutea* ssp. *orbiculata*, *Nymphaea odorata* ssp. *odorata*, *Nymphoides aquatica*, *Habenaria repens*, and *Utricularia* spp. (Wharton 1978). These herbaceous zones are called "prairies" or "sphagnum bogs" depending on their composition.

MEMBERSHIP

Associations:

- *Cliftonia monophylla* / *Lyonia lucida* - *Smilax laurifolia* Forest (CEGL007042, G4)
- *Nuphar lutea* ssp. *orbiculata* Herbaceous Vegetation (CEGL004327, G3)
- *Nymphoides aquatica* Herbaceous Vegetation (CEGL004621, GNR)
- *Nyssa biflora* - *Magnolia virginiana* - (*Pinus elliotii* var. *elliotii*) / *Morella* (*carolinensis*, *inodora*) Forest (CEGL007156, G4?)
- *Nyssa biflora* / *Ilex myrtifolia* / *Carex glaucescens* - *Eriocaulon compressum* Forest (CEGL004720, G2G3)
- *Panicum hemitomon* - *Pontederia cordata* Herbaceous Vegetation (CEGL004461, G3G4)
- *Pinus serotina* - *Pinus elliotii* var. *elliotii* / *Cliftonia monophylla* - *Cyrilla racemiflora* Woodland (CEGL003674, G3?Q)
- *Pinus serotina* / *Lyonia lucida* - *Ilex glabra* - (*Cyrilla racemiflora*) Shrubland (CEGL003846, G3)
- *Taxodium distichum* - *Nyssa biflora* - *Acer rubrum* - *Magnolia virginiana* Saturated Forest (CEGL003804, G2G3)

Alliances:

- *Cliftonia monophylla* Saturated Forest Alliance (A.58)
- *Lyonia lucida* - *Ilex glabra* Saturated Wooded Shrubland Alliance (A.805)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Nymphoides aquatica* Permanently Flooded Herbaceous Alliance (A.1751)

- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Pinus serotina* Saturated Woodland Alliance (A.581)
- *Taxodium distichum* - *Nyssa biflora* - (*Nyssa aquatica*) Saturated Forest Alliance (A.355)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Southern Coastal Plain Hydric Hammock (CES203.501)

Adjacent Ecological System Comments: Southern Coastal Plain Hydric Hammock (CES203.501) may occur upslope.

DISTRIBUTION

Range: This system is found in the southern portions of the Atlantic and East Gulf coastal plains, extending down the Florida peninsula.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA?, MS, SC

Map Zones: 55:C, 56:C, 58:C, 99:C

TNC Ecoregions: 53:C, 55:C, 56:C, 57:C

SOURCES

References: Comer et al. 2003, FNAI 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723132#references

Description Author: R. Evans, mod. M. Pyne

Version: 02 Oct 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1460 SOUTHERN COASTAL PLAIN NONRIVERINE CYPRESS DOME (CES203.251)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Depressional; Needle-Leaved Tree

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2460; ESLF 9129; ESP 1460

CONCEPT

Summary: This system consists of small forested wetlands, typically dominated by *Taxodium ascendens*, with a characteristic and unique dome-shaped appearance in which trees in the center are higher than those around the sides (Monk and Brown 1965). Examples are known from the Southern Coastal Plain (Omernik Ecoregion 75 and adjacent 65) (EPA 2004) of Florida and Georgia, extending into Alabama, Mississippi and Louisiana. Examples occupy poorly drained depressions which are most often embedded in a matrix of pine flatwoods. The oldest and largest individual trees typically occupy the center of these domed wetlands, with smaller and younger individuals around the margins. Pools of stagnant, highly acidic water may stand in the center of these depressions ranging from 1-4 feet in depth, but becoming increasingly shallow along the margins. These sites are underlain by an impervious clay pan which impedes drainage and traps precipitation. Some examples may have thick (50-100 cm) organic layers. In addition to *Taxodium ascendens*, other woody species may include *Nyssa biflora*, *Hypericum chapmanii*, *Hypericum myrtifolium*, *Ilex myrtifolia*, *Leucothoe racemosa*, *Morella cerifera*, *Cephalanthus occidentalis*, *Liquidambar styraciflua*, *Clethra alnifolia*, *Lyonia lucida*, and *Styrax americanus*.

Classification Comments: The original range of this system was thought to include only the East Gulf Coastal Plain (TNC Ecoregion 53) and was named accordingly. Examples were later confirmed in central Florida (TNC Ecoregion 55) and the South Atlantic Coastal Plain portion of Florida (A. Johnson pers. comm.) (TNC Ecoregion 56), whereupon the name was broadened to Southern Coastal Plain Nonriverine Cypress Dome. Cypress "stringers" are included here as well; these are more-or-less linear features that are parts of disconnected drainageways that arise in a pine flatwoods landscape (e.g., CEGLO07419). The vegetation of the "stringers" is somewhat analogous to that of the edges of the true "dome swamps."

Related Concepts:

- Dome Swamp (FNAI 1990) Undetermined

DESCRIPTION

Environment: This system occurs in areas of low relief, occupying poorly drained to permanently wet depressions in uplands such as pine flatwoods. Pools of stagnant, highly acidic water may stand in the center of these depressions ranging from 1-4 feet in depth, but becoming increasingly shallow along the margins (Monk and Brown 1965). Some examples may have thick (50-100 cm) organic layers (Drew et al. 1998).

Vegetation: According to Drew et al. (1998), dominant plant taxa include *Taxodium ascendens*, *Nyssa biflora*, *Cephalanthus occidentalis*, *Liquidambar styraciflua*, *Clethra alnifolia*, *Lyonia lucida*, and *Styrax americanus*. A few less typical upland depression ponds in Florida dominated by *Nyssa sylvatica* are also accommodated in this system for now (A. Johnson pers. comm.). Other species found in this system can include *Nyssa ursina*, *Hypericum chapmanii*, *Hypericum myrtifolium*, *Ilex myrtifolia*, *Leucothoe racemosa*, *Morella cerifera*, *Lobelia floridana*, *Polygala cymosa*, *Carex striata*, and *Carex turgescens*.

MEMBERSHIP

Associations:

- *Hypericum chapmanii* - *Ilex myrtifolia* - (*Nyssa ursina*) Shrubland (CEGL003867, G1)
- *Taxodium ascendens* / (*Nyssa biflora*) / *Leucothoe racemosa* - *Lyonia lucida* - *Morella cerifera* Depression Forest (CEGL007420, G3)
- *Taxodium ascendens* / *Ilex myrtifolia* / *Carex (striata, turgescens)* Stringer Forest (CEGL007419, G3?Q)
- *Taxodium ascendens* / *Ilex myrtifolia* / *Hypericum myrtifolium* / *Lobelia floridana* - *Polygala cymosa* Woodland (CEGL004959, G3)
- *Taxodium ascendens* / *Ilex myrtifolia* Depression Forest (CEGL007418, G3?)

Alliances:

- *Hypericum (chapmanii, fasciculatum)* Seasonally Flooded Shrubland Alliance (A.844)
- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)
- *Taxodium ascendens* Seasonally Flooded Woodland Alliance (A.651)

DISTRIBUTION

Range: This system is found primarily in Florida and adjacent areas of Georgia, extending into Alabama, Mississippi and Louisiana.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS

Map Zones: 55:C, 56:C, 99:C

TNC Ecoregions: 53:C, 55:C, 56:C

SOURCES

References: Comer et al. 2003, Drew et al. 1998, EPA 2004, Johnson pers. comm., Monk and Brown 1965

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723234#references

Description Author: R. Evans, mod. M. Pyne

Version: 11 Dec 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1461 SOUTHERN COASTAL PLAIN SEEPAGE SWAMP AND BAYGALL (CES203.505)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); East Gulf Coastal Plain; Seepage-Fed Sloping; Broad-Leaved Evergreen Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy

National Mapping Codes: EVT 2461; ESLF 9130; ESP 1461

CONCEPT

Summary: This wetland system consists of forested wetlands in acidic, seepage-influenced habitats of the East Gulf Coastal Plain, extending into central Florida. These are mostly evergreen forests generally found at the base of slopes or other habitats where seepage flow is concentrated. Resulting moisture conditions are saturated or even inundated. The vegetation is characterized by *Magnolia virginiana* and *Nyssa biflora*. Examples occur in the outer portions of the Coastal Plain within the range of *Persea palustris*, and where *Magnolia virginiana* is an important or even dominant species. To the north this system grades into East Gulf Coastal Plain Northern Seepage Swamp (CES203.554), where evergreen species are largely replaced by deciduous species in the canopy. Due to excessive wetness, these habitats are normally protected from fire except those which occur during extreme droughty periods. These environments are prone to long-duration standing water, and tend to occur on highly acidic, nutrient-poor soils.

Classification Comments: Some authors have treated *Persea palustris* (of wetlands) and *Persea borbonia* (of uplands) as one taxon under a broadly conceived *Persea borbonia*. We recognize the two distinct taxa, following Godfrey (1988), Kartesz (1999) and Weakley (2005).

Similar Ecological Systems:

- East Gulf Coastal Plain Northern Seepage Swamp (CES203.554)

Related Concepts:

- Baygall (FNAI 1990) Undetermined
- Bayhead Swamp (Smith 1996a) Intersecting

DESCRIPTION

Environment: These wetlands may occur in poorly developed upland drainages, narrow ravine bottoms, bases of steepheads, and small headwaters stream bottoms. In most cases, these wetlands are embedded in uplands with deep sandy soils. When this system is associated with streams, they tend to be low gradient, with narrow, often braided channels and diffuse drainage patterns.

Vegetation: The vegetation is characterized by *Magnolia virginiana* and *Nyssa biflora*. Examples occur in the outer portions of the Coastal Plain within the range of *Persea palustris*, and where *Magnolia virginiana* is an important or even dominant species.

Dominant trees in some stands may include *Quercus laurifolia*, *Liquidambar styraciflua*, and *Liriodendron tulipifera*. In addition, some stands may be dominated by *Cyrilla racemiflora* and/or *Cliftonia monophylla*. Other shrubs include *Ilex coriacea*, *Leucothoe axillaris*, *Lyonia lucida*, *Morella caroliniensis*, *Morella inodora*, and *Viburnum nudum* var. *nudum*. Herbs include *Carex atlantica* ssp. *capillacea*, *Carex glaucescens*, *Carex lonchocarpa*, *Chasmanthium ornithorhynchum*, *Polygala cymosa*, *Solidago patula* var. *strictula*, and *Sphagnum* spp.

Dynamics: Due to excessive wetness, these habitats are normally protected from fire except those which occur during extreme droughty periods. These environments are prone to long-duration standing water and tend to occur on highly acidic, nutrient-poor soils.

MEMBERSHIP

Associations:

- *Cyrilla racemiflora* - *Cliftonia monophylla* Shrubland (CEGL003847, G4)
- *Gordonia lasianthus* - *Magnolia virginiana* - *Persea palustris* / *Sphagnum* spp. Forest (CEGL007044, G4)
- *Liquidambar styraciflua* - *Quercus laurifolia* / *Magnolia virginiana* / *Carex lonchocarpa* Forest (CEGL004631, G3G4)
- *Liriodendron tulipifera* - *Nyssa biflora* - *Magnolia virginiana* / *Toxicodendron vernix* - *Morella caroliniensis* / *Osmunda regalis* Forest (CEGL004772, G3G4)
- *Magnolia virginiana* - *Nyssa biflora* - *Magnolia grandiflora* / *Ilex coriacea* - *Viburnum nudum* var. *nudum* / *Solidago patula* var. *strictula* Forest (CEGL007473, G2G3)
- *Magnolia virginiana* - *Nyssa biflora* / *Carpinus caroliniana* / *Thelypteris noveboracensis* - *Athyrium filix-femina* Forest (CEGL004722, G3G4)
- *Magnolia virginiana* - *Persea palustris* / *Lyonia lucida* Forest (CEGL007049, G3?)
- *Magnolia virginiana* / *Illicium floridanum* Forest (CEGL007047, G2)
- *Nyssa biflora* - (*Acer rubrum*) / *Ilex opaca* / *Leucothoe axillaris* / *Carex atlantica* ssp. *capillacea* Forest (CEGL004427, G2G3)
- *Nyssa biflora* - *Acer rubrum* var. *trilobum* - *Liriodendron tulipifera* / *Ilex coriacea* - *Lyonia lucida* Forest (CEGL004645, G3)
- *Nyssa biflora* - *Magnolia virginiana* - (*Pinus elliotii* var. *elliotii*) / *Morella (caroliniensis, inodora)* Forest (CEGL007156, G4?)
- *Pinus elliotii* var. *elliotii* - *Magnolia virginiana* - *Taxodium ascendens* - *Nyssa biflora* / *Polygala cymosa* - *Carex glaucescens*

Forest (CEGL007556, G2G3)

- *Pinus serotina* - *Pinus elliotii* var. *elliotii* / *Cliftonia monophylla* - *Cyrilla racemiflora* Woodland (CEGL003674, G3?Q)
- *Quercus laurifolia* - *Magnolia virginiana* - *Nyssa biflora* / *Chasmanthium ornithorhynchum* Forest (CEGL007472, G2?)
- *Quercus laurifolia* - *Nyssa biflora* East Gulf Coastal Plain Saturated Forest [Provisional] (CEGL004754, GNR)

Alliances:

- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Liquidambar styraciflua* Saturated Forest Alliance (A.350)
- *Magnolia virginiana* - *Nyssa biflora* - (*Quercus laurifolia*) Saturated Forest Alliance (A.378)
- *Magnolia virginiana* - *Persea palustris* Saturated Forest Alliance (A.60)
- *Nyssa biflora* - *Acer rubrum* - (*Liriodendron tulipifera*) Saturated Forest Alliance (A.351)
- *Pinus serotina* Saturated Woodland Alliance (A.581)
- *Quercus laurifolia* - *Nyssa biflora* Saturated Forest Alliance (A.352)

DISTRIBUTION

Range: This system occurs in the East Gulf Coastal Plain, extending into central Florida and southwestern Georgia, and includes the southern parts of Alabama and Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS

Map Zones: 55:C, 56:C, 99:C

TNC Ecoregions: 43:C, 53:C, 55:C

SOURCES

References: Comer et al. 2003, Godfrey 1988, Kartesz 1999, Weakley 2005

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723083#references

Description Author: R. Evans and M. Pyne

Version: 11 Dec 2006

Concept Author: R. Evans and M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN PIEDMONT LARGE FLOODPLAIN FOREST (CES202.324)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9324

CONCEPT

Summary: This system consists of vegetated communities along Piedmont rivers, south of the James River in Virginia, where flooding and flood-related environmental factors affect vegetational composition and dynamics. Well-developed examples of this system occur in the Triassic basins. The vegetation includes both non-forested bar and scour communities and the more extensive forested floodplain communities. Forests are generally differentiated by depositional landforms such as levees, sloughs, ridges, terraces, and abandoned channel segments. The system is affected by flooding through wetness, scouring, deposition of material, and input of nutrients.

Classification Comments: This system is distinguished from Southern Piedmont Small Floodplain and Riparian Forest (CES202.323) by having well-developed fluvial landforms which differentiate vegetation. The smaller rivers are less differentiated both because the fluvial landforms are smaller and because the flooding regime is more variable. This system is distinguished from upland systems by the significant presence of plants indicative of alluvial or bottomland settings. This suite of species is absent or occurs incidentally in upland sites.

Piedmont floodplain systems are generally quite distinct from those of the Coastal Plain, with more limited development of floodplains and depositional features, because of the steeper river gradients and harder rocks. The near absence of *Taxodium distichum*, *Nyssa* spp., and other species largely confined to the Coastal Plain corresponds well to the geologic boundary in most places. The floodplains on Triassic sediments have some similarity to those in the Coastal Plain because of their more extensive floodplain development. The break with South-Central Interior Large Floodplain (CES202.705) is less sharp. The presence of Appalachian mesophytic species is often the best indicator.

Distinctive subgroups within this system, which could potentially be the basis for further subdivision, include the Triassic Basin floodplains and the distinction between forests and non-forested communities. The non-forested communities, maintained by periodic severe disturbance, have very different dynamics as well as vegetation structure, but are always associated with the forests and share the flooding regime. Triassic Basin floodplains have large floodplains with small streams. They likely have differences in flooding regime, including longer duration of flooding. Swamp forests, where periods of standing water are an important environmental influence, occupy larger portions of Triassic Basin floodplains than of other floodplains.

Similar Ecological Systems:

- South-Central Interior Large Floodplain (CES202.705)
- Southern Piedmont Mesic Forest (CES202.342)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

DESCRIPTION

Environment: Occurs near rivers, on floodplains and terraces affected by river flooding and on emergent bars and banks within channels. The site usually includes distinct depositional landforms, including levees, sloughs, ridges, terraces, and abandoned channel segments. The substrate is primarily alluvium. Soils are usually sandy to loamy, but include local clayey and gravelly areas. Soils are generally fertile, among the most nutrient-rich in the Piedmont region. Emergent and vegetated bars of gravel to cobbles are included here as well, as are scoured bedrock areas. Floods are generally of short duration, and wetness is a major influence only within channels and where water is ponded in local depressions. The geologic substrate may be of any kind. A special case is the soft Triassic sedimentary rocks of the Piedmont, where even small streams develop large floodplains with well-developed fluvial landforms and therefore fall into this category.

Vegetation: Most of the extent of the system is forest vegetation. The forest canopy is usually dominated by a mix of characteristic alluvial and bottomland species such as *Platanus occidentalis*, *Betula nigra*, *Acer negundo*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Quercus michauxii*, and *Quercus pagoda*. Some more widespread species such as *Liriodendron tulipifera* and *Acer rubrum* are also abundant. Mesophytic species such as *Fagus grandifolia* are a component on the driest areas. Successional areas are often dominated by *Pinus taeda*, *Pinus virginiana*, *Liquidambar styraciflua*, or *Liriodendron tulipifera*. Lower strata in the forests are similarly dominated by bottomland species, but may contain more mesophytic species. *Lindera benzoin*, *Xanthorhiza simplicissima*, *Elymus hystrix*, *Elymus canadensis*, *Chasmanthium latifolium*, and *Boehmeria cylindrica* are among the characteristic species. Non-forested vegetation is generally limited to small patches or bands along the channel, and is quite variable in structure and composition. Partly submerged bars may be dominated by *Justicia americana*. Frequently reworked gravel bars may be dominated by young *Salix nigra*, *Platanus occidentalis*, or *Betula nigra*, or they may have sparse vegetation of a wide variety of annual and perennial herbs of weedy habits. The few extensive bedrock-scour areas in gorges have distinctive vegetation dominated by perennial

herbs rooted in pockets and crevices.

Dynamics: The distinctive dynamics of river flooding are presumably the primary reason for the distinctive vegetation of this system, though not all of the factors are well known. The large rivers have the largest watersheds in the region, but the gradients of most of these rivers limit floods to fairly short duration. Flooding is most common in the winter, but may occur in other seasons. The sorting of plant communities by depositional landforms of different height suggest that wetness or depth of flood waters may be of significance, though it has much less influence than in the Coastal Plain. Flood waters have significant energy, and scouring and reworking of sediment are an important factor in bar and bank communities. However, in the forested floodplains, flood disturbances that kill established woody plants are rare, and canopy population dynamics are dominated by wind throw. In addition to disturbance, floods bring nutrient input, deposit sediment, and disperse plant seeds.

Wind disturbance is at least as important in this system as other Piedmont forests, perhaps more important than in uplands because of frequently wet soils, less dense soils, and more shallow-rooted trees. Fire does not appear to be a dominant factor, and most floodplain vegetation is not very flammable. However, historical references to canebrakes dominated by *Arundinaria gigantea* suggest that fire may have once been more possible and more important in at least some portions.

These systems are commonly subject to a variety of indirect modern human influences beyond those that affect most forests. A large fraction of the large Piedmont rivers have been dammed, and power generation and regulation of water flow create unnatural flood regimes. Extensive erosion of uplands, caused by poor agricultural practices dating back to colonial times, transported large amounts of sediment into floodplains. As in uplands, large floodplains often have substantial areas in cultivation. River bottoms were the focus of agriculture among Native Americans, so some of these systems have a long history of human clearing. A number of exotic plant species have invaded floodplains, more than in any other Piedmont system.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Acer barbatum* / *Asimina triloba* / *Toxicodendron radicans* / *Carex blanda* Forest (CEGL007321, G3?)
- *Liriodendron tulipifera* / *Asimina triloba* / *Arundinaria gigantea* ssp. *gigantea* Forest (CEGL004419, G3G5)
- *Quercus pagoda* - *Quercus phellos* - *Quercus lyrata* - *Quercus michauxii* / *Chasmanthium latifolium* Forest (CEGL007356, G2?)
- *Quercus shumardii* - *Quercus michauxii* - *Quercus nigra* / *Acer barbatum* - *Tilia americana* var. *heterophylla* Forest (CEGL008487, G3)

Alliances:

- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Quercus* (*michauxii*, *pagoda*, *shumardii*) - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)

SPATIAL CHARACTERISTICS

Spatial Summary: Naturally a large patch system, occurring in narrow to broad linear patches along rivers. Widespread heavy human alteration has left mostly small patch remnants, with only a few large patches.

Size: Examples probably originally extended for miles along rivers, forming patches of hundreds to thousands of acres. Intense modern human alteration has made this a rare system, with examples now mostly limited to small patches. Some examples of hundreds to over 1000 acres remain.

Adjacent Ecological Systems:

- Piedmont Seepage Wetland (CES202.298)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Mesic Forest (CES202.342)

Adjacent Ecological System Comments: Always associated with a riverine aquatic system. Usually bordered by Southern Piedmont Mesic Forest (CES202.342). Some adjacent uplands may have drier systems, and locally may have rock outcrop systems.

DISTRIBUTION

Range: This system is widespread in the Piedmont, from Alabama to southern Virginia. The northern boundary in Virginia is not well determined.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 59:C, 61:C

TNC Ecoregions: 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723177#references

Description Author: M. Schafale and R. Evans

Version: 12 Dec 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN PIEDMONT SMALL FLOODPLAIN AND RIPARIAN FOREST (CES202.323)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

National Mapping Codes: ESLF 9312

CONCEPT

Summary: This system consists of vegetated communities along streams and small rivers in the Piedmont of the southeastern United States where flooding and flood-related environmental factors affect vegetational composition and dynamics. The vegetation includes both non-forested bar and scour communities and the more extensive forested floodplain communities. The forests of these smaller floodplains and bottomlands are not differentiated by depositional landforms such as levees, sloughs, ridges, terraces, and abandoned channel segments, because these features are small and flooding regimes are variable. The system is affected by flooding through wetness, scouring, deposition of material, and input of nutrients.

Classification Comments: This system is distinguished from Southern Piedmont Large Floodplain Forest (CES202.324) by lacking well-developed fluvial landforms which differentiate vegetation. The smaller rivers are less differentiated both because the fluvial landforms are smaller and because the flooding regime is more variable. The large floodplains created by small streams in Triassic sediments are included with Southern Piedmont Large Floodplain Forest (CES202.324). Both of the Piedmont floodplain systems are distinguished from upland systems by the significant presence of plants indicative of alluvial or bottomland settings. This suite of species is absent or occurs on incidentally in upland sites.

Piedmont floodplain systems are generally quite distinct from those of the Coastal Plain, with more limited development of floodplains and depositional features, because of the steeper river gradients and harder rocks. The near absence of *Taxodium distichum*, *Nyssa* spp., and other species largely confined to the Coastal Plain corresponds well to the geologic boundary in most places. The break with South-Central Interior Large Floodplain (CES202.705) is less sharp. The presence of Appalachian mesophytic species is often the best indicator. The floodplains of the westernmost Piedmont generally belong to South-Central Interior Large Floodplain (CES202.705).

Similar Ecological Systems:

- Piedmont Seepage Wetland (CES202.298)
- South-Central Interior Large Floodplain (CES202.705)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Mesic Forest (CES202.342)

DESCRIPTION

Environment: Occurs near streams and small rivers, on floodplains and terraces affected by river flooding and on emergent bars and banks within channels. Depositional landforms, including levees, sloughs, ridges, terraces, and abandoned channel segments may be present, but are smaller than the scale of the communities of the floodplain. The substrate is primarily alluvium. Soils are usually sandy to loamy, but include local clayey and gravelly areas. Soils are generally fertile, among the most nutrient-rich in the Piedmont region. Alluvial soils may be as important a factor as ongoing flooding in differentiating these systems from adjacent uplands. Emergent and vegetated bars of gravel to cobbles occur occasionally but are generally not extensive or as distinctive as they are on larger rivers. Floods are generally of short duration, and wetness is a major influence only within channels and where water is ponded in local depressions. The geologic substrate may be of any kind, but areas on Triassic sediments tend to have large floodplain systems even on fairly small streams.

Vegetation: Almost all of the extent of the system is naturally forested. The forest canopy is usually a mix of mesophytic and widespread species such as *Liriodendron tulipifera*, *Liquidambar styraciflua*, and *Acer rubrum*, along with characteristic alluvial and bottomland species such as *Platanus occidentalis*, *Betula nigra*, *Acer negundo*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Quercus michauxii*, and *Quercus pagoda*. *Fagus grandifolia* may be present in drier portions, mixed with the other species. Successional areas are often strongly dominated by *Pinus taeda*, *Pinus virginiana*, *Liquidambar styraciflua*, or *Liriodendron tulipifera*. Lower strata in the forests may be either primarily of mesophytic species shared with moist uplands systems, or a mix of mesophytic and bottomland species. Non-forested vegetation is generally limited to very small patches or bands along the channel, and seldom forms distinct communities.

Dynamics: The distinctive dynamics of stream flooding are presumably the primary reason for the distinctive vegetation of this system, though not all of the factors are well known. Small rivers and streams, with small watersheds, have more variable flooding regimes than larger rivers. Floods tend to be of short duration and unpredictably variable as to season and depth. Flood waters may have significant energy in higher gradient systems, but scouring and reworking of sediment rarely affect more than small patches. They are important in maintaining the small non-forested patches. In the forested floodplains, flood disturbances that kill established woody plants are rare, and canopy population dynamics are dominated by wind throw. In addition to disturbance, floods bring nutrient

input, deposit sediment, and disperse plant seeds.

Wind disturbance is at least as important in this system as other Piedmont forests, perhaps more important than in uplands because of frequently wet soils, less dense soils, and more shallow-rooted trees. Fire does not appear to be a dominant factor, and most floodplain vegetation is not very flammable. However, historical references to canebrakes dominated by *Arundinaria gigantea* suggest that fire may have once been more possible and more important in at least some portions.

These systems are less commonly subject than large rivers to alteration of flood regimes by upstream impoundments, but alterations in their watersheds may alter flood intensity and duration. Extensive erosion of uplands, caused by poor agricultural practices dating back to colonial times, transported large amounts of sediment into floodplains. A number of exotic plant species have invaded floodplains, more than in any other Piedmont system.

MEMBERSHIP

Associations:

- *Fagus grandifolia* - *Quercus alba* / *Kalmia latifolia* - *Rhododendron canescens* - *Symplocos tinctoria* Forest (CEGL008551, G3?)
- *Fagus grandifolia* - *Quercus* spp. / *Kalmia latifolia* - *Hamamelis virginiana* / *Galax urceolata* Forest (CEGL004549, G2G4Q)
- *Hymenocallis coronaria* - *Justicia americana* Herbaceous Vegetation (CEGL004285, G1)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*) Temporarily Flooded Forest (CEGL007330, GNA)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Lindera benzoin* / *Arisaema triphyllum* Forest (CEGL004418, G4)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Onoclea sensibilis* Forest (CEGL007329, G4)
- *Pinus taeda* - *Liriodendron tulipifera* / *Lindera benzoin* / *Carex crinita* Forest (CEGL007546, GNA)
- *Platanus occidentalis* - *Celtis laevigata* - *Fraxinus pennsylvanica* / *Lindera benzoin* - *Ilex decidua* / *Carex retroflexa* Forest (CEGL007730, G4?)
- *Podostemum ceratophyllum* Herbaceous Vegetation (CEGL004331, G3G5)
- *Quercus shumardii* - *Quercus michauxii* - *Quercus nigra* / *Acer barbatum* - *Tilia americana* var. *heterophylla* Forest (CEGL008487, G3)
- *Ruppia maritima* Carolinian Zone Herbaceous Vegetation (CEGL004335, G4G5)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Salix nigra* Temporarily Flooded Shrubland (CEGL003901, G4?)
- *Schizachyrium scoparium* - *Solidago plumosa* Herbaceous Vegetation (CEGL004459, G1)

Alliances:

- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Pinus taeda* - *Liriodendron tulipifera* Temporarily Flooded Forest Alliance (A.434)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Podostemum ceratophyllum* Permanently Flooded Herbaceous Alliance (A.1752)
- *Quercus* (*michauxii*, *pagoda*, *shumardii*) - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Salix nigra* Temporarily Flooded Shrubland Alliance (A.948)
- *Schizachyrium scoparium* Temporarily Flooded Herbaceous Alliance (A.1346)

SPATIAL CHARACTERISTICS

Spatial Summary: Naturally a small- to medium-patch or narrow linear system, following streams.

Size: Examples probably originally extended for miles in branching networks of smaller stream systems, and might extend for miles along the larger streams. Patches might be hundreds and potentially even thousands of contiguous acres, but most intact remnants are 100 acres or less.

Adjacent Ecological Systems:

- Piedmont Seepage Wetland (CES202.298)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Mesic Forest (CES202.342)

Adjacent Ecological System Comments: Always associated with an intermittent stream, perennial stream, or small river aquatic system. Usually bordered by Southern Piedmont Mesic Forest (CES202.342). Some adjacent uplands may have drier systems, and locally may have rock outcrop systems.

DISTRIBUTION

Range: This system is widespread in the Piedmont, from Alabama to southern Virginia. The northern boundary in Virginia is roughly the watershed of the James River.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 59:C, 61:C

TNC Ecoregions: 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723178#references

Description Author: M. Schafale and R. Evans

Version: 12 Dec 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHWEST FLORIDA PERCHED BARRIERS TIDAL SWAMP AND LAGOON (CES203.540)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Tidal / Estuarine [Haline]

National Mapping Codes: ESLF 9347

CONCEPT

Summary: This system includes tidal wetlands along the western coast of Florida from approximately Tampa Bay south to Charlotte Harbor. In this region, instead of the tidal marshes found to the north, these are mangrove forests with canopies up to 10 m tall (Montague and Wiegert 1990). Odum and McIvor (1990) show a diagram displaying the community zonation present in this system at Tampa Bay. A narrow high marsh zone of *Batis* and *Juncus* grades into low swamps with *Laguncularia racemosa*, *Avicennia germinans*, and *Rhizophora mangle*. Interpretation of the vegetation is difficult due to extensive human alteration. For example, Lewis et al. (1979) estimated that 44% loss of intertidal vegetation in the Tampa Bay region had taken place.

Classification Comments: The use of the term "perched" in the name refers to the elevated nature of the barrier islands, which are built on remnant limestone reefs.

MEMBERSHIP

Associations:

- *Avicennia germinans* / *Spartina alterniflora* Shrubland (CEGL003801, G2?)
- *Conocarpus erectus* - (*Laguncularia racemosa*) / *Batis maritima* - *Borrchia frutescens* / *Sesuvium portulacastrum* - *Suaeda linearis* Shrubland (CEGL003806, G2?)

Alliances:

- *Avicennia germinans* Tidal Shrubland Alliance (A.733)
- *Conocarpus erectus* Saturated Shrubland Alliance (A.732)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 55:C

SOURCES

References: Comer et al. 2003, Lewis et al. 1979, Montague and Wiegert 1990, Odum and McIvor 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723062#references

Description Author: R. Evans

Version: 06 Feb 2003

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1506 WEST GULF COASTAL PLAIN NONRIVERINE WET HARDWOOD FLATWOODS (CES203.548)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Woody Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); West Gulf Coastal Plain; Hardpan; Depressional; Silt Soil Texture

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Tree-dominated

National Mapping Codes: EVT 2506; ESLF 9350; ESP 1506

CONCEPT

Summary: This system represents predominantly wet hardwood flatwoods of the West Gulf Coastal Plain of southern Arkansas, eastern Texas, and western Louisiana. Examples may be somewhat more common in the inland portions of the region but are also found in the Outer Coastal Plain as well. These areas are usually found on nonriverine, Pleistocene high terraces (EPA 35c). Soils are fine-textured, and hardpans may be present in the subsurface. The limited permeability of these soils contributes to perched water tables during fairly substantial portions of the year (when precipitation is greatest and evapotranspiration is lowest). Saturation occurs not from overbank flooding but typically whenever precipitation events occur. The local landscape is often a complex of ridges and swales, usually occurring in close proximity. There is vegetation variability related to soil texture and moisture and disturbance history. Most examples support hardwood forests or swamps, which are often heavily oak-dominated. Important species are tolerant of inundation. They include *Quercus michauxii*, *Quercus phellos*, *Quercus laurifolia*, and *Liquidambar styraciflua*, with sparse coverage of wetland herbs such as *Carex glaucescens*. Some swales support unusual pockets of *Fraxinus caroliniana* and *Crataegus* spp. Some examples can contain *Pinus taeda*.

Classification Comments: This system may grade upslope into West Gulf Coastal Plain Pine-Hardwood Flatwoods (CES203.278) and West Gulf Coastal Plain Flatwoods Pond (CES203.547).

Similar Ecological Systems:

- Lower Mississippi River Flatwoods (CES203.193)
- West Gulf Coastal Plain Flatwoods Pond (CES203.547)
- West Gulf Coastal Plain Pine-Hardwood Flatwoods (CES203.278)

Related Concepts:

- Flatland Hardwood Forest (Marks and Harcombe 1981) Undetermined

DESCRIPTION

Environment: This system is found on the wettest inclusions of Pleistocene terraces in the West Gulf Coastal Plain of southern Arkansas, eastern Texas, and western Louisiana.

Vegetation: Stands are typically dominated by hardwoods, including *Quercus michauxii*. Important species are tolerant of inundation. They include *Quercus michauxii*, *Quercus phellos*, *Quercus laurifolia*, and *Liquidambar styraciflua*, with sparse coverage of wetland herbs such as *Carex glaucescens*. Some swales support unusual pockets of *Fraxinus caroliniana* and *Crataegus* spp. Some examples can contain *Pinus taeda*.

Dynamics: The predominant ecological processes affecting this system are related to soil texture and moisture and disturbance history. These are wetlands that hold standing water for variable periods during the year after rainfall events. The wettest examples were likely not affected to a large degree by fires; however, they are often embedded in pyrogenic landscapes which did burn frequently (R. Evans pers. obs., T. Foti pers. comm.). The difference in the dynamics between this system and the "non-wet" (dry-mesic, xero-hydric) flatwoods of the region (CES203.278) is their different structure: the wetter type occurs as a closed forest, the dry/mesic one as a more open forest or woodland (with an open canopy, a full herbaceous expression, and few shrubs). The fire regime is different as well: the xero-hydric type is short-interval, low-intensity, low-severity versus medium- to long-interval, low-intensity, high-severity for the wet one (D. Zollner pers. comm. 2006).

MEMBERSHIP

Associations:

- (*Quercus laurifolia*) / *Crataegus opaca* - *Crataegus viridis* Forest (CEGL007386, G1)
- *Fraxinus caroliniana* Seasonally Flooded Forest (CEGL004753, G2G3)
- *Nyssa biflora* - *Quercus laurifolia* / *Sphagnum* spp. Depression Forest (CEGL007390, G3?)
- *Quercus laurifolia* - *Liquidambar styraciflua* - *Nyssa biflora* - *Acer rubrum* / *Sabal minor* Forest (CEGL007804, G3?)
- *Quercus laurifolia* - *Quercus phellos* - *Quercus nigra* / *Viburnum dentatum* - (*Sebastiania fruticosa*) / *Carex glaucescens* Upper West Gulf Flatwoods Forest (CEGL007961, G2G3)
- *Quercus lyrata* - *Quercus phellos* - *Ulmus americana* / *Rhynchospora* spp. Forest (CEGL007549, G2G3)
- *Quercus phellos* - *Quercus similis* / *Crataegus marshallii* - *Crataegus spathulata* / *Chasmanthium laxum* Forest (CEGL007363, G3?)
- *Quercus phellos* / *Chasmanthium laxum* - *Carex (flaccosperma, intumescens)* - *Hymenocallis lirisme* Flatwoods Forest

(CEGL007371, G3G4)

- *Quercus phellos* / *Chasmanthium laxum* Forest (CEGL008576, G3?)
- *Taxodium distichum* - *Nyssa biflora* - *Magnolia virginiana* - *Acer rubrum* Forest (CEGL007902, G2?)

Alliances:

- *Crataegus (aestivalis, opaca, rufula)* Seasonally Flooded Forest Alliance (A.320)
- *Fraxinus caroliniana* Seasonally Flooded Forest Alliance (A.344)
- *Nyssa (aquatica, biflora, ogeche)* Floodplain Seasonally Flooded Forest Alliance (A.323)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)

DISTRIBUTION

Range: This system is found in the West Gulf Coastal Plain, Upper West Gulf Coastal Plain, and Mississippi River Alluvial Plain (P. Faulkner pers. comm.).

Divisions: 203:C

Nations: US

Subnations: AR, LA, TX

Map Zones: 36:?, 37:C, 44:C, 45:C, 98:P

TNC Ecoregions: 31:?, 40:C, 41:C, 42:C

SOURCES

References: Comer et al. 2003, Foti pers. comm., Marks and Harcombe 1981, R. Evans pers. comm., Zollner pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723054#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

HERBACEOUS WETLAND

ATLANTIC COASTAL PLAIN EMBAYED REGION SEAGRASS BED (CES203.243)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9295

CONCEPT

Summary: This system of seagrass beds occurs primarily in the embayed regions of North Carolina and southeastern Virginia. The vast series of barriers provides ample area for colonization of hydromorphic herbaceous vegetation in protected sounds and lagoons which are subject to wind tides only. Local habitats range from small guts, shallow tributary creeks, and large marsh pools along freshwater and oligohaline sections of tidal rivers to shallow estuarine bays, tidal creeks, and salt marsh pools. This system lies outside the climatic range for most tropical species, especially *Thalassia testudinum* and *Cymodocea filiformis*. These species are largely replaced by *Zostera marina*. This region is the northern terminus for *Halodule beaudettei*, and most typical beds of the region can be characterized as *Zostera - Halodule* (Thayer et al. 1984).

Classification Comments: Northern Atlantic Coastal Plain Seagrass Bed (CES203.246) is a related system with a range to the north of this type that is generally characterized as *Zostera - Ruppia* (Thayer et al. 1984).

Similar Ecological Systems:

- Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
- Northern Atlantic Coastal Plain Seagrass Bed (CES203.246)

DESCRIPTION

Environment: Water salinity ranges from oligohaline at the mouths of tidal rivers to brackish waters.

Vegetation: According to Fleming et al. (2001), *Ceratophyllum demersum* is the most important and abundant species found along the freshwater margins of this system, where associates include *Utricularia* spp., *Elodea nuttallii*, *Spirodela polyrrhiza*, and *Wolffiella gladiata*. Shallow waters may support sparse to dense surface cover of *Nymphaea odorata* or, rarely, *Nelumbo lutea*. More saline areas support *Ruppia maritima*, *Zostera marina*, *Zannichellia palustris*, and *Stuckenia pectinata*. Aquatic algae are frequent to abundant associates. In portions of the area where *Zostera* and *Halodule* co-occur, each attains maximum biomass at different times of the year (Thayer et al. 1984).

Dynamics: The dynamics of tidal, aquatic communities dominated by vascular plants are complex and poorly understood. The distribution and abundance of vascular plants in these habitats are probably controlled by responses to water chemistry, water clarity and light penetration, the impact of currents and boat wakes, and herbivory by aquatic animals (Fleming et al. 2001).

MEMBERSHIP

Associations:

- *Halodule beaudettei* Herbaceous Vegetation (CEGL004318, G4?)
- *Ruppia maritima* Carolinian Zone Herbaceous Vegetation (CEGL004335, G4G5)
- *Zostera marina* Herbaceous Vegetation (CEGL004336, G4G5)

Alliances:

- *Halodule beaudettei* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Zostera marina* Permanently Flooded - Tidal Herbaceous Alliance (A.1766)

DISTRIBUTION

Range: This system is found in the embayed regions of North Carolina and southeastern Virginia southward to Cape Fear. South of Cape Fear seagrasses are largely absent until the St. Johns region of Florida (Kenworthy pers. comm.).

Divisions: 203:C

Nations: US

Subnations: NC, VA

Map Zones: 58:C, 60:C

TNC Ecoregions: 57:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2001, Thayer et al. 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723242#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN EMBAYED REGION TIDAL FRESHWATER MARSH (CES203.259)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Freshwater]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9276

CONCEPT

Summary: Embayed region tidal freshwater marshes are characterized by fresh to oligohaline waters which are driven by irregular wind tides, with minimal lunar tidal influence. They are the predominant marsh system in the drowned creeks and inland estuary shores of the embayed region of northeastern North Carolina and adjacent Virginia. This system typically occurs as complexes of several associations dominated by large graminoids such as *Spartina patens*, *Cladium mariscus ssp. jamaicense*, *Schoenoplectus pungens*, *Typha angustifolia*, *Typha latifolia*, and *Juncus roemerianus*, sometimes with species-rich associations of shorter graminoids, forbs, and floating or submerged aquatics. While some association dominants are tolerant of brackish water, they are associated with plants restricted to oligohaline or freshwater. Irregular flooding and fire are both important forces in this system, and rising sea level is a particularly important driver of long-term trends.

Classification Comments: The distinction between this system and other tidal freshwater marsh systems is based on the distinctive dynamics of the irregular wind tidal flooding.

DESCRIPTION

Environment: The embayed region of the Mid-Atlantic Coastal Plain stretches along northeastern North Carolina and adjacent areas of Virginia. Estuaries in drowned river valleys are unusually extensive here. The barrier islands along the coast are unusually continuous and the ocean's tidal range modest. This produces estuaries where irregular wind tides are the dominant hydrological process. The water is oligohaline to fresh over most of the tidal areas, with brackish water near the coast and saltwater only on or near the barrier island inlets. Rainfall may be an important influence in marsh interiors for significant periods of time between high wind tides. Soils appear to be essentially always saturated, with shallow flooding for periods of several days at all times of year. Due to limited sediment transport, marsh soils are primarily organic. Marshes occur in small to large patches or bands along the drowned creeks and rivers. Most give way to tidal swamps inland and upstream, but some occur on islands. Those near the transition to brackish water may grade to wind tide-influenced brackish marshes downstream.

Vegetation: This system consists largely of wetland vegetation dominated by large graminoid herbs that are tolerant of constant saturation but intolerant of too much salt. *Spartina patens*, *Cladium mariscus ssp. jamaicense*, *Schoenoplectus pungens*, *Typha angustifolia*, and *Typha latifolia* dominate large areas. *Juncus roemerianus* is sometimes a dominant, especially in areas that have become fresh in the last 100 years as a result of coastal inlet changes. All of these dominants are accompanied by at least a few other plants intolerant of saltwater. Vegetation dominated by smaller graminoids, wetland forbs, submerged or floating aquatics, shrubs, or open stands of trees may also be present. Individual marshes usually are mosaics or zoned complexes of patches of the component associations.

Dynamics: Hydrology is the most important driving process, with the constant saturation determining the potential vegetation, and the variable flooding and variations in salinity in the fresh to brackish range a primary disturbance. Rising sea level is an important driver of longer term vegetation trends, including expansion into adjacent swamp areas. Fire is also an important natural process in all but the smallest and most isolated patches. Frost (pers. comm.) estimates that many marshes burned as often as every three years in presettlement times and were an important source of ignition for adjacent communities. Marshes that have not burned recently have lower species richness, are more strongly dominated by the large graminoids, and are believed to be poorer habitat for waterfowl. Marshes often show evidence of transition to or from treed communities, in the form of young invading trees and shrubs or standing dead older trees. Lack of fire appears to be allowing sufficient tree invasion to eventually produce a swamp forest in some upstream examples, but the trend in most places is toward development of marshes in former swamp areas.

MEMBERSHIP

Associations:

- *Cladium mariscus ssp. jamaicense* Tidal Herbaceous Vegetation (CEGL004178, G4?)
- *Eleocharis fallax* - *Eleocharis rostellata* - *Schoenoplectus americanus* - *Sagittaria lancifolia* Herbaceous Vegetation (CEGL004628, G1G2)
- *Eriocaulon parkeri* - *Polygonum punctatum* Herbaceous Vegetation (CEGL006352, G2)
- *Halodule beaudettei* Herbaceous Vegetation (CEGL004318, G4?)
- *Isoetes riparia* Tidal Herbaceous Vegetation (CEGL006058, GNR)
- *Juncus roemerianus* - *Pontederia cordata* Herbaceous Vegetation (CEGL004660, G2G3)
- *Morella cerifera* - *Rosa palustris* / *Thelypteris palustris* var. *pubescens* Shrubland (CEGL004656, G2G3)
- *Nuphar lutea ssp. advena* Tidal Herbaceous Vegetation (CEGL004472, G4G5)

- *Phragmites australis* Tidal Herbaceous Vegetation (CEGL004187, GNA)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Vegetation (CEGL004473, G2G4)
- *Schoenoplectus pungens* - (*Osmunda regalis* var. *spectabilis*) Herbaceous Vegetation (CEGL004189, G2G3)
- *Spartina alterniflora* - *Lilaeopsis chinensis* Herbaceous Vegetation (CEGL004193, G3G4)
- *Spartina cynosuroides* - *Panicum virgatum* - *Phyla lanceolata* Herbaceous Vegetation (CEGL007741, G2G3)
- *Spartina cynosuroides* Herbaceous Vegetation (CEGL004195, G4)
- *Typha angustifolia* - *Hibiscus moscheutos* Herbaceous Vegetation (CEGL004201, G4G5)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)
- *Zizania aquatica* Tidal Herbaceous Vegetation (CEGL004202, G4?)
- *Zizaniopsis miliacea* Tidal Herbaceous Vegetation (CEGL004705, G3G5)

Alliances:

- *Cladium mariscus* ssp. *jamaicense* Tidal Temperate Herbaceous Alliance (A.1473)
- *Eleocharis fallax* - *Eleocharis rostellata* Tidal Herbaceous Alliance (A.1474)
- *Eriocaulon parkeri* Tidal Herbaceous Alliance (A.1701)
- *Halodule beaudettei* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Isoetes riparia* Tidal Herbaceous Alliance (A.1879)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Morella cerifera* - *Rosa palustris* Tidal Shrubland Alliance (A.806)
- *Nuphar lutea* Tidal Herbaceous Alliance (A.1708)
- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Alliance (A.1710)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina cynosuroides* Tidal Herbaceous Alliance (A.1480)
- *Typha* (*angustifolia*, *domingensis*) Tidal Herbaceous Alliance (A.1472)
- *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Zizania aquatica* Tidal Herbaceous Alliance (A.1484)
- *Zizaniopsis miliacea* Tidal Herbaceous Alliance (A.1485)

SPATIAL CHARACTERISTICS

Size: Patches range from a few square meters to 1000-2000 acres.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
- Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240)

Adjacent Ecological System Comments: Generally grades to Southern Atlantic Coastal Plain Tidal Wooded Swamp (CES203.240) inland and upstream. May grade to Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260) downstream or seaward. Occasionally borders uplands or other wetlands.

DISTRIBUTION

Range: This system is restricted to the embayed region of North Carolina and Virginia, with the best development along the North Carolina-Virginia border. The transition to areas with more lunar tidal influence is fairly gradual to the south over a space of 50 miles.

Divisions: 203:C

Nations: US

Subnations: NC, VA

Map Zones: 58:C, 60:C

TNC Ecoregions: 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723227#references

Description Author: R. Evans, M. Schafale, G. Fleming

Version: 23 Sep 2002

Concept Author: R. Evans, M. Schafale, G. Fleming

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN EMBAYED REGION TIDAL SALT AND BRACKISH MARSH (CES203.260)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Haline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9261

CONCEPT

Summary: This system encompasses the brackish to salt intertidal marshes of the embayed region of southeastern Virginia and adjacent North Carolina. It is distinguished by the extensive brackish water and wind tidal flooding characteristic of that region. Low diversity, often monospecific, marshes are found on intertidal flats generally cut off from direct oceanic influence by a series of protective barrier islands. Embedded within the matrix of marshes are smaller hypersaline areas or salt pannes.

Classification Comments: This system is distinguished from the salt marsh systems to the north and south because of the characteristic hydrology of the embayed region and its implications to ecosystem dynamics. However, the species-poor vegetation is not notably different. There is some question whether the few salt marshes on near inlets on the barrier islands in this region should be considered part of this system. They have regular lunar tidal flooding and full strength saltwater, both not characteristic of most of the region. However, lunar tidal flooding is muted compared to other regions. Submerged aquatic vegetation (*Ruppia*, etc.) is covered under the Atlantic Coastal Plain Embayed Region Seagrass Bed (CES203.243).

Similar Ecological Systems:

- Atlantic Coastal Plain Embayed Region Seagrass Bed (CES203.243)
- Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)

DESCRIPTION

Environment: Occurs on intertidal flats that are tidally flooded with salt to brackish water in the Embayed Region of the Mid-Atlantic Coastal Plain in North Carolina and Virginia. The embayed region is characterized by very extensive sounds cut off from the ocean by long barrier islands with few tidal inlets. A low tidal range in the ocean in this region limits tidal exchange at the inlets. Saltwater is present only in limited areas near the inlets. Brackish water prevails in most of the southern part of the region and some of the seaward side of the northern part of the region, grading to oligohaline and freshwater inland and northward, as well as upstream in tidal creeks. Lunar tidal fluctuation is negligible in most of the embayed region, and the irregular flooding of wind tides dominates. Soils are generally organic, but mineral soils are present in the more regularly flooded areas.

Vegetation: Vegetation is primarily herbaceous marsh, most of it dominated by *Juncus roemerianus*. Areas near tidal inlets have salt marsh dominated by *Spartina alterniflora*. The marshes are low in species richness and are strongly dominated by a single species. Also part of the system are more limited communities such as hypersaline flats dominated by *Distichlis spicata* and *Sarcocornia*, salt-tolerant shrublands, and a few hammocks that occur on small elevated areas closely associated with the marshes.

Dynamics: Tidal flooding is the ecological factor that distinguishes this system from others. Because tides are irregular and shifts not as frequent or as strong as in lunar tide-dominated areas, sediment transport and probably productivity are lower in the marshes. Storms may drive increased amounts of salt into the sounds, stressing or killing plants in the brackish marshes. For marshes on the back of barrier islands, overwash in storms may deposit sand in the marsh. Marshes usually recover from this, but if sufficient sand is deposited, a different system may develop on the site. Fire is a natural force in the larger and less isolated patches of marsh, removing dead material, stimulating growth, and increasing species richness slightly but not altering overall composition. Rising sea level will affect this system strongly, drowning some marsh areas, promoting shoreline erosion, and causing salt or brackish marshes to spread into freshwater marsh areas.

MEMBERSHIP

Associations:

- *Baccharis halimifolia* - *Iva frutescens* / *Panicum virgatum* Shrubland (CEGL003921, G5)
- *Borrichia frutescens* / (*Spartina patens*, *Juncus roemerianus*) Shrubland (CEGL003924, G4)
- *Eriocaulon parkeri* - *Polygonum punctatum* Herbaceous Vegetation (CEGL006352, G2)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Juniperus virginiana* var. *silicicola* - (*Quercus virginiana*, *Sabal palmetto*) Forest (CEGL007813, G3?)
- *Phragmites australis* Temperate Upland Herbaceous Vegetation (CEGL004019, GNA)
- *Phragmites australis* Tidal Herbaceous Vegetation (CEGL004187, GNA)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Vegetation (CEGL004473, G2G4)
- *Salicornia* (*virginica*, *bigelovii*, *maritima*) - *Spartina alterniflora* Herbaceous Vegetation (CEGL004308, G5)
- *Schoenoplectus pungens* Tidal Herbaceous Vegetation (CEGL004188, GNR)
- *Spartina alterniflora* / (*Ascophyllum nodosum*) Acadian/Virginian Zone Herbaceous Vegetation (CEGL004192, G5)
- *Spartina alterniflora* Carolinian Zone Herbaceous Vegetation (CEGL004191, G5)

- *Spartina patens* - *Distichlis spicata* - (*Juncus roemerianus*) Herbaceous Vegetation (CEGL004197, G4G5)

Alliances:

- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Borrchia frutescens* Tidal Shrubland Alliance (A.1026)
- *Eriocaulon parkeri* Tidal Herbaceous Alliance (A.1701)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Phragmites australis* Herbaceous Alliance (A.1196)
- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Alliance (A.1710)
- *Sarcocornia perennis* - (*Distichlis spicata*, *Salicornia* spp.) Tidal Herbaceous Alliance (A.1704)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system.

Size: Occurs in small to large patches, with a few ranging up to thousands of acres.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (CES203.259)

Adjacent Ecological System Comments: Grades to Atlantic Coastal Plain Embayed Region Tidal Freshwater Marsh (CES203.259) upstream and inland. May border various communities on the upland side.

DISTRIBUTION

Range: Endemic to southeastern Virginia and adjacent North Carolina.

Divisions: 203:C

Nations: US

Subnations: NC, VA

Map Zones: 58:C, 60:C

TNC Ecoregions: 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723226#references

Description Author: R. Evans, M. Schafale, G. Fleming

Version: 23 Sep 2002

Concept Author: R. Evans, M. Schafale, G. Fleming

Stakeholders: East, Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN INDIAN RIVER LAGOON SEAGRASS BED (CES203.256)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9254

CONCEPT

Summary: Seagrass beds comprising this ecological system are found on the Atlantic Coast of Florida from approximately the St. Johns River (near the Florida-Georgia border) south to Sebastian Inlet (approximately from 30 degrees 30 minutes N latitude to 28 degrees N latitude). This region is the northernmost range of *Thalassia testudinum* and *Cymodocea filiformis* along the Atlantic Coast (Kenworthy pers. comm.). Seagrasses in this region are found in a narrow longitudinal complex of lagoonal embayments, including Mosquito Lagoon, Indian River, and Banana River, where they occupy approximately 2% of the available bottom area (Moore 1992). All of the typical seagrass species are present, including *Cymodocea filiformis*, *Halodule beaudettei*, *Halophila engelmannii*, *Ruppia maritima*, and *Thalassia testudinum*. Little specific information is available on the extent of each type, but it is believed that several of the individual seagrass species may be found in mixed-species beds. More commonly, they are likely to exhibit the general pattern of individual species zonation typical of other systems where zones are largely related to water depth. Beds along the northern boundary of the system are somewhat less diverse than those associated with the Indian River Lagoon, due largely to the absence of *Halophila engelmannii* (which does not extend northward of the lagoon) (W. Kenworthy pers. comm.).

Similar Ecological Systems:

- East Gulf Coastal Plain Florida Big Bend Seagrass Bed (CES203.244)
- Florida Keys Seagrass Bed (CES411.285)
- Southwest Florida Seagrass Bed (CES203.274)

Related Concepts:

- Seagrass Bed (FNAI 1990) Broader

DESCRIPTION

Environment: This system is largely protected from storm surges by a nearly continuous series of protective barriers which are perched on limestone and consequently wind tides predominate. This region is connected to the Atlantic by 4 small inlets. However, since freshwater inputs are so localized and minimal, water salinity is close to sea strength.

Vegetation: All of the typical seagrass species are present, including *Cymodocea filiformis*, *Halodule beaudettei*, *Halophila engelmannii*, *Ruppia maritima*, and *Thalassia testudinum*. Little specific information is available on the extent of each type, but it is believed that several of the individual seagrass species may be found in mixed-species beds.

MEMBERSHIP

Associations:

- *Cymodocea filiformis* - (*Thalassia testudinum*) Herbaceous Vegetation (CEGL004317, G4?)
- *Halodule beaudettei* Herbaceous Vegetation (CEGL004318, G4?)
- *Halophila engelmannii* Herbaceous Vegetation (CEGL004688, G3?)
- *Ruppia maritima* Carolinian Zone Herbaceous Vegetation (CEGL004335, G4G5)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)

Alliances:

- *Cymodocea filiformis* Permanently Flooded - Tidal Herbaceous Alliance (A.1732)
- *Halodule beaudettei* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Halophila engelmannii* Permanently Flooded - Tidal Herbaceous Alliance (A.1736)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)

DISTRIBUTION

Range: This system occurs in Florida, from the St. Johns River (near the Florida-Georgia border) south to Sebastian Inlet, in a narrow longitudinal complex of lagoonal embayments along the Florida coast, including Mosquito Lagoon, Indian River, and Banana River.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

TNC Ecoregions: 55:C, 56:C

SOURCES

References: Comer et al. 2003, Kenworthy pers. comm., Moore 1992

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723230#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

ATLANTIC COASTAL PLAIN INDIAN RIVER LAGOON TIDAL MARSH (CES203.257)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
Diagnostic Classifiers: Tidal / Estuarine; Graminoid
Non-Diagnostic Classifiers: Herbaceous
National Mapping Codes: ESLF 9253

CONCEPT

Summary: This tidally influenced marsh system of the Indian River Lagoon along Florida's Atlantic Coast supports approximately 10% of the salt marshes in Florida (Montague and Wiegert 1990). The bulk of these are "high marshes" wholly above mean high water levels. They are protected from direct exposure to the Atlantic Ocean by perched barrier islands, and consequently receive natural inundation only from wind tides and seasonal sea level changes. A berm or levee generally separates these high marshes from lower fringing marshes of *Spartina alterniflora* (to the north) and *Rhizophora mangle* (to the south). Landward of this berm, salt flats or hypersaline zones often develop with *Salicornia*, *Distichlis spicata*, *Borrchia frutescens*, *Batis maritima*, and *Paspalum vaginatum*. In some areas these species occur in monospecific zones, while in others they co-occur, grading into occasional *Avicennia germinans*. These zones are followed by a typical *Juncus roemerianus* zone, and the most inland fringes may be dominated by *Spartina bakeri*. Marshes of this region have been heavily altered by mosquito control impoundments of the 1950s and 1960s.

Related Concepts:

- Tidal Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: Tidal amplitudes in this region range from 0.6-1.5 meters. Tides have a minute range in the north contributing to a very narrow intertidal zone, which is sometimes occupied by *Spartina alterniflora*. In the south where tidal range is greater, mangroves occupy the intertidal zone, replacing *Spartina*.

Vegetation: *Spartina alterniflora* zone is dominant, with lesser area of *Juncus roemerianus* and *Spartina patens*.

MEMBERSHIP

Associations:

- *Cladium mariscus* ssp. *jamaicense* Tidal Herbaceous Vegetation (CEGL004178, G4?)
- *Distichlis spicata* - (*Sporobolus virginicus*) Herbaceous Vegetation (CEGL007694, G3G5)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Sarcocornia perennis* - (*Batis maritima*, *Distichlis spicata*) Dwarf-shrubland (CEGL002278, G4)
- *Spartina alterniflora* Carolinian Zone Herbaceous Vegetation (CEGL004191, G5)
- *Spartina bakeri* - *Kosteletzkyia virginica* Herbaceous Vegetation (CEGL004194, G3?)

Alliances:

- *Cladium mariscus* ssp. *jamaicense* Tidal Temperate Herbaceous Alliance (A.1473)
- *Distichlis spicata* Tidal Herbaceous Alliance (A.1882)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Sarcocornia perennis* - (*Distichlis spicata*, *Spartina alterniflora*) Tidal Dwarf-shrubland Alliance (A.1705)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina bakeri* - (*Spartina patens*) Tidal Herbaceous Alliance (A.1479)

DISTRIBUTION

Range: This system is endemic to the Atlantic Coast of Florida where it ranges from central Volusia County, southward through Brevard, Indian River, St. Lucie, and northern Martin counties.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

TNC Ecoregions: 55:C

SOURCES

References: Comer et al. 2003, Montague and Wiegert 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723229#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1516 ATLANTIC COASTAL PLAIN SANDHILL SEEP (CES203.253)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]

National Mapping Codes: EVT 2516; ESLF 3187; ESP 1516

CONCEPT

Summary: This sandhill seep system occurs in small patches on slopes in dissected terrain, where a clay lens or other impermeable layer forces groundwater to the surface as seepage. This type occurs largely in the Fall-line Sandhills region of the Carolinas and Georgia but also rarely in other parts of the Atlantic Coastal Plain. Soils are seasonally to permanently saturated by seepage and range from sandy or clayey to mucky. Vegetation is variable and complex in composition and structure, consisting of a mixture of plants of pine savannas and streamhead pocosins, but contrasting with both in structure and proportions. The tree canopy may be open or absent, and patches of dense shrubs, dense grass, ferns, and various mixtures may be present. Fire is a crucial determinant of structure and composition; it tends to occur in a variable and patchy pattern that is driven by both the fire regime of the surrounding system and the wetness of the seep vegetation at the time.

Classification Comments: This system is distinguished from Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265) by having wetland hydrology driven by seepage rather than seasonal high water table, and by vegetational and landscape differences. Occurs rarely in southeastern Georgia in escarpment areas which have greater topography than is locally typical, and perched water tables which flow to the surface in sloping areas.

Similar Ecological Systems:

- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)
- Central Atlantic Coastal Plain Wet Longleaf Pine Savanna and Flatwoods (CES203.265)
- East Gulf Coastal Plain Interior Shrub Bog (CES203.385)
- Piedmont Seepage Wetland (CES202.298)

DESCRIPTION

Environment: This system occurs on gentle to steep slopes of dissected areas in interbedded sand and clay, largely in the Fall-line Sandhills region but rarely in other parts of the Atlantic Coastal Plain. Sites are seasonally to permanently saturated with seeping groundwater, forced to the surface by an impermeable layer such as a clay bed. Soils may be sandy, clayey, or in the wettest sites, mucky. The hydrological connection to adjacent Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254), whose well-drained sandy soils are the source of seepage water, is crucial. Fire is a crucial natural force, and is also dependent on the adjacent systems. At Fort Benning, Georgia, examples of this system occur in wet mineral soils in zones between drier, sandhills longleaf pine communities and saturated streamside forests dominated by *Nyssa biflora*.

Vegetation: Vegetation is a potentially diverse mixture of plants of wet savannas and pocosins. Vegetation structure may vary widely, with dense shrubs, dense herbs, or mixtures of shrubs and herbs, and with an open tree canopy or absent tree canopy occurring in complexes or in different patches. *Pinus palustris*, *Pinus serotina*, or several hardwood species may dominate the canopy. Characteristic Streamhead Pocosin shrubs, such as *Ilex glabra*, *Lyonia lucida*, *Clethra alnifolia*, *Toxicodendron vernix*, *Ilex coriacea*, and *Zenobia pulverulenta*, may mix with flatwoods shrubs, such as *Gaylussacia frondosa* and *Kalmia carolina*. The herbs are primarily species shared with wet savannas, such as *Aristida stricta*, *Calamovilfa brevipilis*, *Ctenium aromaticum*, *Andropogon glomeratus*, and a variety of showy forbs and insectivorous plants, but often occur in very different proportions. Large wetland ferns, such as *Osmunda cinnamomea*, *Osmunda regalis*, and *Pteridium aquilinum*, also often dominate.

Dynamics: Fire is the predominant natural dynamic force in this system and is critical in determining its structure and even its identity. Fire regime is dominated by the fire regime of the surrounding system, which naturally burned every few years, but is modified by the wetness and flammability of the seep vegetation. Some fires do not penetrate parts of the seeps, creating variable age and vegetation structure. Areas that seldom burn have dense shrubs, while areas that burn frequently are dominated by herbs. With long absence of fire, many seeps become indistinguishable from Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252). Canopy dynamics are probably driven mainly by fire, with hot fires killing the less fire-tolerant trees and creating a fine mosaic or zoned complex of older trees, younger regeneration, and treeless areas. Shrubs and herbs readily sprout after fires, but relative proportions are controlled by the frequency of fire.

MEMBERSHIP

Associations:

- (*Pinus palustris*, *Pinus serotina*) / *Ctenium aromaticum* - *Muhlenbergia expansa* - *Calamovilfa brevipilis* Woodland (CEGL003659, G2)
- *Arundinaria gigantea* ssp. *tecta* Shrubland (CEGL003843, G1)
- *Clethra alnifolia* - *Toxicodendron vernix* / *Aristida stricta* - *Osmunda cinnamomea* - *Sarracenia* spp. Shrub Herbaceous Vegetation

(CEGL004467, G2?)

- *Gaylussacia frondosa* - *Clethra alnifolia* - *Arundinaria gigantea* ssp. *tecta* / *Aristida stricta* - *Pteridium aquilinum* var. *pseudocaudatum* Herbaceous Vegetation (CEGL004468, G3?)
- *Ilex coriacea* - *Lyonia lucida* - *Smilax laurifolia* Shrubland (CEGL004666, G3G4)
- *Pinus palustris* - *Pinus serotina* / *Ilex glabra* - *Lyonia lucida* / *Ctenium aromaticum* Woodland (CEGL003860, G3)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Rhynchospora oligantha* - *Sarracenia* spp. - (*Aristida beyrichiana*, *Ctenium aromaticum*) - *Osmunda cinnamomea* / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1463)

SPATIAL CHARACTERISTICS

Spatial Summary: Small patch, with occurrences ranging from a fraction of an acre to several acres. Patches sometimes occur in complexes in close proximity, but as often are isolated. Some seeps are linear bodies stretching across slopes, some are linear running downslope, and some are small oval bodies.

Adjacent Ecological Systems:

- Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254)
- Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252)

Adjacent Ecological System Comments: Generally surrounded by Atlantic Coastal Plain Fall-line Sandhills Longleaf Pine Woodland (CES203.254). Sometimes interspersed or grading to Atlantic Coastal Plain Streamhead Seepage Swamp, Pocosin, and Baygall (CES203.252) on one side.

DISTRIBUTION

Range: This system occurs from east-central North Carolina to central Georgia, primarily in the Fall-line Sandhills region but occasionally occurring in the Outer Coastal Plain. For example, this system occurs in limited parts of southeastern Georgia associated with the topography of old escarpments. It occurs primarily in the Atlantic drainage but is rarely represented in the Gulf drainage (such as at Fort Benning, Georgia).

Divisions: 203:C

Nations: US

Subnations: GA, NC, SC

Map Zones: 55:C, 58:C

TNC Ecoregions: 53:C, 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723232#references

Description Author: M. Schafale and R. Evans

Version: 23 Sep 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CENTRAL ATLANTIC COASTAL PLAIN FRESH AND OLIGOHALINE TIDAL MARSH (CES203.376)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Freshwater]; Tidal / Estuarine [Oligohaline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9413

CONCEPT

Summary: This system represents tidally influenced fresh marsh and tidal shrublands ranging from approximately Morehead City, NC, southward to St. Johns River, FL [see Montague and Wiegert (1990)]. This system occurs where there is adequate river flow and discharge to maintain fresh to oligohaline conditions, while still within tidal range. These marshes most often occur well inside the mouths of tidal creeks and rivers. Elevation differences within the marsh correspond to the occurrence of different vegetation types.

Related Concepts:

- Tidal Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: Most of the region where this system occurs consists of marshy shores and sea islands.

MEMBERSHIP

Associations:

- *Alnus serrulata* / (*Zizania aquatica*, *Zizaniopsis miliacea*) Shrubland (CEGL004627, G3?)
- *Baccharis halimifolia* - *Iva frutescens* - *Morella cerifera* - (*Ilex vomitoria*) Shrubland (CEGL003920, G4?)
- *Borrichia frutescens* / (*Spartina patens*, *Juncus roemerianus*) Shrubland (CEGL003924, G4)
- *Schoenoplectus pungens* - (*Osmunda regalis* var. *spectabilis*) Herbaceous Vegetation (CEGL004189, G2G3)
- *Spartina cynosuroides* Herbaceous Vegetation (CEGL004195, G4)
- *Zizania aquatica* Tidal Herbaceous Vegetation (CEGL004202, G4?)
- *Zizaniopsis miliacea* Tidal Herbaceous Vegetation (CEGL004705, G3G5)

Alliances:

- *Alnus (incana, serrulata, maritima)* Tidal Shrubland Alliance (A.1024)
- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Borrichia frutescens* Tidal Shrubland Alliance (A.1026)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Spartina cynosuroides* Tidal Herbaceous Alliance (A.1480)
- *Zizania aquatica* Tidal Herbaceous Alliance (A.1484)
- *Zizaniopsis miliacea* Tidal Herbaceous Alliance (A.1485)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)

DISTRIBUTION

Range: This system ranges from approximately Morehead City, North Carolina, southward to the St. Johns River in Florida.

Divisions: 203:C

Nations: US

Subnations: FL?, GA, NC, SC

Map Zones: 55:C, 58:C

TNC Ecoregions: 56:C, 57:C

SOURCES

References: Comer et al. 2003, Montague and Wiegert 1990, Odum et al. 1984, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723140#references

Description Author: R. Evans, mod. M. Pyne

Version: 02 Feb 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CENTRAL ATLANTIC COASTAL PLAIN SALT AND BRACKISH TIDAL MARSH (CES203.270)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Haline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9236

CONCEPT

Summary: This system encompasses the brackish to salt intertidal marshes of the Atlantic Coast, ranging from south of the Embayed Region of North Carolina to northern Florida (south to the vicinity of Daytona Beach). It is dominated by medium to extensive expanses of *Spartina alterniflora*, flooded twice daily by lunar tides. *Juncus roemerianus* and other brackish marshes occur upstream in tidal creeks, and a variety of small-patch associations occur near the inland edges. Examples of this system may also support inclusions of shrublands dominated by either *Baccharis halimifolia* and/or *Borrchia frutescens*, as well as forests or woodlands with *Juniperus virginiana* var. *silicicola* in the overstory.

Classification Comments: This system is distinguished from Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260) because of the characteristic hydrology of the Embayed Region and what it implies about ecosystem dynamics. This system is dominated by salt marshes regularly flooded by lunar tides, while the Embayed Region is dominated by brackish marshes irregularly flooded by wind tides. This system is distinguished from salt marsh systems of the Gulf Coast because of the differences in tidal dynamics and energy.

The range of this system is somewhat larger than the "Embayed Region" tidal marshes (which range southward only to Cape Lookout). This is due to the fact that submerged aquatic vegetation occurs throughout the region without discernable patterns of change, whereas the tidal marshes do vary across this range.

Similar Ecological Systems:

- Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)

Related Concepts:

- Tidal Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: This system occurs on intertidal flats that are tidally flooded with salt to brackish water along the Atlantic Coast south of the Embayed Region of North Carolina, extending to northern Florida (south to the St. Johns River). Regular tidal flooding occurs over most of the system, with irregular flooding in unusually high tides occurring in the upper zones. Tidal ranges vary, but are two feet or more. The water is salty over most of the expanse of this system, grading to brackish upstream in tidal rivers and creeks. Upper zones tend to have vegetation suggestive of brackish water as well, but this is apparently the result of a combination of irregular saltwater flooding with freshwater input. Local depressions in upper zones may be hypersaline due to concentration of salt by evaporation. Flooding depth and salinity are the primary determinants of the boundary of this system and of the variation in associations within it. Soils are either sandy or clayey and often are sulfidic and high in organic matter. The input of cations in sea water prevents them from being strongly acidic, but they may rapidly become extremely acidic if drained.

Vegetation: Vegetation is primarily marsh. *Spartina alterniflora* is the predominant vegetation. *Juncus roemerianus* may dominate fairly large expanses along brackish portions of tidal creeks and rivers. Upper zones include a few herbaceous and shrubland associations with plants tolerant of occasional to frequent saltwater, and a few herbaceous to sparse vegetation associations in hypersaline depressions. All associations are low in plant species richness. Salt marsh communities are known for their high primary productivity, much of which is exported to estuarine systems with tidal flushing.

Dynamics: Tidal flooding is the ecological factor that distinguishes this system from others. Tides bring nutrients, making the regularly flooded marshes fertile. Storms may push saltwater into brackish areas and higher zones, acting as a disturbance to vegetation. In salt marshes, storms locally concentrate debris into piles or bands (wrack) that smother vegetation. For marshes on the back of barrier islands, storm overwash may deposit sand in the marsh. Marshes usually recover from this, but if sufficient sand is deposited, a different system may develop on the site. Fire may be a natural force in some patches that are connected to the mainland. Most salt marshes are probably too wet to burn. Rising sea level will affect this system strongly, drowning some marsh areas, promoting shoreline erosion, and causing salt or brackish marshes to spread inland into freshwater marsh areas.

MEMBERSHIP

Associations:

- *Baccharis halimifolia* - *Iva frutescens* / *Panicum virgatum* Shrubland (CEGL003921, G5)
- *Borrchia frutescens* / (*Spartina patens*, *Juncus roemerianus*) Shrubland (CEGL003924, G4)
- *Cladium mariscus* ssp. *jamaicense* Tidal Herbaceous Vegetation (CEGL004178, G4?)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Juniperus virginiana* var. *silicicola* - (*Quercus virginiana*, *Sabal palmetto*) Forest (CEGL007813, G3?)

- *Juniperus virginiana* var. *silicicola* / *Morella cerifera* / *Kosteletzkya virginica* - *Bacopa monnieri* Woodland (CEGL007166, G1?)
- *Phragmites australis* Temperate Upland Herbaceous Vegetation (CEGL004019, GNA)
- *Phragmites australis* Tidal Herbaceous Vegetation (CEGL004187, GNA)
- *Salicornia* (*virginica*, *bigelovii*, *maritima*) - *Spartina alterniflora* Herbaceous Vegetation (CEGL004308, G5)
- *Schoenoplectus pungens* Tidal Herbaceous Vegetation (CEGL004188, GNR)
- *Spartina alterniflora* Carolinian Zone Herbaceous Vegetation (CEGL004191, G5)
- *Spartina patens* - *Distichlis spicata* - (*Juncus roemerianus*) Herbaceous Vegetation (CEGL004197, G4G5)

Alliances:

- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Borrchia frutescens* Tidal Shrubland Alliance (A.1026)
- *Cladium mariscus* ssp. *jamaicense* Tidal Temperate Herbaceous Alliance (A.1473)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Juniperus virginiana* var. *silicicola* Tidal Woodland Alliance (A.1887)
- *Phragmites australis* Herbaceous Alliance (A.1196)
- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Quercus virginiana* - (*Sabal palmetto*) Forest Alliance (A.55)
- *Sarcocornia perennis* - (*Distichlis spicata*, *Salicornia* spp.) Tidal Herbaceous Alliance (A.1704)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system.

Size: Occurs in small to large patches, with a few ranging up to 1000 acres or more.

Adjacent Ecological Systems:

- Central Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.376)
- Central Atlantic Coastal Plain Maritime Forest (CES203.261)

Adjacent Ecological System Comments: Grades to Central Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.376) upstream on tidal rivers. Grades to a variety of systems on adjacent higher area dune and coastal grassland types, Central Atlantic Coastal Plain Maritime Forest (CES203.261), and various mainland upland systems.

DISTRIBUTION

Range: This systems ranges from central North Carolina to the St. Johns River in northern Florida. The northern boundary is roughly the eastern end of Carteret County, North Carolina.

Divisions: 203:C

Nations: US

Subnations: FL, GA, NC, SC

Map Zones: 55:C, 58:C

TNC Ecoregions: 55:C, 56:C, 57:C

SOURCES

References: Comer et al. 2003, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723216#references

Description Author: R. Evans, mod. M. Pyne

Version: 02 Feb 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1514 CENTRAL FLORIDA HERBACEOUS POND SHORE (CES203.890)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Herbaceous; Depressional; Graminoid

Non-Diagnostic Classifiers: Isolated Wetland [Partially Isolated]

National Mapping Codes: EVT 2514; ESLF 9275; ESP 1514

CONCEPT

Summary: This system includes a variety of seasonal depression ponds in central Florida, especially along the Lake Wales Ridge. Examples are rounded or irregularly shaped, shallow depressions from tens to hundreds of meters in diameter (Abrahamson et al. 1984). Extensive variation is present based on the variety of soils and resultant hydroperiods. Most examples exhibit some zonation in vegetation and nearly all are ringed by *Serenoa repens*. Characteristic or dominant species associated with the interior of the ponds include *Panicum hemitomon*, *Panicum abscissum*, *Hypericum edisonianum*, and *Andropogon brachystachyus*.

Classification Comments: Compare to East Gulf Coastal Plain Southern Depression Pondshore (CES203.504), found to the north.

Similar Ecological Systems:

- East Gulf Coastal Plain Depression Pondshore (CES203.558)

DESCRIPTION

Environment: Most examples are known from the Lake Wales Ridge area of central Florida. These are shallow depressions found on a variety of different soils with different hydroperiods (Abrahamson et al. 1984).

Vegetation: Most depression ponds accommodated in this system display distinct vegetational zonation. At least four vegetational zones can be readily distinguished (Abrahamson et al. 1984); the community types need to be further reconciled into associations.

MEMBERSHIP

Associations:

- *Amphicarpum muehlenbergianum* - (*Panicum hemitomon*) Herbaceous Vegetation (CEGL008588, G2G3)
- *Andropogon (capillipes, glaucopsis)* - *Rhynchospora fascicularis* var. *fascicularis* - *Rhexia mariana* Herbaceous Vegetation (CEGL004460, G2?)
- *Dichanthelium wrightianum* - *Dichanthelium erectifolium* Herbaceous Vegetation (CEGL004105, G2G3)
- *Hypericum brachyphyllum* Dwarf-shrubland (CEGL003955, G3?)
- *Panicum hemitomon* - *Pluchea (camphorata, rosea)* - *Ludwigia* spp. Herbaceous Vegetation (CEGL007792, G3)
- *Panicum hemitomon* - *Pontederia cordata* Herbaceous Vegetation (CEGL004461, G3G4)
- *Rhynchospora (careyana, inundata)* Seasonally Flooded Herbaceous Vegetation (CEGL004132, G3?)
- *Woodwardia virginica* / *Sphagnum cuspidatum* Herbaceous Vegetation (CEGL004475, G2?)

Alliances:

- *Aristida palustris* - *Andropogon (capillipes, glaucopsis)* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1364)
- *Dichanthelium (erectifolium, wrightianum)* - *Rhynchospora filifolia* Seasonally Flooded Herbaceous Alliance (A.1370)
- *Hypericum brachyphyllum* Seasonally Flooded Dwarf-shrubland Alliance (A.1090)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Rhynchospora (careyana, inundata)* Seasonally Flooded Herbaceous Alliance (A.1383)
- *Woodwardia virginica* Seasonally Flooded Herbaceous Alliance (A.1713)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central Florida Pine Flatwoods (CES203.382)
- Central Florida Wet Prairie and Herbaceous Seep (CES203.491)
- Florida Dry Prairie (CES203.380)

Adjacent Ecological System Comments: May grade into Central Florida Wet Prairie and Herbaceous Seep (CES203.491).

Surrounding matrix vegetation can include Central Florida Pine Flatwoods (CES203.382) and Florida Dry Prairie (CES203.380).

DISTRIBUTION

Range: Endemic to central Florida.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

TNC Ecoregions: 55:C

SOURCES

References: Abrahamson et al. 1984, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722789#references

Description Author: R. Evans

Version: 25 Mar 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CENTRAL FLORIDA WET PRAIRIE AND HERBACEOUS SEEP (CES203.491)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9279

CONCEPT

Summary: This system includes herbaceous seepage wetlands and nearly treeless plains over poorly drained soils in central Florida. Although examples of this system are similar to other wetland ecological systems, these are characterized by the presence of subtropical plant species not occurring in herbaceous-dominated wetlands farther north, especially *Panicum abscissum*. At least some examples have dense cover of grasses and low shrubs, with fairly rich species composition. Examples may be most common along the southern part of the Lake Wales Ridge area.

Classification Comments: East Gulf Coastal Plain Savanna and Wet Prairie (CES203.192) is a closely related system found farther north.

Similar Ecological Systems:

- East Gulf Coastal Plain Savanna and Wet Prairie (CES203.192)

Related Concepts:

- Wet Prairie (FNAI 1990) Intersecting

DESCRIPTION

Environment: Associated with saturated soils caused by seepage or high water tables; some examples may be saturated for 50-100 days/year. Seepage-influenced examples tend to occur in areas of greater topographic relief than wet prairies.

Vegetation: Usually dominated by *Panicum abscissum*.

Dynamics: Frequent fires were an important natural process in this system, with an estimated frequency of 1-4 years (FNAI 1990).

MEMBERSHIP

Associations:

- *Panicum abscissum* Herbaceous Vegetation (CEGL004113, G2G3)

Alliances:

- *Panicum abscissum* Saturated Herbaceous Alliance (A.1460)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central Florida Herbaceous Pondshore (CES203.890)
- Central Florida Pine Flatwoods (CES203.382)
- Florida Dry Prairie (CES203.380)
- Florida Longleaf Pine Sandhill (CES203.284)

Adjacent Ecological System Comments: May grade downslope into Central Florida Herbaceous Pondshore (CES203.890).

Surrounding matrix vegetation can include Central Florida Pine Flatwoods (CES203.382) and Florida Dry Prairie (CES203.380).

DISTRIBUTION

Range: Endemic to central Florida, mainly found in the southern Lake Wales Ridge.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:P, 56:C

TNC Ecoregions: 55:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723095#references

Description Author: R. Evans and C. Nordman

Version: 14 Dec 2004

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1493 CENTRAL INTERIOR AND APPALACHIAN HERBACEOUS WETLAND SYSTEMS (CES202.641)

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shallow (<15 cm) Water; >180-day hydroperiod; Temperate; Depressional; Broad-Leaved Shrub; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2493; ESLF 9212; ESP 1493

CONCEPT

Summary: This systems group is typically found on glacial potholes, along small streams, ponds, channels in glacial outwash and on lakeplains. These wetlands consist of deep to shallow areas of freshwater marsh dominated by emergent and submergent species that may be surrounded by a zone of wet meadow. Stands may be open ponds with floating or rooted aquatics, deep marsh with bulrush or cattails, or wet meadow. They range in size from fairly small to several acres. The hydric soils are flooded by water at depths of several centimeters to over 1 meter for most of the growing season. Emergent marsh species such as *Typha* spp. and *Schoenoplectus* spp. dominate the core of this system, with an occasional scattering of tall *Carex* spp. and forbs that can vary from dense to open cover. Wet meadows can surround the emergent marsh core along wet mineral soils or shallow peat with the water table typically just below the surface for most of the growing season. The vegetation in the wet meadow zone is dominated by sedges (*Carex* spp.) and grasses such as *Calamagrostis canadensis*. These systems also can contain a zone of wet prairie species such as *Spartina pectinata*. Shrub swamps can also be associated with the wet meadows within these systems. Typical shrub species include *Cornus* spp., *Salix* spp., and/or *Cephalanthus occidentalis*. Trees are generally absent and, if present, are scattered.

Classification Comments: This group of systems occurs only on glaciated areas of Ohio and PA (Landfire meeting 2-07).

Similar Ecological Systems:

- Laurentian-Acadian Shrub-Herbaceous Wetland Systems (CES201.642)

DESCRIPTION

Vegetation: Characteristic trees in stands of this systems group include *Acer saccharinum*, *Populus deltoides*, *Betula nigra*, *Celtis laevigata*, *Liquidambar styraciflua* (in the southern half of this group's range), willows, especially *Salix nigra* in the wettest areas, and *Platanus occidentalis*, with *Fraxinus pennsylvanica*, *Ulmus americana*, *Liriodendron tulipifera*, *Quercus michauxii*, *Quercus pagoda*, and (at least in the Midwest) *Quercus macrocarpa* in more well-drained areas. The particular mix of tree species will vary across the geographic range of this systems group, with some trees absent over parts of the range. Understory species are mixed but include shrubs, such as *Cephalanthus occidentalis*, *Cornus drummondii*, and *Asimina triloba*, sedges (*Carex* spp.) and grasses (*Elymus hystrix*, *Elymus canadensis*, *Chasmanthium latifolium*, and others) which sometimes form savanna-like vegetation. Oxbows may support herbaceous vegetation dominated by species including *Nelumbo lutea* and *Typha latifolia*. Canebrakes dominated by *Arundinaria gigantea* ssp. *gigantea* are present in some areas. Frequently reworked gravel bars may be dominated by young *Salix nigra*, *Platanus occidentalis*, or *Betula nigra*, or they may have sparse vegetation of a wide variety of annual and perennial herbs of weedy habits.

Dynamics: Fire originating in adjacent uplands, as well as hydrology, can influence the wet meadow portions of these systems. In the absence of fire, drought and/or ditching can increase the proportion of shrubs compared to the wet meadow or prairie species.

MEMBERSHIP

Standard Ecological Systems:

- North-Central Interior Freshwater Marsh (CES202.899)
- North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)

DISTRIBUTION

Range: This systems group ranges throughout the upper midwestern United States from northwestern Pennsylvania to Missouri and the Dakotas and into adjacent Canada.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: IA, IL, IN, MI, MN, MO, ND, OH, ON, PA, SD, WI

Map Zones: 39:P, 40:P, 41:C, 42:C, 43:C, 44:P, 47:C, 49:C, 50:C, 51:C, 52:C, 53:C, 62:C

USFS Ecomap Regions: 221F:CC

TNC Ecoregions: 35:C, 36:C, 45:C, 46:C, 47:C, 48:C, 49:?

SOURCES

References: Comer and Albert 1997, Midwestern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.785011#references

Description Author: S.C. Gawler

Version: 20 Jul 2007

Stakeholders: Canada, East, Midwest, Southeast

EAST GULF COASTAL PLAIN DEPRESSION POND SHORE (CES203.558)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9403

CONCEPT

Summary: This small-patch wetland system occupies upland depressions (ponds and pondshores) in the East Gulf Coastal Plain. Included here are shallow ponds of various geomorphic origin in a variety of substrates (e.g., limesinks, "Grady Ponds") which are not separately distinguished as systems. This system only includes ponds and pondshores in more-or-less isolated upland settings, not those in riparian or floodplain environments. They may serve as the origin of a stream system in a general way, releasing water gradually into the stream drainage system during periods of wet weather. These tend to occupy basins that were formed by subsidence of surface sediments caused by solution in underlying limestone or as swales in eolian sand deposits. No explicit distinction is intended for wooded versus herbaceous ponds. In some examples, a distinct zonation of vegetation is present, in others the zones are not distinct or the differing associations are present in a complex mosaic. Most seasonal depression ponds are usually composed of mosaics of several plant associations. The vegetation includes various zones which become exposed as water levels decline, as well as emergent (rising out of the water) or submergent/floating plants. Some typical associations include ones dominated by species such as *Dichanthelium wrightianum*, *Dichanthelium erectifolium*, *Eleocharis equisetoides*, *Eleocharis microcarpa*, *Juncus effusus*, *Juncus repens*, *Rhynchospora corniculata*, *Rhynchospora inundata*, *Panicum hemitomon*, *Proserpinaca* spp., *Pluchea* spp., *Ludwigia* spp., *Saccharum* spp., *Panicum verrucosum*, *Rhexia* spp., and *Sabatia angularis*. In addition, associations dominated by *Polygonum* spp., *Leersia* spp., and *Typha* spp. may be present but are not characteristic. Coastal dune lakes and related wetlands of barrier islands are covered by another system, Southeastern Coastal Plain Interdunal Wetland (CES203.258).

Classification Comments: In Mississippi, this system is apparently confined to the Pamlico Plain where it is very rare and small scale in occurrence (R. Wieland pers. comm.). It is unknown how distinct these depressions are from so-called "Grady Ponds" (e.g., Cottonmouth Savanna site). This system is closely related to Southern Atlantic Coastal Plain Depression Pondshore (CES203.262) of the Atlantic Coastal Plain. This system also has karstic origins in common with Southern Coastal Plain Sinkhole (CES203.495) but occupies comparatively much shallower depressions and lacks exposed limestone. Compare to Central Florida Herbaceous Pondshore (CES203.890) to the south.

Similar Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- Central Florida Herbaceous Pondshore (CES203.890)
- East Gulf Coastal Plain Sandhill Lakeshore Depression (CES203.292)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)
- Southern Coastal Plain Sinkhole (CES203.495)

Related Concepts:

- Depression Marsh (FNAI 1990) Broader
- Flatwoods/Prairie/Marsh Lake (FNAI 1990) Intersecting
- Limesink (in part) (Wharton 1978) Intersecting

DESCRIPTION

Environment: Examples of this system are relatively shallow depressions or basins with some surface soils present. These tend to occupy basins that were formed by subsidence of surface sediments caused by solution in underlying limestone or as swales in eolian sand deposits. However, sinkholes with steep, vertical, exposed limestone walls are accommodated by another ecological system, as are sandhill ponds that develop on extreme sandy sites in the East Gulf Coastal Plain of Florida and adjacent Alabama. Hydroperiod can vary substantially from year to year, and vegetation can similarly vary significantly in aspect and dominants. Fire is an important natural force in the outer, drier portions of many examples, and periodic fires may sweep through the interior of many examples during dry periods.

Vegetation: Most seasonal depression ponds are usually composed of mosaics of several plant associations. The vegetation includes various zones which become exposed as water levels decline. These are occupied sequentially by various graminoids and/or forbs, as well as emergent (rising out of the water) and submergent/floating plants. Some typical dominant species in component associations include *Aristida palustris*, *Dichanthelium wrightianum*, *Dichanthelium erectifolium*, *Eleocharis elongata*, *Eleocharis equisetoides*, *Eleocharis microcarpa*, *Fuirena scirpoidea*, *Juncus repens*, *Rhynchospora chapmanii*, *Rhynchospora corniculata*, *Rhynchospora harperi*, *Rhynchospora inundata*, *Rhynchospora filifolia*, *Rhynchospora tracyi*, *Proserpinaca* spp., *Juncus abortivus*, *Juncus effusus*, *Panicum hemitomon*, *Pluchea* spp., *Ludwigia* spp., *Saccharum* spp., *Panicum verrucosum*, *Rhexia* spp., and *Sabatia angularis*. In addition, associations dominated by *Polygonum* spp., *Leersia* spp., and *Typha* spp. may be present but are not characteristic. Other characteristic species include *Rhexia cubensis*, *Panicum rigidulum*, *Panicum verrucosum*, *Carex striata*, *Lachnanthes carolina*,

Bartonia verna, *Lachnocaulon minus*, and *Centella erecta*. Woody plants which may be present (particularly on margins) include *Cephalanthus occidentalis*, *Hibiscus* spp., *Hypericum chapmanii*, *Hypericum fasciculatum*, *Hypericum reductum*, *Ilex myrtifolia*, and *Nyssa ursina*. Some stands with trees contain *Fraxinus pennsylvanica*, *Populus heterophylla*, *Ulmus americana*, and *Quercus texana*. Vegetation may exhibit distinct zonation in response to variation in duration of flooding. Communities can range from floating aquatic types (in the centers of the deepest basins) to emergent herbaceous zones (in semipermanent water drawdown zones) to sparse, yet diverse, small graminoid and forb herbaceous vegetation to bald-cypress woodland edges. Some examples may have emergent trees throughout their extent.

Dynamics: The seasonal fluctuation in the water levels in these ponds controls both the overall vegetation composition as well as the composition of the zones of the vegetation, which may be quite distinct from one another. Hydroperiod can vary substantially from year to year, and vegetation can similarly vary significantly in aspect and dominants. Fire is an important natural force in the outer, drier portions of many examples, and periodic fires may sweep through the interior of many examples during dry periods.

MEMBERSHIP

Associations:

- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912, G4)
- *Alnus serrulata* Southeastern Seasonally Flooded Shrubland (CEGL008474, G4)
- *Cephalanthus occidentalis* / *Hibiscus moscheutos* ssp. *moscheutos* Depression Pond Shrubland (CEGL004742, G3?)
- *Crataegus rufula* Forest (CEGL007783, G2G3)
- *Cyrilla racemiflora* - *Lyonia lucida* Shrubland (CEGL003844, G3?)
- *Dichantherium wrightianum* - *Dichantherium erectifolium* Herbaceous Vegetation (CEGL004105, G2G3)
- *Eleocharis (elongata, equisetoides)* - *Rhynchospora tracyi* Semipermanently Flooded Herbaceous Vegetation (CEGL004960, G3?)
- *Eleocharis microcarpa* - *Juncus repens* - *Rhynchospora corniculata* - (*Mecardonia acuminata*, *Proserpinaca* spp.) Herbaceous Vegetation (CEGL004748, G2G3)
- *Fraxinus pennsylvanica* - *Populus heterophylla* - *Ulmus americana* - (*Quercus texana*) Forest (CEGL004694, G2?)
- *Fuirena scirpoidea* - *Rhynchospora tracyi* Herbaceous Vegetation (CEGL004123, G3G4)
- *Hypericum chapmanii* - *Ilex myrtifolia* - (*Nyssa ursina*) Shrubland (CEGL003867, G1)
- *Hypericum fasciculatum* / *Rhynchospora (chapmanii, harperi)* Shrubland (CEGL003869, G2G3)
- *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112, G5)
- *Nyssa biflora* / *Itea virginica* - *Cephalanthus occidentalis* Depression Forest (CEGL007434, G3G4)
- *Panicum hemitomon* - *Eleocharis equisetoides* - *Rhynchospora inundata* Herbaceous Vegetation (CEGL004127, G3)
- *Panicum hemitomon* - *Pluchea (camphorata, rosea)* - *Ludwigia* spp. Herbaceous Vegetation (CEGL007792, G3)
- *Panicum virgatum* - *Andropogon (capillipes, glaucopsis)* - *Aristida palustris* Herbaceous Vegetation (CEGL004100, G2?)
- *Polygonum (hydropiperoides, punctatum)* - *Leersia (lenticularis, virginica)* Herbaceous Vegetation (CEGL004290, G4?)
- *Polygonum amphibium* - (*Polygonum hydropiperoides*) Seasonally Flooded Herbaceous Vegetation (CEGL004699, G4G5)
- *Polygonum densiflorum* - (*Saccharum giganteum*) Herbaceous Vegetation (CEGL004966, G4G5)
- *Rhynchospora filifolia* - *Juncus abortivus* Herbaceous Vegetation (CEGL004131, G2?)
- *Saccharum* spp. - *Panicum verrucosum* - (*Rhexia* spp., *Sabatia* spp.) Herbaceous Vegetation (CEGL004752, G2G3)
- *Salix nigra* / (*Cephalanthus occidentalis*) Forest (CEGL004773, G4G5)
- *Taxodium ascendens* / *Ilex myrtifolia* Depression Forest (CEGL007418, G3?)
- *Taxodium distichum* East Gulf Coastal Plain Pondshore Woodland (CEGL004046, G3)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Alnus serrulata* Seasonally Flooded Shrubland Alliance (A.994)
- *Aristida palustris* - *Andropogon (capillipes, glaucopsis)* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1364)
- *Cephalanthus occidentalis* Seasonally Flooded Shrubland Alliance (A.988)
- *Crataegus (aestivalis, opaca, rufula)* Seasonally Flooded Forest Alliance (A.320)
- *Cyrilla racemiflora* - *Ilex coriacea* - (*Cliftonia monophylla*) Saturated Shrubland Alliance (A.802)
- *Dichantherium (erectifolium, wrightianum)* - *Rhynchospora filifolia* Seasonally Flooded Herbaceous Alliance (A.1370)
- *Eleocharis (elongata, equisetoides)* - *Rhynchospora tracyi* Semipermanently Flooded Herbaceous Alliance (A.1428)
- *Fuirena scirpoidea* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1373)
- *Hypericum (chapmanii, fasciculatum)* Seasonally Flooded Shrubland Alliance (A.844)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Juncus repens* - *Eleocharis microcarpa* Seasonally Flooded Herbaceous Alliance (A.1376)
- *Nyssa (aquatica, biflora, ogeche)* Pond Seasonally Flooded Forest Alliance (A.324)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Rhynchospora* spp. - *Panicum (rigidulum, verrucosum)* - *Rhexia virginica* Seasonally Flooded Herbaceous Alliance (A.1384)
- *Salix nigra* Seasonally Flooded Forest Alliance (A.334)
- *Taxodium ascendens* Seasonally Flooded Forest Alliance (A.336)
- *Taxodium distichum* - (*Taxodium ascendens*) Seasonally Flooded Lakeshore Woodland Alliance (A.652)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)

SPATIAL CHARACTERISTICS

Spatial Summary: Small patch

DISTRIBUTION

Range: This system is found in the East Gulf Coastal Plain, including the Gulf Coast Flatwoods (i.e., EPA Level III Ecoregion 75 (EPA 2004)), as well as more inland portions (EPA Ecoregion 65). In particular, there are clusters of large ponds in parts of EPA 65g, 65h, and 65o, these areas being more or less proximal to EPA 75. They are also found in scattered parts of the inner Coastal Plain (e.g., Tifton Uplands (65h of EPA) and the Okefenokee Plain (75e of EPA). This system also includes the "limesink" ponds of the Valdosta Limesink Region (65o in part).

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA?, MS

Map Zones: 45:C, 46:C, 55:C, 99:C

TNC Ecoregions: 42:C, 43:C, 53:C

SOURCES

References: Comer et al. 2003, EPA 2004, FNAI 1990, Peet and Allard 1993, Southeastern Ecology Working Group n.d., Wieland pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723046#references

Description Author: M. Pyne

Version: 02 Feb 2007

Concept Author: M. Pyne

Stakeholders: Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN FLORIDA BIG BEND SEAGRASS BED (CES203.244)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9412

CONCEPT

Summary: This seagrass bed system overlies the drowned karst of the Florida Big Bend region extending along the west coast from approximately St. Marks National Wildlife Refuge to Tarpon Springs, Florida (Anclote Key). This area is one of the few known places in the world with a zero energy coast line (Murali 1982). This phenomenon allows for the development of seagrass beds without protective ocean barriers. Six different species of seagrasses comprise these beds which range from near-shore shoals (exposed at low tide) to relatively deep waters as far as 112 km offshore. The deepest extent of this system is constrained, at least in part, by water clarity as seagrasses require light penetration for photosynthesis. For this reason, these beds are found in deeper waters along the southern boundary of the system, deeper waters where the water is increasingly clear due apparently to reduced input of highly organic river runoff which is concentrated in the north (Zieman and Zieman 1989). Species composition and density are variable. The densest beds are found in shallow waters well removed from river mouths. Although several of the individual seagrass species may be found in mixed species beds, there is a general pattern of species zonation evident, largely related to water depth. Periodically exposed shoals tend to support monospecific stands of *Halodule*. *Thalassia* grows only in shallower subtidal areas, and *Cymodocea* is concentrated in deeper subtidal areas. Pure stands of *Halophila* are abundant in deepest areas often removed from beds of the other species, while *Ruppia* is confined to river mouths.

Similar Ecological Systems:

- Atlantic Coastal Plain Indian River Lagoon Seagrass Bed (CES203.256)
- Florida Keys Seagrass Bed (CES411.285)
- Northern Gulf of Mexico Seagrass Bed (CES203.263)
- Southwest Florida Seagrass Bed (CES203.274)

Related Concepts:

- Seagrass Bed (FNAI 1990) Broader

DESCRIPTION

Environment: This system is found along a zero energy coast line of Florida where the average wave breaker heights are 3-4 cm or less, and there is almost no significant littoral transport of sand. Factors contributing to this phenomenon are the wide gently sloping shelf, the divergence of approaching wave trains into the large expanding coastal concavity, the location of the coast in an upwind direction, small sediment supply, and wave dampening effects of submerged beaches. These are important factors which allow the development of this system without normal ocean barriers (Murali 1982).

Vegetation: Seagrasses are monocots which carry out their entire life cycle completely submerged in the marine environment. Species composition and density are variable. The densest beds are found in shallow waters well removed from river mouths.

Although several of the individual seagrass species may be found in mixed-species beds, there is a general pattern of species zonation evident, largely related to water depth. Periodically exposed shoals tend to support monospecific stands of *Halodule*. *Thalassia* grows only in shallower subtidal areas, and *Cymodocea* is concentrated in deeper subtidal areas. Pure stands of *Halophila* are abundant in deepest areas often removed from beds of the other species, while *Ruppia* is confined to river mouths. Succession dynamics also helps determine composition. *Halodule beaudettei* (= *Halodule wrightii*) is the local pioneering species which colonizes areas from seed or vegetative reproduction. *Cymodocea* often appears next and may mix with *Halodule*. *Thalassia* occupies beds as succession advances.

Dynamics: Unlike most other seagrass systems, these beds are not protected from large storm surges. Hurricanes may cause localized disruptions and bottom scouring which may dislodge plants. The rate of recolonization depends upon the severity of the disturbance and the species involved. Colonization of seagrasses often follows a generalized successional sequence. Non-vegetated areas may first be colonized by rhizophytic macroalgae which have some sediment-binding capacity. Possibly more importantly they contribute sedimentary particles as they die and decompose (Zieman and Zieman 1989). *Halodule beaudettei* is the local pioneering species which colonizes areas from seed or vegetative reproduction. *Cymodocea* often appears next and may mix with *Halodule*. *Thalassia* occupies beds as succession advances. This pattern marks a progressive increase of biomass in the system with increased leaf areas, increased sediment-trapping capacity, and increased microbial cycling. Seagrasses in this region experience large temperature fluctuations and exhibit more cold tolerance than those in more southerly areas. Cold temperatures during the winter cause leaf die-off to within several centimeters of the sediment surface.

MEMBERSHIP

Associations:

- *Cymodocea filiformis* - (*Thalassia testudinum*) Herbaceous Vegetation (CEGL004317, G4?)

- *Halodule beaudettei* Herbaceous Vegetation (CEGL004318, G4?)
- *Halophila engelmannii* Herbaceous Vegetation (CEGL004688, G3?)
- *Ruppia maritima* Louisianian Zone Herbaceous Vegetation (CEGL004450, G4G5)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)
- *Vallisneria americana* Estuarine Bayou Herbaceous Vegetation (CEGL004634, G3G5)

Alliances:

- *Cymodocea filiformis* Permanently Flooded - Tidal Herbaceous Alliance (A.1732)
- *Halodule beaudettei* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Halophila engelmannii* Permanently Flooded - Tidal Herbaceous Alliance (A.1736)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)
- *Vallisneria americana* Permanently Flooded - Tidal Herbaceous Alliance (A.1770)

DISTRIBUTION

Range: This system is restricted to the Florida Big Bend region extending along the west coast from approximately St. Marks to Tarpon Springs.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, Murali 1982, Zieman and Zieman 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723241#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN SANDHILL LAKESHORE DEPRESSION (CES203.292)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional [Vernal Pool]; Graminoid

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9223

CONCEPT

Summary: This small-patch wetland system occupies upland depressions on deep sandy soils in the southern portions of the East Gulf Coastal Plain of Florida and Alabama. These depressions are apparently of karstic origin but exhibit no evidence of calcareous conditions or evidence of limestone. Limestone is buried 50 or more feet below the surface under coarse sandy soils that cover the margins and, in some cases, the entire surface extent of these depressions (A. Johnson pers. comm.). The resulting appearance of these pondshores is that of large, inland white sand beach (at least in dry years). In the drier margins they even support some plant species found on coastal beaches of the region, such as *Lupinus westianus*, *Hypericum reductum*, and *Chrysoma pauciflosculosa*. The aspect of the vegetation ranges from shrublands to herbaceous-dominated with local variability. Several narrowly endemic plant species may be present such as *Hypericum lissophloeus*, *Rhexia salicifolia*, and *Xyris longisepala*. Examples may be periodically flooded to depths of as much as 1.5 m deep, but they dry down regularly. Some are fairly large, steep-sided depressions with as much as a 30-m elevation change from rim (sandhill) to center, while others form much more gradual depressions. Fire may be an important natural force in some examples.

Classification Comments: This system has karstic origins in common with Southern Coastal Plain Sinkhole (CES203.495) but lacks exposed limestone and steep vertical, limestone walls. Other upland depressions of the East Gulf Coastal Plain (that may or may not have karstic origins) on less extreme sandy soils are accommodated by East Gulf Coastal Plain Southern Depression Pondshore (CES203.504).

This system was formerly covered by East Gulf Coastal Plain Southern Depression Pondshore (CES203.504), but this type was split out and recognized as distinct in February 2004.

Similar Ecological Systems:

- East Gulf Coastal Plain Depression Pondshore (CES203.558)
- Southern Coastal Plain Sinkhole (CES203.495)

Related Concepts:

- Sandhill Upland Lake (FNAI 1990) Equivalent

DESCRIPTION

Environment: Examples occur in the near-coastal flatlands (*sensu* Peet and Allard 1993) or the Gulf Coastal Plain Flatwoods region (*sensu* EPA 2004).

Vegetation: *Hypericum lissophloeus*, *Rhexia salicifolia*, and *Xyris longisepala* are some of the more unusual species associated with this system (A. Johnson pers comm.).

MEMBERSHIP

Associations:

- *Hypericum lissophloeus* Shrubland (CEGL003870, G1)
- *Hypericum reductum* / *Syngonanthus flavidulus* - *Rhexia salicifolia* - (*Xyris longisepala*) Dwarf-shrubland (CEGL004998, G1G2)

Alliances:

- *Hypericum lissophloeus* Seasonally Flooded Shrubland Alliance (A.846)
- *Hypericum reductum* Temporarily Flooded Dwarf-shrubland Alliance (A.1088)

DISTRIBUTION

Range: This system is found in the Florida panhandle and adjacent portions of Alabama (possibly confined to a single site) (A. Johnson pers. comm.).

Divisions: 203:C

Nations: US

Subnations: AL, FL

Map Zones: 55:C

TNC Ecoregions: 53:C

SOURCES

References: EPA 2004, Johnson pers. comm., Peet and Allard 1993, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.731768#references

Description Author: R.E. Evans and A. Johnson
Version: 11 Mar 2004
Concept Author: R.E. Evans and A. Johnson

Stakeholders: Southeast
ClassifResp: Southeast

1485 EAST GULF COASTAL PLAIN SAVANNA AND WET PRAIRIE (CES203.192)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Extensive Wet Flat; Very Short Disturbance Interval; Graminoid

Non-Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2485; ESLF 9206; ESP 1485

CONCEPT

Summary: This ecological system of western Florida and adjacent Alabama and Mississippi, may be considered a "lush grassland" (Kindell et al. 1997), "grass-sedge savannah" (Clewell 1981), wet prairie (FNAI 1990), or wet savanna (Collins et al. 2001). As implied by these names, this system consists of primarily herbaceous vegetation with relatively thick cover of grasses and sedge species. Examples occupy low, flat plains on poorly drained soils, often saturated for 50-100 days per year. Frequent fires, including growing-season burns, are essential for maintenance of this system. Some examples have a sparse tree component of *Pinus elliotii* or *Pinus palustris* and scattered shrubs, such as *Morella cerifera*.

Classification Comments: Related vegetation of central Florida is covered by another ecological system.

Similar Ecological Systems:

- Central Florida Wet Prairie and Herbaceous Seep (CES203.491)

Related Concepts:

- Wet Prairie (FNAI 1990) Broader

DESCRIPTION

Environment: This system occupies low, flat plains on poorly drained Ultisols. Sites are saturated for 50-100 days per year (FNAI 1990). Other soil orders may include Ultisols, Spodosols, Inceptisols, and Entisols (Collins et al. 2001); some of these soils have an argillic horizon which impedes drainage and contributes to high water tables. On Eglin Air Force Base, this system is found on the Rutledge series (Kindell et al. 1997).

Vegetation: Collins et al. (2001) documented less than 10 trees per acre (*Pinus elliotii* and *Pinus palustris*) in examples of this system on the Apalachicola National Forest. *Magnolia virginiana*, *Acer rubrum*, and *Morella cerifera* are often present in sometimes locally dense patches, especially when managed with infrequent fires (FNAI 1990, Collins et al. 2001). *Aristida beyrichiana*, *Ctenium aromaticum*, *Rhexia alifanus*, *Rhynchospora* spp., and *Eriocaulon* spp. are typical species.

MEMBERSHIP

Associations:

- *Aristida beyrichiana* - *Rhynchospora oligantha* - *Carphephorus pseudoliatris* - *Sarracenia (alata, flava, leucophylla)* Herbaceous Vegetation (CEGL004154, G2)
- *Aristida beyrichiana* - *Rhynchospora* spp. - *Pilea tenuifolia* - *Sarracenia (psittacina, flava)* Herbaceous Vegetation (CEGL004153, G2)
- *Aristida beyrichiana* - *Rhynchospora* spp. - *Verbesina chapmanii* Herbaceous Vegetation (CEGL004152, G2)
- *Hypericum fasciculatum* / *Rhynchospora (chapmanii, harperi)* Shrubland (CEGL003869, G2G3)
- *Nyssa ursina* / *Aristida beyrichiana* - *Rhynchospora (chapmanii, corniculata)* Herbaceous Vegetation (CEGL008595, G1G2)
- *Scleria baldwinii* - *Rhynchospora cephalantha* - *Polygala cymosa* - *Fuirena scirpoidea* Herbaceous Vegetation (CEGL007717, G2?)

Alliances:

- *Fuirena scirpoidea* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1373)
- *Hypericum (chapmanii, fasciculatum)* Seasonally Flooded Shrubland Alliance (A.844)
- *Rhynchospora oligantha* - *Sarracenia* spp. - (*Aristida beyrichiana*, *Ctenium aromaticum*) - *Osmunda cinnamomea* / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1463)

DISTRIBUTION

Range: Western Florida and adjacent Alabama and Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C

TNC Ecoregions: 53:C

SOURCES

References: Clewell 1981, Collins et al. 2001, Comer et al. 2003, FNAI 1990, Kindell et al. 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723248#references

Description Author: R. Evans and C. Nordman

Version: 14 Dec 2004

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

FLORIDA BIG BEND FRESH AND OLIGOHALINE TIDAL MARSH (CES203.507)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine [Freshwater]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9290

CONCEPT

Summary: This system includes tidal freshwater and oligohaline marshes of the northern Gulf of Mexico along the Florida Big Bend area (roughly from Wakulla County to the Pasco/Hernando county line on Florida's west coast). The tidal range in this region is higher than in the western Panhandle, and wave energy is low; lunar, wind and seasonal tides make flooding irregular (Montague and Wiegert 1990). In comparison to the matrix-forming salt and brackish marshes of the same region, this system is confined to small patches that are generally restricted to areas near the mouths of rivers where freshwater is abundant.

Related Concepts:

- Tidal Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: Tidal (irregular) but influenced by freshwater flows from the mouths of rivers.

Vegetation: This system is dominated by herbaceous graminoids tolerant of tidal flooding, but not tolerant of saltwater and with only a limited tolerance of true brackish conditions. It does not include the abundant salt marshes of *Spartina alterniflora* and *Juncus roemerianus* (brackish).

MEMBERSHIP

Associations:

- *Eleocharis rostellata* - *Rhynchospora colorata* - *Rhynchospora microcarpa* Herbaceous Vegetation (CEGL004951, G2?Q)
- *Sagittaria lancifolia* - *Glottidium vesicarium* - *Solidago sempervirens* - *Lythrum lineare* Herbaceous Vegetation (CEGL008447, G3G4)
- *Schoenoplectus californicus* Tidal Herbaceous Vegetation (CEGL003985, G4G5)
- *Typha domingensis* Tidal Herbaceous Vegetation (CEGL008456, GNR)
- *Zizaniopsis miliacea* Tidal Herbaceous Vegetation (CEGL004705, G3G5)

Alliances:

- *Eleocharis fallax* - *Eleocharis rostellata* Tidal Herbaceous Alliance (A.1474)
- *Sagittaria lancifolia* Tidal Herbaceous Alliance (A.1987)
- *Schoenoplectus californicus* Tidal Herbaceous Alliance (A.2004)
- *Typha (angustifolia, domingensis)* Tidal Herbaceous Alliance (A.1472)
- *Zizaniopsis miliacea* Tidal Herbaceous Alliance (A.1485)

DISTRIBUTION

Range: Endemic to Florida from Wakulla County (Apalachicola Bay) to Pasco/Hernando county line, north of Tampa Bay.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 99:C

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, Montague and Wiegert 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723081#references

Description Author: R. Evans and C. Nordman, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

FLORIDA BIG BEND SALT AND BRACKISH TIDAL MARSH (CES203.508)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9289

CONCEPT

Summary: This system represents salt and brackish marshes of the northern Gulf of Mexico along the Florida Big Bend (roughly from Wakulla County (Apalachicola Bay) to the Pasco/Hernando countyline (more or less to Tampa Bay) on Florida's west coast). The tidal range here is higher than in the western Panhandle, and wave energy is low; lunar, wind and seasonal tides make flooding irregular (Montague and Wiegert 1990). The bulk of these marshes are comprised of monospecific stands of *Juncus roemerianus* that often exhibit tall- and short-growth zones. Less common are patches of *Spartina alterniflora*, which may be confined to the edges of creeks or in other pockets of low elevation; small patches of *Distichlis spicata* may also be present near berms or levees (Montague and Wiegert 1990).

Related Concepts:

- Tidal Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: Irregularly tidal; wind, lunar, and seasonal influences are important.

Vegetation: This system consists of salt marshes characterized by *Spartina alterniflora*, *Juncus roemerianus*, and *Distichlis spicata* and brackish marshes dominated by *Juncus roemerianus*. The brackish marshes are in areas slightly higher than the salt marshes, where flooding is greater.

MEMBERSHIP

Associations:

- *Batis maritima* - *Sarcocornia perennis* Dwarf-shrubland (CEGL003956, G5)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Spartina alterniflora* - *Juncus roemerianus* - *Distichlis spicata* Louisianian Zone Salt Tidal Herbaceous Vegetation (CEGL004190, G5)

Alliances:

- *Batis maritima* Tidal Dwarf-shrubland Alliance (A.1111)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)

DISTRIBUTION

Range: This system is endemic to Florida from Wakulla County (Apalachicola Bay) to the Pasco/Hernando countyline, north of Tampa Bay. (To the west of Apalachicola Bay, where the tides are diurnal instead of semi-diurnal, Mississippi Sound Salt and Brackish Tidal Marsh (CES203.303) replaces this system.)

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 99:C

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Comer et al. 2003, Montague and Wiegert 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723080#references

Description Author: R. Evans and C. Nordman, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

FLORIDA KEYS SEAGRASS BED (CES411.285)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)
Land Cover Class: Herbaceous Wetland
Spatial Scale & Pattern: Large patch
Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland
Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb
Non-Diagnostic Classifiers: Herbaceous
National Mapping Codes: ESLF 9270

CONCEPT

Summary: This system encompasses seagrass beds of Florida Bay and the Florida Keys. *Thalassia testudinum*, *Cymodocea filiformis* (= *Syringodium filiforme*), and *Halodule beaudettei* are the primary potential species. All three species may co-occur in mixed beds, or stands may be heavily dominated by *Thalassia testudinum* only. Some stands may be further characterized by high density and abundance of calcareous green algae.

Similar Ecological Systems:

- Atlantic Coastal Plain Indian River Lagoon Seagrass Bed (CES203.256)
- East Gulf Coastal Plain Florida Big Bend Seagrass Bed (CES203.244)
- Southwest Florida Seagrass Bed (CES203.274)

Related Concepts:

- Seagrass Bed (FNAI 1990) Broader

DESCRIPTION

Environment: The Florida Bay region is characterized by a peculiar depositional environment (Tanner 1960) with low wave energy, shallow waters, and prevalence of calcareous material. The extensive seagrass beds may form marine peats.

Vegetation: *Thalassia testudinum*, *Cymodocea filiformis*, and *Halodule* are the primary potential species. All three species may co-occur in mixed beds, while other areas may be heavily dominated by *Thalassia testudinum* only, such as Bob Allen Key and Duck Key (<http://serc.fiu.edu/seagrass/!CDreport/DataHome.htm>). Some stands may be further characterized by high density and abundance of calcareous green algae.

MEMBERSHIP

Associations:

- *Thalassia testudinum* - *Cymodocea filiformis* Herbaceous Vegetation (CEGL008384, GNR)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)

Alliances:

- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Tanner 1960

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723203#references

Description Author: R. Evans

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

FLORIDA RIVER FLOODPLAIN MARSH (CES203.055)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9246

CONCEPT

Summary: This system occupies generally narrow, but widely fluctuating, zones of herbaceous vegetation along rivers of northeastern, central and southern Florida. *Cladium mariscus ssp. jamaicense* or *Panicum hemitomon* and *Polygonum punctatum* were apparently the historical dominant plant species, but a variety of other species may also be present. Plant species composition (including dominants) may vary seasonally or annually depending on inundation and fire history.

Classification Comments: Placing all component associations is difficult due to a number of factors; the current list (8-03) is incomplete.

Similar Ecological Systems:

- Floridian Highlands Freshwater Marsh (CES203.077)--is found on lakes and former lakes (i.e., Paynes Prairie) not on rivers.
- South Florida Slough, Gator Hole, and Willow Head (CES411.485)

Related Concepts:

- Floodplain Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: This system occupies non-tidal, generally narrow, but widely fluctuating, zones of freshwater herbaceous marsh vegetation along rivers of northeastern, central and southern Florida. These include the Myakka, St. Johns, Kissimmee, and perhaps Caloosahatchee rivers.

Vegetation: A relatively diverse assemblage of vegetation is present, ranging from open-water communities to emergent and graminoid marshes and scattered shrublands. See floristic list provided by Huffman and Judd (1998). In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

Dynamics: This system is subject to river flooding. In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

MEMBERSHIP

Associations:

- *Cephalanthus occidentalis* / *Limnobium spongia* - *Salvinia minima* Shrubland (CEGL004457, G3?)
- *Cladium mariscus ssp. jamaicense* Herbaceous Vegetation (CEGL003940, GNR)
- *Nelumbo lutea* - *Pontederia cordata* - *Schoenoplectus tabernaemontani* Herbaceous Vegetation (CEGL004470, G2G3)
- *Osmunda regalis* var. *spectabilis* - *Peltandra virginica* - *Sagittaria lancifolia* Herbaceous Vegetation (CEGL004471, G2?)
- *Panicum hemitomon* - *Pontederia cordata* Herbaceous Vegetation (CEGL004461, G3G4)
- *Salix caroliniana* / *Decodon verticillatus* / *Typha latifolia* Forest (CEGL004423, G2G3)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Typha latifolia* - *Pontederia cordata* Herbaceous Vegetation (CEGL004462, G3?)

Alliances:

- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Cladium mariscus ssp. jamaicense* Seasonally Flooded Temperate Herbaceous Alliance (A.1369)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Osmunda (cinnamomea, regalis)* Saturated Herbaceous Alliance (A.1692)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Salix caroliniana* Seasonally Flooded Forest Alliance (A.332)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Typha latifolia* Seasonally Flooded Herbaceous Alliance (A.1393)

DISTRIBUTION

Range: This system is endemic to rivers of northeastern, central and southern Florida.

Divisions: 203:C; 411:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C
TNC Ecoregions: 54:C, 55:C

SOURCES

References: Comer et al. 2003, Huffman and Judd 1998, Kushlan 1990, Patton and Judd 1986

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722655#references

Description Author: R. Evans, mod. C.W. Nordman and M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1489 FLORIDIAN HIGHLANDS FRESHWATER MARSH (CES203.077)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional [Sinkhole]; Graminoid

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2489; ESLF 9214; ESP 1489

CONCEPT

Summary: This system represents non-tidal marsh vegetation in the peninsula of Florida and in the Tallahassee area. These highland marshes occupy different types of depressions such as former lake basins, shallow peat-filled valleys, and zones around existing natural lakes (Kushlan 1990). The marshes and the basins they occur within are unstable over time due to subsurface subsidence and drainage pattern changes. In some examples, surface waterflow is generally lacking due to the presence of limestone near the surface, but water levels have fluctuated greatly over time (Patton and Judd 1986). Soils range from mucky surfaces to sandy loams or sands, but slowly permeable subsoils contribute to the presence of standing water for much of the year. The vegetation mosaic includes a range of mostly herbaceous plant communities that may be referred to as marshes, meadows, and prairies, collectively comprising a relatively diverse number of associations. Permanent water bodies support a range of submerged and floating aquatic species. Areas with approximately a meter of standing water tend to support dense stands of emergent herbaceous perennials, often in monospecific stands; species include *Typha latifolia*, *Pontederia cordata*, *Nelumbo lutea*, and others. Where there is less water (usually present only during wet season), more graminoid vegetation is present, with species such as *Panicum hemitomon*, *Leersia hexandra*, and other species. With historic water level fluctuations, the vegetation mosaic has also changed, sometimes quite rapidly.

Classification Comments: This system was originally intended to cover Paynes Prairie only, but the concept was greatly expanded to include other non-tidal marsh vegetation of Florida, including that around natural lakes, as well as the large Kissimmee and St. Johns River marshes. The Kissimmee and St. Johns River marshes also occur within floodplains but are influenced by somewhat different processes than typical highland marshes. These were formerly considered part of Florida River Floodplain Marsh (CES203.055).

Similar Ecological Systems:

- Florida River Floodplain Marsh (CES203.055)
- South Florida Slough, Gator Hole, and Willow Head (CES411.485)

Related Concepts:

- Basin Marsh (FNAI 1990) Broader

DESCRIPTION

Environment: These highland marshes occupy different types of depressions such as former lake basins, shallow peat-filled valleys, and zones around existing natural lakes (Kushlan 1990). The marshes and the basins they occur within are unstable over time due to subsurface subsidence and drainage pattern changes. Soils range from mucky surfaces to sandy loams or sands, but slowly permeable subsoils contribute to the presence of standing water for much of the year.

Vegetation: A relatively diverse assemblage of vegetation is present, ranging from open water communities to emergent and graminoid marshes, and scattered shrublands. Placing all component associations is difficult due to a number of factors; the current list (12-02) is incomplete. In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

Dynamics: In some examples, surface waterflow is generally lacking due to the presence of limestone near the surface, but water levels have fluctuated greatly over time (Patton and Judd 1986). In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

MEMBERSHIP

Associations:

- *Cephalanthus occidentalis* / *Limnobium spongia* - *Salvinia minima* Shrubland (CEGL004457, G3?)
- *Cladium mariscus* ssp. *jamaicense* Herbaceous Vegetation (CEGL003940, GNR)
- *Nelumbo lutea* - *Pontederia cordata* - *Schoenoplectus tabernaemontani* Herbaceous Vegetation (CEGL004470, G2G3)
- *Osmunda regalis* var. *spectabilis* - *Peltandra virginica* - *Sagittaria lancifolia* Herbaceous Vegetation (CEGL004471, G2?)
- *Panicum hemitomon* - *Pontederia cordata* Herbaceous Vegetation (CEGL004461, G3G4)
- *Salix caroliniana* / *Decodon verticillatus* / *Typha latifolia* Forest (CEGL004423, G2G3)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Spartina bakeri* - *Muhlenbergia filipes* - *Andropogon glomeratus* - *Rhynchospora colorata* Herbaceous Vegetation (CEGL004511, G3?)
- *Typha latifolia* - *Pontederia cordata* Herbaceous Vegetation (CEGL004462, G3?)

Alliances:

- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Cladium mariscus* ssp. *jamaicense* Seasonally Flooded Temperate Herbaceous Alliance (A.1369)
- *Nelumbo lutea* Permanently Flooded Temperate Herbaceous Alliance (A.1671)
- *Osmunda (cinnamomea, regalis)* Saturated Herbaceous Alliance (A.1692)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Salix caroliniana* Seasonally Flooded Forest Alliance (A.332)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Spartina bakeri* Seasonally Flooded Herbaceous Alliance (A.1389)
- *Typha latifolia* Seasonally Flooded Herbaceous Alliance (A.1393)

DISTRIBUTION

Range: This system is found in the Florida Peninsula and in the Tallahassee Hills/Valdosta Limesink area, possibly ranging into adjacent Georgia.

Divisions: 203:C

Nations: US

Subnations: FL, GA?

Map Zones: 55:C, 56:C

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Comer et al. 2003, Kushlan 1990, Patton and Judd 1986

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723252#references

Description Author: R. Evans, mod. C.W. Nordman and M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1490 GULF AND ATLANTIC COASTAL PLAIN TIDAL MARSH SYSTEMS (CES203.638)

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch, Matrix, Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Temperate; Tidal / Estuarine; Estuarine; Graminoid

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2490; ESLF 9209; ESP 1490

CONCEPT

Summary: This systems group includes tidal marshes in various settings along the Atlantic and Gulf coasts and barrier islands. Salt, brackish, and freshwater marshes are included. Regular tidal flooding occurs over most of the system, with irregular flooding in unusually high tides occurring in the upper zones. Tides bring nutrients, making the regularly flooded marshes fertile. Storms may push saltwater into brackish areas, acting as a disturbance to vegetation. The dominant factors in vegetation variability are salinity and geography. Salt marshes are often dominated by *Spartina* grasses, often forming large and low-diversity but high-productivity expanses. *Juncus roemerianus* is also common and, like *Spartina*, may be dominant over large areas. Local depressions in upper zones may be hypersaline due to concentration of salt by evaporation; *Salicornia* spp., *Sarcocornia* spp., and *Distichlis spicata* are characteristic in these salt pannes. In brackish settings, *Spartina* may be characteristic as well, but it is often mixed with or replaced by other graminoids such as *Schoenoplectus* spp. Brackish marshes may include large patches of flats with low forbs (along the northern Atlantic Coast); *Sagittaria subulata* and *Limosella australis* are typical. Fresh to oligohaline tidal marshes may be characterized by *Zizania* spp., *Zizaniopsis miliacea*, *Eleocharis* spp., *Sagittaria* spp., and *Typha* spp. They typically occur along bay margins near inflowing rivers, extending up the tidal reaches of those rivers.

While tidal marshes are characteristically herbaceous, they may support inclusions of shrublands dominated by *Baccharis halimifolia*, *Borrhchia frutescens*, or other shrubs. Salt marsh "islands" of slightly higher elevation also support *Juniperus virginiana*. Fresh and oligohaline marshes can have a heterogeneous physiognomy including shrublands, grasslands, and aquatic herbs. Individual systems in this group are differentiated based on salinity, geography, and tidal dynamics and energy.

DESCRIPTION

Dynamics: Tidal marshes throughout the region have been heavily altered by mosquito control and drainage efforts. Rising sea level will affect this systems group strongly, drowning some marsh areas, promoting shoreline erosion, and causing salt or brackish marshes to spread inland into freshwater marsh areas. Significant fresh and brackish marsh loss has occurred in the deltaic plain of the Mississippi River. These losses are related to natural and anthropogenic causes. Subsidence and loss of wetlands are a natural part of the deltaic process, but they have been exacerbated by the reduction in sediment load and freshwater input into coastal areas caused by the impoundment and channelization of streams and rivers. In addition, dredged channels in the marsh facilitate saltwater intrusion, and spoil banks prevent marshes from draining. Increases in salinity cause shifts in composition to species more tolerant of salinity, ultimately resulting in loss of species diversity and open saline waters.

MEMBERSHIP

Standard Ecological Systems:

- Atlantic Coastal Plain Embayed Region Tidal Salt and Brackish Marsh (CES203.260)
- Atlantic Coastal Plain Indian River Lagoon Tidal Marsh (CES203.257)
- Central and Upper Texas Coast Fresh and Oligohaline Tidal Marsh (CES203.472)
- Central and Upper Texas Coast Salt and Brackish Tidal Marsh (CES203.473)
- Central Atlantic Coastal Plain Salt and Brackish Tidal Marsh (CES203.270)
- Florida Big Bend Fresh and Oligohaline Tidal Marsh (CES203.507)
- Gulf Coast Chenier Plain Fresh and Oligohaline Tidal Marsh (CES203.467)
- Mississippi Delta Fresh and Oligohaline Tidal Marsh (CES203.470)
- Mississippi Delta Salt and Brackish Tidal Marsh (CES203.471)
- Mississippi Sound Fresh and Oligohaline Tidal Marsh (CES203.067)
- Mississippi Sound Salt and Brackish Tidal Marsh (CES203.303)
- Northern Atlantic Coastal Plain Brackish Tidal Marsh (CES203.894)
- Northern Atlantic Coastal Plain Fresh and Oligohaline Tidal Marsh (CES203.516)
- Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519)

DISTRIBUTION

Range: This systems group is distributed along the tidal reaches of the Gulf and Atlantic coastal plains from southern Maine to Texas.

Divisions: 202:C; 203:C

Nations: US

Subnations: AL, CT, DE, FL, GA, LA, MA, MD, ME, MS, NC, NH, NJ, NY, RI, SC, TX, VA

Map Zones: 36:C, 37:C, 55:C, 56:C, 58:C, 60:C, 65:C, 66:C, 98:C, 99:C

USFS Ecomap Regions: 221A:CC, 232A:CC

TNC Ecoregions: 31:C, 53:C, 55:C, 56:C, 57:C, 58:C, 62:C

SOURCES

References: FNAI 1990, Hackney and de la Cruz 1982, Montague and Wiegert 1990, Southeastern Ecology Working Group n.d., Stout 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.785008#references

Description Author: S.C. Gawler

Version: 23 Jan 2007

Concept Author: Southeastern Ecology Group

Stakeholders: East, Southeast

ClassifResp: Southeast

INTERIOR LOW PLATEAU SEEPAGE FEN (CES202.346)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping

Non-Diagnostic Classifiers: Shrubland (Shrub-dominated)

National Mapping Codes: ESLF 9409

CONCEPT

Summary: This system accommodates small-scale, herbaceous-dominated seepage areas found in limited areas of the Interior Low Plateau of Tennessee, Kentucky and possibly Ohio. It is most frequent in the Western Highland Rim of Tennessee (Lewis, Cheatham, and Williamson counties). There are also rare occurrences of this system in the Eastern Highland Rim of Tennessee and related limited areas of Kentucky and possibly Ohio (D. Minney pers. comm. 2006). These features have been generally known as "seepage fens" and are fed by mineral-rich groundwater. Examples are associated with stream drainages but are generally not affected by stream-related hydrology. Soils contain a thin organic layer over limestone gravel, over a less permeable layer of more solid rock. The vegetation is dominated by herbaceous plants. Characteristic species include *Carex atlantica*, *Carex lurida*, *Carex leptalea* ssp. *harperi*, *Parnassia grandifolia*, *Juncus brachycephalus*, *Rudbeckia fulgida* var. *umbrosa*, *Cardamine bulbosa*, *Impatiens capensis*, *Juncus coriaceus*, *Juncus effusus*, *Lobelia puberula*, *Lobelia cardinalis*, *Oxypolis rigidior*, *Phlox glaberrima*, *Rhynchospora capitellata*, *Scirpus atrovirens*, *Scirpus cyperinus*, *Solidago patula* var. *patula*, and *Thelypteris palustris* var. *pubescens*. Woody species include *Alnus serrulata*, *Salix humilis*, *Salix caroliniana*, *Cornus amomum*, and *Acer rubrum*, which may invade the herbaceous seep. *Xyris tennesseensis* is endemic to this system and occurs in 50% or more of its occurrences.

Classification Comments: This system is a small-patch system, originally described from a small region. Its range has been expanded to include a greater geographic scope.

Similar Ecological Systems:

- North-Central Appalachian Seepage Fen (CES202.607)
- Ozark-Ouachita Fen (CES202.052)

Related Concepts:

- *Carex lurida* (*hystericina*?) - *Carex leptalea* - *Rhynchospora capillacea* Alkaline Seep (Minney 2000) Undetermined
- Calcareous Seep (Evans 1991) Finer

DESCRIPTION

Environment: These features are fed by mineral-rich groundwater. Stands occur on the sideslopes of hills in narrow valleys, bases of bluffs, rock ledges, and terraces of streams and rivers, where the soil or substrate is saturated by calcareous groundwater seepage. Examples are associated with stream drainages but are generally not affected by stream-related hydrology. The parent material is a mixture of gravel and dolomite with fragments of deeply weathered bedrock present or colluvium over bedrock. Soils contain a thin organic layer over limestone gravel, over a less permeable layer of more solid rock.

Vegetation: The vegetation is dominated by herbaceous plants. Characteristic species include *Carex atlantica*, *Carex lurida*, *Carex leptalea* ssp. *harperi*, *Parnassia grandifolia*, *Juncus brachycephalus*, *Rudbeckia fulgida* var. *umbrosa*, *Cardamine bulbosa*, *Impatiens capensis*, *Juncus coriaceus*, *Juncus effusus*, *Lobelia puberula*, *Lobelia cardinalis*, *Oxypolis rigidior*, *Phlox glaberrima*, *Rhynchospora capitellata*, *Scirpus atrovirens*, *Scirpus cyperinus*, *Solidago patula* var. *patula*, and *Thelypteris palustris* var. *pubescens*. Woody species include *Alnus serrulata*, *Salix humilis*, *Salix caroliniana*, *Cornus amomum*, and *Acer rubrum*. Some stands in southern Ohio may lack *Parnassia* (D. Minney pers. comm. 2006).

MEMBERSHIP

Associations:

- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912, G4)
- *Carex lurida* - *Carex leptalea* - *Parnassia grandifolia* - *Juncus brachycephalus* - (*Xyris tennesseensis*) Herbaceous Vegetation (CEGL004161, G1)

Alliances:

- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Carex lurida* - *Carex leptalea* - (*Carex atlantica*, *Carex interior*, *Parnassia grandifolia*) Saturated Herbaceous Alliance (A.1452)

DISTRIBUTION

Range: This system is found in limited areas of the Interior Low Plateau of Tennessee, Kentucky and possibly Ohio, including primarily the Western Highland Rim region of Tennessee (Ecoregion 71f of Griffith et al. (1998), EPA (2004); Subsection 222Eg of Keys et al. (1995)).

Divisions: 202:C

Nations: US

Subnations: KY, OH?, TN
Map Zones: 47:C, 48:C, 53:C
TNC Ecoregions: 44:C

SOURCES

References: Comer et al. 2003, EPA 2004, Griffith et al. 1998, Keys et al. 1995, Minney pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723164#references

Description Author: M. Pyne

Version: 17 Apr 2006

Concept Author: M. Pyne

Stakeholders: Midwest, Southeast

ClassifResp: Southeast

LAURENTIAN-ACADIAN FRESHWATER MARSH (CES201.594)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shallow (<15 cm) Water; >180-day hydroperiod; Depressional [Lakeshore]; Riverine / Alluvial; Graminoid

Non-Diagnostic Classifiers: Circumneutral Water; Acidic Water; Moderate (100-500 yrs) Persistence; Herbaceous; Extensive Wet Flat; Depressional [Pond]; Muck; Aquatic Herb

National Mapping Codes: ESLF 9405

CONCEPT

Summary: These freshwater emergent and/or submergent marshes are dominated by herbaceous vegetation. They are common throughout the northeastern United States and adjacent Canadian provinces. Freshwater marshes occur in closed or open basins that are generally flat and shallow. They are associated with lakes, ponds, slow-moving streams, and/or impoundments or ditches. The herbaceous vegetation does not persist through the winter. Scattered shrubs are often present and usually total less than 25% cover. Trees are generally absent and, if present, are scattered. The substrate is typically muck over mineral soil. Examples of vegetation in the Delaware Estuary freshwater marsh communities include *Typha latifolia*, *Typha angustifolia*, *Phragmites australis*, *Schoenoplectus americanus*, *Thelypteris palustris*, *Impatiens capensis*, *Carex* spp., *Vallisneria americana*, *Potamogeton perfoliatus*, *Nuphar lutea* ssp. *advena*, and *Nymphaea odorata*.

Similar Ecological Systems:

- Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)
- North-Central Interior Freshwater Marsh (CES202.899)

MEMBERSHIP

Associations:

- *Bidens cernua* - *Verbena hastata* - *Polygonum* spp. Herbaceous Vegetation (CEGL006446, GNR)
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrubland (CEGL002186, G5)
- *Elodea canadensis* - *Potamogeton* spp. Eastern Herbaceous Vegetation [Placeholder] (CEGL006431, GNR)
- *Equisetum fluviatile* - (*Eleocharis palustris*) Herbaceous Vegetation (CEGL005258, G4)
- *Eriocaulon aquaticum* - *Lobelia dortmanna* Herbaceous Vegetation (CEGL006346, GNR)
- *Juncus militaris* - *Eriocaulon aquaticum* Herbaceous Vegetation (CEGL006345, GNR)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Nymphaea odorata* - *Nuphar lutea* (ssp. *pumila*, ssp. *variegata*) Herbaceous Vegetation (CEGL002562, G5)
- *Nymphaea tetragona* - *Nuphar lutea* (ssp. *pumila*, ssp. *variegata*) Herbaceous Vegetation (CEGL002563, G4G5)
- *Phragmites australis* Eastern North America Temperate Semi-natural Herbaceous Vegetation (CEGL004141, GNA)
- *Pontederia cordata* - *Peltandra virginica* - *Sagittaria latifolia* Herbaceous Vegetation (CEGL006191, G5)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Vegetation [Placeholder] (CEGL004291, GNR)
- *Potamogeton* spp. - *Ceratophyllum* spp. Midwest Herbaceous Vegetation (CEGL002282, G5)
- *Schoenoplectus (tabernaemontani, acutus)* Eastern Herbaceous Vegetation (CEGL006275, GNR)
- *Schoenoplectus acutus* - (*Schoenoplectus fluviatilis*) Freshwater Herbaceous Vegetation (CEGL002225, G4G5)
- *Schoenoplectus fluviatilis* - *Schoenoplectus* spp. Herbaceous Vegetation (CEGL002221, G3G4)
- *Schoenoplectus fluviatilis* Herbaceous Vegetation (CEGL006366, GNR)
- *Schoenoplectus tabernaemontani* - *Typha* spp. - (*Sparganium* spp., *Juncus* spp.) Herbaceous Vegetation (CEGL002026, G4G5)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Vegetation (CEGL006349, GNR)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Eastern Herbaceous Vegetation (CEGL006153, G5)
- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150, G5)
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Herbaceous Vegetation (CEGL002229, G4?)
- *Typha* spp. Midwest Herbaceous Vegetation (CEGL002233, G5)
- *Vallisneria americana* - *Potamogeton perfoliatus* Herbaceous Vegetation (CEGL006196, G5)
- *Zizania (aquatica, palustris)* Herbaceous Vegetation (CEGL002382, G3G4)

Alliances:

- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Eleocharis* spp. - *Eriocaulon aquaticum* Semipermanently Flooded Herbaceous Alliance (A.1429)
- *Equisetum fluviatile* Semipermanently Flooded Herbaceous Alliance (A.1678)
- *Juncus militaris* Semipermanently Flooded Herbaceous Alliance (A.1430)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Alliance (A.1669)

- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Schoenoplectus acutus* - (*Schoenoplectus tabernaemontani*) Semipermanently Flooded Herbaceous Alliance (A.1443)
- *Schoenoplectus fluviatilis* Seasonally Flooded Herbaceous Alliance (A.1387)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Typha* spp. - (*Schoenoplectus* spp., *Juncus* spp.) Seasonally Flooded Herbaceous Alliance (A.1394)
- *Vallisneria americana* Permanently Flooded Temperate Herbaceous Alliance (A.1757)
- *Zizania (aquatica, palustris)* Semipermanently Flooded Herbaceous Alliance (A.1441)

DISTRIBUTION

Range: This system occurs in New England and northern New York west across the upper Great Lakes to Minnesota, and adjacent Canada, southward to Pennsylvania, New Jersey, and Ohio; mostly north of the glacial boundary.

Divisions: 201:C; 202:C

Nations: CA, US

Subnations: CT, IL?, IN?, MA, ME, MI, MN, NB, NH, NJ, NY, OH?, ON, PA, QC, VT, WI

Map Zones: 41:C, 49:?, 50:C, 51:C, 52:?, 60:C, 61:C, 62:P, 63:C, 64:C, 65:C, 66:C

TNC Ecoregions: 47:C, 48:C, 49:C, 59:C, 61:C, 63:C, 64:C

SOURCES

References: Comer and Albert 1997, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.731557#references

Description Author: E. Largay

Version: 22 Dec 2005

Concept Author: S.C. Gawler, D. Faber-Langendoen

Stakeholders: Canada, East, Midwest

ClassifResp: East

LAURENTIAN-ACADIAN WET MEADOW-SHRUB SWAMP (CES201.582)

CLASSIFIERS

Classification Status: Standard

Primary Division: Laurentian-Acadian (201)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Shallow (<15 cm) Water; Depressional [Lakeshore]; Riverine / Alluvial; Broad-Leaved Shrub; Graminoid

Non-Diagnostic Classifiers: Circumneutral Water; Acidic Water; Moderate (100-500 yrs) Persistence; Herbaceous; Extensive Wet Flat; Depressional [Pond]; Muck

National Mapping Codes: ESLF 9406

CONCEPT

Summary: This system encompasses shrub swamps and wet meadows on mineral soils of the Northeast and upper Midwest. They are often associated with lakes and ponds, but are also found along streams, where the water level does not fluctuate greatly. They are commonly flooded for part of the growing season but often do not have standing water throughout the season. The size of occurrences ranges from small pockets to extensive acreages. The system can have a patchwork of shrub and graminoid dominance; typical species include *Salix* spp., *Cornus amomum*, *Alnus incana*, *Spiraea alba*, *Calamagrostis canadensis*, tall *Carex* spp., and *Juncus effusus*. Trees are generally absent and, if present, are scattered.

Similar Ecological Systems:

- Laurentian-Acadian Freshwater Marsh (CES201.594)
- North-Central Interior Wet Meadow-Shrub Swamp (CES202.701)

MEMBERSHIP

Associations:

- *Alnus incana* - *Cornus (amomum, sericea)* / *Clematis virginiana* Shrubland (CEGL006062, G4G5)
- *Alnus incana* Swamp Shrubland (CEGL002381, G5)
- *Alnus serrulata* Swamp Shrubland (CEGL005082, G4G5)
- *Calamagrostis canadensis* - *Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL006519, GNR)
- *Carex (rostrata, utriculata)* - *Carex lacustris* - (*Carex vesicaria*) Herbaceous Vegetation (CEGL002257, G4G5)
- *Carex lacustris* Herbaceous Vegetation (CEGL002256, G4G5)
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258, G4?)
- *Carex stricta* - *Carex vesicaria* Herbaceous Vegetation (CEGL006412, G4G5)
- *Carex tetanica* - *Carex prairea* - *Eleocharis erythropoda* - *Lysimachia quadriflora* Herbaceous Vegetation (CEGL006170, G1Q)
- *Cephalanthus occidentalis* / *Carex* spp. Northern Shrubland (CEGL002190, G4)
- *Cornus (amomum, sericea)* - *Viburnum dentatum* - *Rosa multiflora* Shrubland (CEGL006576, GNA)
- *Cornus sericea* - *Salix* spp. - (*Rosa palustris*) Shrubland (CEGL002186, G5)
- *Equisetum fluviatile* - (*Eleocharis palustris*) Herbaceous Vegetation (CEGL005258, G4)
- *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112, G5)
- *Juncus militaris* - *Eriocaulon aquaticum* Herbaceous Vegetation (CEGL006345, GNR)
- *Myrica gale* - *Spiraea alba* - *Chamaedaphne calyculata* Shrubland (CEGL006512, GNR)
- *Phalaris arundinacea* Eastern Herbaceous Vegetation (CEGL006044, GNA)
- *Phragmites australis* Eastern North America Temperate Semi-natural Herbaceous Vegetation (CEGL004141, GNA)
- *Salix nigra* / *Phalaris arundinacea* - *Apocynum cannabinum* Temporarily Flooded Shrubland (CEGL006065, G4?)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Vegetation (CEGL006349, GNR)

Alliances:

- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus incana* Temporarily Flooded Shrubland Alliance (A.950)
- *Alnus serrulata* Seasonally Flooded Shrubland Alliance (A.994)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex (rostrata, utriculata)* Seasonally Flooded Herbaceous Alliance (A.1403)
- *Carex lacustris* Seasonally Flooded Herbaceous Alliance (A.1367)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Carex stricta* Seasonally Flooded Herbaceous Alliance (A.1397)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Cornus sericea* - *Salix* spp. Seasonally Flooded Shrubland Alliance (A.989)
- *Equisetum fluviatile* Semipermanently Flooded Herbaceous Alliance (A.1678)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Juncus militaris* Semipermanently Flooded Herbaceous Alliance (A.1430)

- *Myrica gale* Saturated Shrubland Alliance (A.1022)
- *Phalaris arundinacea* Seasonally Flooded Herbaceous Alliance (A.1381)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Salix nigra* Temporarily Flooded Shrubland Alliance (A.948)
- *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance (A.1386)

DISTRIBUTION

Range: New England and northern New York west across the upper Great Lakes to Minnesota, and adjacent Canada, southward to Pennsylvania and Ohio; mostly north of the glacial boundary.

Divisions: 201:C

Nations: CA, US

Subnations: CT, IL?, IN?, MA, ME, MI, MN, NB, NH, NY, OH?, ON, PA, QC, VT, WI

Map Zones: 41:C, 49:?, 50:C, 51:C, 52:?, 60:C, 61:C, 62:P, 63:C, 64:C, 65:C, 66:C

USFS Ecomap Regions: 212H:CC, 212J:CC, 212K:CC, 212L:CC, 212M:CC, 212N:CC, 212Q:CC, 212R:CC, 212S:CC, 212T:CC, 212X:CC, 212Y:CC, 212Z:CC, 222K:CC, 222M:CC, 222R:CC

TNC Ecoregions: 47:C, 48:C, 49:C, 59:C, 61:C, 63:C, 64:C

SOURCES

References: Comer and Albert 1997, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.731538#references

Description Author: S.C. Gawler, D. Faber-Langendoen, mod. E. Largay

Version: 11 Apr 2007

Concept Author: S.C. Gawler, D. Faber-Langendoen

Stakeholders: Canada, East, Midwest

ClassifResp: East

MISSISSIPPI SOUND SALT AND BRACKISH TIDAL MARSH (CES203.303)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saltwater (Polyhaline); Brackish (Mesohaline); Tidal / Estuarine [Haline]; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9263

CONCEPT

Summary: This system includes salt and brackish tidal marshes of the northern Gulf of Mexico region of northwestern Florida, southern Alabama, and southeastern Mississippi. These marshes are typically associated with mud-bottomed bays behind barrier islands. Wind-dominated tides and low tidal amplitudes (<1 meter) characterize this region. This system includes predominately brackish marshes and supports what is probably the largest zone of *Juncus roemerianus* in the Atlantic and Gulf Coastal Plain outside of the North Carolina/Virginia Embayed Region estuarine marshes.

Similar Ecological Systems:

- Mississippi Sound Fresh and Oligohaline Tidal Marsh (CES203.067)

DESCRIPTION

Environment: This marsh system occurs in a region characterized by diurnal tides, with waves usually less than 0.5 m in amplitude. Inundation is irregular and depends upon wind speed and direction, and the flow of water from nearby rivers; generally more flooding occurs in the summer than winter (Hackney and de la Cruz 1982). The climate is mixed, with subtropical conditions prevailing during years with mild winters and temperate conditions when strong arctic cold fronts extend to the gulf.

Vegetation: Brackish needlerush marshes dominate this system. Communities distinguished by tall and short *Juncus roemerianus* may both be present. A *Spartina* zone occurs in narrow bands only; small-scale hypersaline tidal flats are frequently present.

MEMBERSHIP

Associations:

- *Cladium mariscus* ssp. *jamaicense* Tidal Herbaceous Vegetation (CEGL004178, G4?)
- *Ilex vomitoria* - *Quercus (geminata, virginiana)* - *Morella cerifera* - *Serenoa repens* Shrubland (CEGL003813, G2G3)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Spartina alterniflora* - *Juncus roemerianus* - *Distichlis spicata* Louisianian Zone Salt Tidal Herbaceous Vegetation (CEGL004190, G5)
- *Spartina patens* - *Schoenoplectus (americanus, pungens)* - (*Distichlis spicata*) Herbaceous Vegetation (CEGL004755, G4?)
- *Spartina spartinae* - *Sporobolus virginicus* Tidal Herbaceous Vegetation (CEGL004199, G4G5)

Alliances:

- *Cladium mariscus* ssp. *jamaicense* Tidal Temperate Herbaceous Alliance (A.1473)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Quercus virginiana* - *Ilex vomitoria* - (*Morella cerifera*) Shrubland Alliance (A.785)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Spartina spartinae* Tidal Herbaceous Alliance (A.1483)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Mississippi Sound Fresh and Oligohaline Tidal Marsh (CES203.067)

DISTRIBUTION

Range: This system is found along the northern Gulf of Mexico in northwestern Florida, southern Alabama, and southeastern Mississippi. The eastern extent of this system coincides with the range of diurnal tides in the northern Gulf of Mexico. (East of Apalachicola Bay, where the tides are semi-diurnal (Stout 1984), Florida Big Bend Salt and Brackish Tidal Marsh (CES203.508) replaces this system.) To the west, Mississippi Delta Salt and Brackish Tidal Marsh (CES203.471) replaces this system in the Mississippi Delta.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 46:C, 99:C

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, Hackney and de la Cruz 1982, Stout 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723188#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Jan 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

NORTH-CENTRAL APPALACHIAN SEEPAGE FEN (CES202.607)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Herbaceous; Seepage-Fed Sloping

Non-Diagnostic Classifiers: Circumneutral Water; 1-29-day hydroperiod; Short (50-100 yrs) Persistence; Lowland; Shrubland (Shrub-dominated); Temperate; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9232

CONCEPT

Summary: This system is found in scattered locations in the central Appalachians and eastern Great Lakes regions. Mostly non-forested, these open fens develop on shallow to deep peat over a sloping substrate, where seepage waters provide nutrients. Conditions are often circumneutral to alkaline. Sedges are the major dominants. *Packera aurea*, *Symplocarpus foetidus*, and *Lobelia kalmii* are among the characteristic forbs. Some of these areas are kept open by grazing, and succession to shrublands may occur in the absence of disturbance.

Similar Ecological Systems:

- Interior Low Plateau Seepage Fen (CES202.346)--of unglaciated Kentucky, Ohio, and Tennessee.
- Southern Appalachian Seepage Wetland (CES202.317)

MEMBERSHIP

Associations:

- *Alnus serrulata* - *Lindera benzoin* / *Osmunda regalis* var. *spectabilis* - *Carex tetanica* Shrubland (CEGL008408, G1?)
- *Carex atlantica* - *Solidago patula* var. *patula* - *Lilium grayi* / *Sphagnum bartlettianum* Herbaceous Vegetation (CEGL004158, G1)
- *Carex canescens* - *Eriophorum virginicum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL006549, GNR)
- *Carex prairea* - *Carex stricta* - *Pycnanthemum virginianum* Herbaceous Vegetation (CEGL006551, GNR)
- *Cornus amomum* - *Salix candida* / *Dasiphora fruticosa* ssp. *floribunda* / *Carex stricta* Shrubland (CEGL006359, G3?)
- *Cornus racemosa* / *Carex (sterilis, aquatilis, lacustris)* Shrub Herbaceous Vegetation (CEGL006123, G2G3)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex (sterilis, hystericina, flava)* Shrub Herbaceous Vegetation (CEGL006326, G2)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex interior* - *Carex flava* - *Sarracenia purpurea* Shrub Herbaceous Vegetation (CEGL005140, G3)
- *Dasiphora fruticosa* ssp. *floribunda* / *Rhynchospora capillacea* - *Scleria verticillata* Shrub Herbaceous Vegetation (CEGL006356, G1)
- *Juniperus virginiana* / *Betula pumila* / *Carex sterilis* - *Oligoneuron rigidum* Shrub Herbaceous Vegetation (CEGL006367, G1)
- *Juniperus virginiana* / *Dasiphora fruticosa* ssp. *floribunda* / *Carex flava* - *Carex tetanica* Shrub Herbaceous Vegetation (CEGL006357, G1G2)
- *Morella pensylvanica* - *Dasiphora fruticosa* ssp. *floribunda* / *Carex sterilis* - *Carex flava* Shrub Herbaceous Vegetation (CEGL006103, G2)
- *Symplocarpus foetidus* Herbaceous Vegetation (CEGL002385, G4?)

Alliances:

- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Carex (atlantica, echinata)* - *Eriophorum virginicum* - *Rhynchospora capitellata* - *Solidago patula* Saturated Herbaceous Alliance (A.1450)
- *Carex (flava, hystericina, interior, sterilis)* Saturated Shrub Herbaceous Alliance (A.1561)
- *Carex* spp. Saturated Herbaceous Alliance (A.1455)
- *Cornus sericea* - *Photinia melanocarpa* - *Toxicodendron vernix* Saturated Shrubland Alliance (A.1016)
- *Dasiphora fruticosa* ssp. *floribunda* / *Carex (flava, interior, lasiocarpa, sterilis)* Saturated Shrub Herbaceous Alliance (A.1562)
- *Symplocarpus foetidus* - *Caltha palustris* Saturated Herbaceous Alliance (A.1694)

DISTRIBUTION

Range: This system is found in scattered locations from central New England and New York west to Lake Erie and south to West Virginia and western Virginia (Central Appalachians ecoregion).

Divisions: 202:C

Nations: US

Subnations: CT, MA, MD, NJ, NY, PA, VA, VT, WV

Map Zones: 53:C, 61:C, 62:C, 63:P, 64:C, 65:C

USFS Ecomap Regions: 221A:CC, 221Ba:CCC, 221E:CC, M221A:CC

TNC Ecoregions: 45:P, 48:P, 49:C, 59:C, 60:P, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723002#references

Description Author: S.C. Gawler

Version: 09 Jan 2003

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN BRACKISH TIDAL MARSH (CES203.894)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Brackish (Mesohaline); Herbaceous; Tidal / Estuarine [Haline]; Graminoid

National Mapping Codes: ESLF 9272

CONCEPT

Summary: This system ranges from Massachusetts south to the Chesapeake drainage and is comprised of brackish marshes occurring on the portion of large tidal rivers and their tributaries where saltwater is mixed with freshwater. Vegetation typically exhibits zonation, with associations distributed by flooding frequency. Typical species include *Spartina alterniflora*, *Typha angustifolia*, *Spartina cynosuroides*, and *Schoenoplectus americanus*.

Classification Comments: In contrast to Northern Atlantic Coastal Plain Tidal Salt Marsh (CES203.519), which this type grades into, brackish marshes are distinguished by being confined within a tidal river and by reduced cover of *Spartina patens* and increased cover of associated brackish marsh species such as *Schoenoplectus americanus*, *Typha angustifolia*, *Amaranthus cannabinus*, and *Polygonum* spp. Flats with low forbs will be dominated by plants such as *Sagittaria subulata* and *Limosella australis* rather than by the halophytes (*Salicornia* and *Sarcocornia* spp., for example) seen in salt marsh flats.

MEMBERSHIP

Associations:

- *Amaranthus cannabinus* Tidal Herbaceous Vegetation (CEGL006080, G3G5)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Vegetation (CEGL004473, G2G4)
- *Schoenoplectus americanus* - *Spartina patens* Herbaceous Vegetation (CEGL006612, GNR)
- *Schoenoplectus pungens* Tidal Herbaceous Vegetation (CEGL004188, GNR)
- *Schoenoplectus robustus* - *Spartina alterniflora* Herbaceous Vegetation (CEGL006416, GNR)
- *Spartina alterniflora* - *Lilaeopsis chinensis* Herbaceous Vegetation (CEGL004193, G3G4)
- *Spartina alterniflora* - *Polygonum punctatum* - *Amaranthus cannabinus* Herbaceous Vegetation (CEGL006418, GNR)
- *Spartina cynosuroides* Herbaceous Vegetation (CEGL004195, G4)
- *Spartina patens* - *Agrostis stolonifera* Herbaceous Vegetation (CEGL006365, GNR)
- *Typha angustifolia* - *Hibiscus moscheutos* Herbaceous Vegetation (CEGL004201, G4G5)

Alliances:

- *Amaranthus cannabinus* Tidal Herbaceous Alliance (A.1706)
- *Sagittaria subulata* - *Limosella australis* Tidal Herbaceous Alliance (A.1710)
- *Schoenoplectus americanus* Tidal Herbaceous Alliance (A.2007)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina cynosuroides* Tidal Herbaceous Alliance (A.1480)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Typha (angustifolia, domingensis)* Tidal Herbaceous Alliance (A.1472)

DISTRIBUTION

Range: This system ranges from Massachusetts south to the Chesapeake drainage and the James River, Virginia.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, NJ, NY, VA

Map Zones: 60:C, 65:C

TNC Ecoregions: 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722786#references

Description Author: L. Sneddon, mod. S.C. Gawler

Version: 12 Oct 2004

Concept Author: L. Sneddon

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN FRESH AND OLIGOHALINE TIDAL MARSH (CES203.516)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9293

CONCEPT

Summary: This system includes freshwater tidal vegetation occurring on the upper reaches of large rivers influenced by tidal flooding, but beyond the reach of the salt wedge. The system is best developed on the Chesapeake and Delaware Bay drainages, including the rivers of southern New Jersey. The system extends northeast and includes inland portions of the Hudson River, Connecticut River, and the Merrimac River and their tributaries. The vegetation includes tall marshes dominated by tall grasses such as *Zizania aquatica*, marshes of lower stature dominated by forbs such as *Amaranthus cannabinus*, *Hibiscus moscheutos* and others, and vegetation characterized by short-statured and rosette-forming forbs such as *Eriocaulon parkeri* and *Isoetes riparia*. Associations are distributed by proximity to tidal waters and thus duration and force of flooding. Sediments of more protected and isolated vegetation is comprised of finer-grained materials that are poorly drained, or of well-consolidated peat deposits. Vegetation exposed to greater flooding force and scouring action is supported by mineral substrates such as sand and gravel.

MEMBERSHIP

Associations:

- *Acorus calamus* Tidal Herbaceous Vegetation (CEGL006833, GNR)
- *Alnus (incana ssp. rugosa, serrulata) - Cornus amomum* Shrubland (CEGL006337, GNR)
- *Alnus maritima / Acorus calamus* Shrubland (CEGL006841, GNR)
- *Amaranthus cannabinus* Tidal Herbaceous Vegetation (CEGL006080, G3G5)
- *Carex hyalinolepis* Tidal Herbaceous Vegetation (CEGL006177, GNR)
- *Decodon verticillatus* Semipermanently Flooded Shrubland (CEGL005089, GNR)
- *Eriocaulon parkeri - Polygonum punctatum* Herbaceous Vegetation (CEGL006352, G2)
- *Hibiscus moscheutos - Polygonum punctatum - Peltandra virginica* Tidal Herbaceous Vegetation (CEGL006181, GNR)
- *Impatiens capensis - Peltandra virginica - Polygonum arifolium - Schoenoplectus fluviatilis - Typha angustifolia* Tidal Herbaceous Vegetation (CEGL006325, GNR)
- *Isoetes riparia* Tidal Herbaceous Vegetation (CEGL006058, GNR)
- *Justicia americana - Peltandra virginica* Herbaceous Vegetation [Provisional] (CEGL006579, GNR)
- *Nelumbo lutea* Tidal Herbaceous Vegetation (CEGL006913, GNR)
- *Nuphar lutea ssp. advena* Tidal Herbaceous Vegetation (CEGL004472, G4G5)
- *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Vegetation (CEGL004706, G3G4)
- *Schoenoplectus pungens* Tidal Herbaceous Vegetation (CEGL004188, GNR)
- *Schoenoplectus pungens var. pungens - Juncus canadensis* Herbaceous Vegetation (CEGL006935, GNR)
- *Zizania aquatica* Tidal Herbaceous Vegetation (CEGL004202, G4?)

Alliances:

- *Acorus calamus* Tidal Herbaceous Alliance (A.3018)
- *Alnus (incana, serrulata, maritima)* Tidal Shrubland Alliance (A.1024)
- *Amaranthus cannabinus* Tidal Herbaceous Alliance (A.1706)
- *Carex hyalinolepis* Tidal Herbaceous Alliance (A.3019)
- *Decodon verticillatus* Semipermanently Flooded Shrubland Alliance (A.1013)
- *Eriocaulon parkeri* Tidal Herbaceous Alliance (A.1701)
- *Isoetes riparia* Tidal Herbaceous Alliance (A.1879)
- *Nelumbo lutea* Tidal Herbaceous Alliance (A.3020)
- *Nuphar lutea* Tidal Herbaceous Alliance (A.1708)
- *Peltandra virginica - Pontederia cordata* Tidal Herbaceous Alliance (A.1703)
- *Schoenoplectus pungens* Tidal Herbaceous Alliance (A.1478)
- *Typha (angustifolia, latifolia) - (Schoenoplectus spp.)* Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Zizania aquatica* Tidal Herbaceous Alliance (A.1484)

DISTRIBUTION

Range: Best developed on the Chesapeake and Delaware Bay drainages, including the rivers of southern New Jersey, but extends northeast and includes inland portions of the Hudson River, Connecticut River, and the Merrimac River and their tributaries.

Divisions: 203:C

Nations: US
Subnations: DE, MD, VA
Map Zones: 60:C
TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723075#references

Description Author: R. Evans and L. Sneddon

Version: 12 Oct 2004

Concept Author: R. Evans and L. Sneddon

Stakeholders: East, Southeast
ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN PONDShORE (CES203.518)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9283

CONCEPT

Summary: This system includes vegetation of groundwater-flooded depressions characterized by a flora generally restricted to the Coastal Plain from the southern portion of the Delmarva peninsula to Cape Cod, Massachusetts. Ponds may contain permanent water, such as the deep glacial kettleholes of Cape Cod and Long Island, New York, or may be shallow basins where groundwater drops below the surface late in the growing season. This system occurs on sandy deposits such as outwash plains of the glaciated region (Long Island and Cape Cod), on the deep sands of the New Jersey Pine Barrens, or on finer sediments of the Coastal Plain of Cape May, New Jersey, the Delmarva peninsula, and the Chesapeake Bay region. The vegetation of steeper-sided basins (generally those containing permanent water) are characterized by strong zonation, with a border of tall shrubs, such as *Vaccinium corymbosum*, and several essentially concentric bands or zones dominated by different associations, depending on geography. Characteristic species in Massachusetts and Long Island include *Rhexia virginica*, *Cyperus dentatus*, *Gratiola aurea*, *Panicum verrucosum*, *Euthamia caroliniana* (= *Euthamia tenuifolia*), *Carex striata*, *Juncus pelocarpus*, *Rhynchospora capillacea*, *Rhynchospora macrostachya*, *Xyris difformis*, *Fimbristylis autumnalis*, *Scleria reticularis*, *Sabatia kennedyana*, *Drosera filiformis*, *Juncus militaris*, and many others.

Ponds of the New Jersey Pine Barrens share many of these species, with others including *Juncus repens*, *Muhlenbergia torreyi*, *Rhynchospora oligantha*, *Rhynchospora cephalantha*, *Rhynchospora chalarocephala*, and many others. In shallow basins, such strong zonation is generally lacking but still remains evident in some cases. On Cape Cod, Long Island, and New Jersey, this system most often occurs within the pitch pine barrens.

From Cape May and south, the system occurs within an upland matrix of mixed hardwood forests and generally supports a seasonally flooded swamp forest characterized by *Liquidambar styraciflua*, *Acer rubrum*, wetland oaks such as *Quercus phellos*, and in Virginia and scattered locations on the Inner Coastal Plain of Maryland *Nyssa biflora*. The vegetation is characterized by many of the species from New England, New York and New Jersey and also includes *Juncus repens*, *Boltonia asteroides*, *Fimbristylis perpusilla*, *Coelorachis rugosa*, *Dichanthelium spretum*, *Saccharum giganteum*, *Eleocharis quadrangulata*, and others. *Cephalanthus occidentalis* often occurs as scattered individuals or as a shrub swamp with less diversity and cover of Coastal Plain flora.

Classification Comments: In some cases, these are locally known as "Delmarva bays."

Similar Ecological Systems:

- Atlantic Coastal Plain Clay-Based Carolina Bay Wetland (CES203.245)
- Southern Atlantic Coastal Plain Depression Pondshore (CES203.262)

MEMBERSHIP

Associations:

- *Calamagrostis canadensis* - *Dichanthelium meridionale* - (Mixed Shrub) Herbaceous Vegetation (CEGL006243, GNR)
- *Carex striata* var. *brevis* Herbaceous Vegetation (CEGL004120, G3G4)
- *Cephalanthus occidentalis* / *Polygonum hydropiperoides* - *Panicum verrucosum* Shrubland (CEGL006242, G3?)
- *Cladium mariscoides* - *Coelorachis rugosa* Herbaceous Vegetation (CEGL006332, G1)
- *Cladium mariscoides* - *Eleocharis equisetoides* Herbaceous Vegetation (CEGL006016, GNR)
- *Decodon verticillatus* / *Triadenum virginicum* Shrubland (CEGL006087, GNR)
- *Decodon verticillatus* Semipermanently Flooded Shrubland (CEGL005089, GNR)
- *Dulichium arundinaceum* - *Juncus canadensis* - *Juncus pelocarpus* Herbaceous Vegetation (CEGL006415, GNR)
- *Eleocharis* (*obtusata*, *flavescens*) - *Eriocaulon aquaticum* Herbaceous Vegetation (CEGL006261, G3G5)
- *Eleocharis flavescens* - *Xyris difformis* Herbaceous Vegetation (CEGL006400, GNR)
- *Eragrostis hypnoides* - *Ludwigia sphaerocarpa* - *Polygonum hydropiperoides* Herbaceous Vegetation (CEGL006608, GNR)
- *Eriocaulon aquaticum* - *Lobelia dortmanna* Herbaceous Vegetation (CEGL006346, GNR)
- *Fraxinus pennsylvanica* - *Juglans nigra* - *Ulmus americana* / *Cornus amomum* / *Onoclea sensibilis* Forest (CEGL006918, GNR)
- *Juncus militaris* - *Eriocaulon aquaticum* Herbaceous Vegetation (CEGL006345, GNR)
- *Juncus repens* - *Boltonia asteroides* Herbaceous Vegetation (CEGL006610, GNR)
- *Leersia hexandra* - (*Panicum verrucosum*, *Scleria reticularis*) Herbaceous Vegetation [Provisional] (CEGL004047, G2G3)
- *Liquidambar styraciflua* - *Acer rubrum* - *Nyssa biflora* / *Carex jorii* Forest (CEGL006223, G1G2)
- *Liquidambar styraciflua* - *Acer rubrum* - *Quercus phellos* / *Leucothoe racemosa* Forest (CEGL006110, G4G5)
- *Lysimachia terrestris* - *Dulichium arundinaceum* - *Rhexia virginica* Herbaceous Vegetation (CEGL006035, G2G3)
- *Nymphaea odorata* - *Eleocharis robbinsii* Herbaceous Vegetation (CEGL006086, G2)
- *Panicum hemitomon* - *Panicum verrucosum* Herbaceous Vegetation (CEGL006338, GNR)

- *Panicum virgatum* Seasonally Flooded Herbaceous Vegetation (CEGL004128, GNR)
- *Populus heterophylla* - *Acer rubrum* - *Quercus palustris* - *Liquidambar styraciflua* Forest (CEGL006469, GNR)
- *Rhexia virginica* - *Crotalaria sagittalis* Herbaceous Vegetation (CEGL006300, G2)
- *Rhexia virginica* - *Panicum verrucosum* Herbaceous Vegetation (CEGL006264, G2G3)
- *Rhynchospora capitellata* - *Cyperus dentatus* - *Rhexia virginica* - *Xyris difformis* Herbaceous Vegetation (CEGL006210, G2)
- *Rhynchospora capitellata* - *Rhexia virginica* - *Rhynchospora scirpoides* - *Schoenoplectus hallii* Herbaceous Vegetation (CEGL005108, G2?)
- *Saccharum giganteum* - (*Dichantherium spretum*, *Panicum verrucosum*) Herbaceous Vegetation (CEGL006609, G1G2)
- *Spartina pectinata* North Atlantic Coast Herbaceous Vegetation (CEGL006095, GNR)
- *Taxodium distichum* - *Nyssa biflora* Chesapeake Bay Forest (CEGL006214, GNR)
- *Taxodium distichum* - *Taxodium ascendens* / *Panicum hemitomom* - *Sclerolepis uniflora* Woodland (CEGL004465, G1)
- *Taxodium distichum* - *Taxodium ascendens* / *Panicum hemitomom* Woodland (CEGL004466, G3?)
- *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Shrubland (CEGL006371, G4)

Alliances:

- *Acer (rubrum, saccharinum)* - *Ulmus americana* Temporarily Flooded Forest Alliance (A.299)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex striata* Seasonally Flooded Herbaceous Alliance (A.1426)
- *Cephalanthus occidentalis* Seasonally Flooded Shrubland Alliance (A.988)
- *Cladium mariscoides* Saturated Herbaceous Alliance (A.1447)
- *Cladium mariscoides* Seasonally Flooded Herbaceous Alliance (A.1368)
- *Decodon verticillatus* Seasonally Flooded Shrubland Alliance (A.990)
- *Decodon verticillatus* Semipermanently Flooded Shrubland Alliance (A.1013)
- *Dulichium arundinaceum* Seasonally Flooded Herbaceous Alliance (A.1398)
- *Eleocharis* spp. - *Eriocaulon aquaticum* Semipermanently Flooded Herbaceous Alliance (A.1429)
- *Eragrostis hypnoides* - *Lipocarpa micrantha* - *Micranthemum umbrosum* Seasonally Flooded Herbaceous Alliance (A.1816)
- *Juncus militaris* Semipermanently Flooded Herbaceous Alliance (A.1430)
- *Juncus repens* - *Eleocharis microcarpa* Seasonally Flooded Herbaceous Alliance (A.1376)
- *Liquidambar styraciflua* - (*Acer rubrum*) Seasonally Flooded Forest Alliance (A.321)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Panicum hemitomom* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Panicum virgatum* Seasonally Flooded Herbaceous Alliance (A.1362)
- *Rhynchospora* spp. - *Panicum (rigidulum, verrucosum)* - *Rhexia virginica* Seasonally Flooded Herbaceous Alliance (A.1384)
- *Spartina pectinata* Temporarily Flooded Herbaceous Alliance (A.1347)
- *Taxodium distichum* - (*Taxodium ascendens*) Seasonally Flooded Lakeshore Woodland Alliance (A.652)
- *Taxodium distichum* - *Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337)
- *Vaccinium formosum* - *Vaccinium fuscatum* - *Vaccinium corymbosum* Seasonally Flooded Shrubland Alliance (A.992)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269)

DISTRIBUTION

Range: This system ranges from the southern portion of the Delmarva peninsula to Cape Cod, Massachusetts, and also in limited, highly disjunct occurrences on sand lakeplain near southern Lake Michigan and in southeastern Vermont.

Divisions: 202:C; 203:C

Nations: US

Subnations: DE, MA, MD, MI, NJ, NY, VA, VT, WI

Map Zones: 49:?, 51:C, 60:C, 63:P, 64:P, 65:C

USFS Ecomap Regions: 212T:CC, 222J:CC, 222R:CC

TNC Ecoregions: 48:C, 58:C, 61:C, 62:C

SOURCES

References: Comer et al. 2003, Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723074#references

Description Author: SC. Gawler, R. Evans, L. Sneddon, M. Pyne

Version: 02 Feb 2007

Concept Author: SC. Gawler, R. Evans, L. Sneddon, M. Pyne

Stakeholders: East, Midwest, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN SEAGRASS BED (CES203.246)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Saltwater (Polyhaline); Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9273

CONCEPT

Summary: This ecological system represents submerged aquatic vegetation found in marine environments from Chesapeake Bay northward to the Maine coast. In contrast to Atlantic Coastal Plain Embayed Region Seagrass Bed (CES203.243) to the south, which can be generally characterized as *Zostera - Halodule*, this system is more typically characterized as *Zostera - Ruppia* (Thayer et al. 1984). A host of marine algae is also an important component of this system.

Similar Ecological Systems:

- Atlantic Coastal Plain Embayed Region Seagrass Bed (CES203.243)

DESCRIPTION

Environment: Found in quiet, polyhaline waters of tidal embayments where saline fluctuations are relatively minor (Edinger et al. 2002).

Vegetation: The vegetation dominants are *Zostera* and *Ruppia* (Thayer et al. 1984) with some segregation along salinity gradients. *Zostera marina* is dominant in the most saline areas, while *Ruppia* tends to be most common in somewhat less saline water (Edinger et al. 2002) of the bay where salinity is highest. However, mixed beds of the two species do occur. Thayer et al. (1984) point out that these mixed beds of *Zostera* and *Ruppia* vary in seasonal dominance, with *Ruppia* largely replacing *Zostera* during the midsummer. A diverse array of algae are also present (Edinger et al. 2002).

Dynamics: The dynamics of tidal, aquatic communities dominated by vascular plants are complex and poorly understood. The distribution and abundance of vascular plants in these habitats are probably controlled by responses to water chemistry, water clarity and light penetration, the impact of currents and boat wakes, and herbivory by aquatic animals (Fleming et al. 2001).

MEMBERSHIP

Associations:

- *Ruppia maritima* Acadian/Virginian Zone Temperate Herbaceous Vegetation (CEGL006167, GNR)
- *Zostera marina* Herbaceous Vegetation (CEGL004336, G4G5)

Alliances:

- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Zostera marina* Permanently Flooded - Tidal Herbaceous Alliance (A.1766)

DISTRIBUTION

Range: The southern boundary may need clarification. The conceptual boundary occurs where *Halodule* beds become important; it is presumed that this transition occurs at or around Cape Hatteras, North Carolina.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NH, NJ, NY, RI, VA

Map Zones: 60:C, 65:C, 66:C

TNC Ecoregions: 57:C, 58:C, 62:C

SOURCES

References: Comer et al. 2003, Edinger et al. 2002, Fleming et al. 2001, Orth and Moore 1988, Thayer et al. 1984

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723239#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN SUBTIDAL AQUATIC BED (CES203.521)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9280

CONCEPT

Summary: This system represents submerged aquatic beds of brackish - freshwater tidal upper bays, rivers, and tributaries, ranging from Chesapeake Bay northward to the Massachusetts coast. Typical species include *Stuckenia pectinata*, *Potamogeton perfoliatus*, *Zannichellia palustris*, and others.

DESCRIPTION

Vegetation: Typical species in examples of this system include *Stuckenia pectinata*, *Potamogeton perfoliatus*, *Zannichellia palustris*, and others.

MEMBERSHIP

Associations:

- *Ceratophyllum demersum* - *Vallisneria americana* - *Najas* spp. Tidal Herbaceous Vegetation (CEGL006048, GNR)
- *Potamogeton* spp. - *Ceratophyllum demersum* - *Crassula aquatica* Herbaceous Vegetation (CEGL006340, GNR)
- *Stuckenia pectinata* - *Potamogeton perfoliatus* - (*Zannichellia palustris*) Tidal Herbaceous Vegetation (CEGL006027, G3G5)

Alliances:

- *Ceratophyllum demersum* Permanently Flooded - Tidal Herbaceous Alliance (A.1767)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Stuckenia pectinata* - *Zannichellia palustris* Permanently Flooded - Tidal Herbaceous Alliance (A.1768)

DISTRIBUTION

Range: Ranges from Chesapeake Bay northward to the Massachusetts coast.

Divisions: 203:C

Nations: US

Subnations: VA

Map Zones: 60:C

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723071#references

Description Author: R. Evans

Version: 25 Aug 2004

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN TIDAL SALT MARSH (CES203.519)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: North Atlantic Coastal Plain; Tidal / Estuarine; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9282

CONCEPT

Summary: This system encompasses the mesohaline to saline intertidal marshes of the North Atlantic Coastal Plain, ranging from Chesapeake Bay north to Cape Cod, Massachusetts, and sporadically to the southern Maine coast. It includes a number of different broad vegetation types including salt pannes, salt marshes, and salt shrublands. This system occurs on the bay side of barrier beaches and the outer mouth of tidal rivers where salinity is not much diluted by freshwater input. The typical salt marsh profile, from sea to land, can be summarized as follows: a low regularly flooded marsh strongly dominated by *Spartina alterniflora*; a higher irregularly flooded marsh dominated by *Spartina patens* and *Distichlis spicata*; low hypersaline pannes characterized by *Salicornia* spp.; and a salt scrub ecotone characterized by *Iva frutescens*, *Baccharis halimifolia*, and *Panicum virgatum*. Salt marsh "islands" of slightly higher elevation also support *Juniperus virginiana*. This system also includes the rare sea-level fen vegetation, which occurs at the upper reaches of the salt marsh where groundwater seepage creates a freshwater fen.

Classification Comments: A continuous gradation in salinity presents challenges in separating salt from brackish marsh systems. This system is defined by its landscape position in saltwater bays and outer river mouths as well as actual salinity ranges. Moving up a tidal river, brackish marshes have less cover of *Spartina patens* and increased cover of associated species including tall graminoids such as *Schoenoplectus americanus* and *Typha angustifolia*. Further southward along the East Coast, salt and brackish marshes fall within the same system because the differences in hydrodynamics and landforms in that region produce less distinct habitats.

MEMBERSHIP

Associations:

- *Baccharis halimifolia* - *Iva frutescens* / *Panicum virgatum* Shrubland (CEGL003921, G5)
- *Cladium mariscoides* - *Drosera intermedia* - *Eleocharis rostellata* Herbaceous Vegetation (CEGL006310, G1)
- *Eleocharis rostellata* - *Spartina patens* Herbaceous Vegetation (CEGL006611, GNR)
- *Juncus roemerianus* Herbaceous Vegetation (CEGL004186, G5)
- *Juniperus virginiana* var. *virginiana* / *Morella pensylvanica* Woodland (CEGL006212, G2)
- *Myrica gale* - *Chamaedaphne calyculata* / *Carex exilis* Shrub Herbaceous Vegetation (CEGL006392, GNR)
- *Panicum virgatum* - *Spartina patens* Herbaceous Vegetation (CEGL006150, GNR)
- *Peltandra virginica* - *Schoenoplectus (pungens, tabernaemontani)* Tidal Herbaceous Vegetation [Provisional] (CEGL006578, GNR)
- *Phragmites australis* Eastern North America Temperate Semi-natural Herbaceous Vegetation (CEGL004141, GNA)
- *Phragmites australis* Tidal Herbaceous Vegetation (CEGL004187, GNA)
- *Pinus taeda* / *Morella cerifera* / *Spartina patens* Tidal Woodland (CEGL006849, GNR)
- *Ruppia maritima* - *Schoenoplectus maritimus* Herbaceous Vegetation (CEGL006370, GNR)
- *Salicornia (virginica, bigelovii, maritima)* - *Spartina alterniflora* Herbaceous Vegetation (CEGL004308, G5)
- *Spartina alterniflora* - *Distichlis spicata* Tidal Herbaceous Vegetation [Provisional] (CEGL006586, GNR)
- *Spartina alterniflora* / (*Ascophyllum nodosum*) Acadian/Virginian Zone Herbaceous Vegetation (CEGL004192, G5)
- *Spartina patens* - *Distichlis spicata* - (*Juncus gerardii*) Herbaceous Vegetation (CEGL006006, G5)
- *Spartina patens* - *Distichlis spicata* - (*Juncus roemerianus*) Herbaceous Vegetation (CEGL004197, G4G5)
- *Typha angustifolia* - *Hibiscus moscheutos* Herbaceous Vegetation (CEGL004201, G4G5)

Alliances:

- *Baccharis halimifolia* - *Iva frutescens* Tidal Shrubland Alliance (A.1023)
- *Chamaedaphne calyculata* / *Carex lasiocarpa* Saturated Shrub Herbaceous Alliance (A.1557)
- *Cladium mariscoides* Saturated Herbaceous Alliance (A.1447)
- *Eleocharis fallax* - *Eleocharis rostellata* Tidal Herbaceous Alliance (A.1474)
- *Juncus roemerianus* Tidal Herbaceous Alliance (A.1475)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Panicum virgatum* Tidal Herbaceous Alliance (A.1476)
- *Peltandra virginica* - *Pontederia cordata* Tidal Herbaceous Alliance (A.1703)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Phragmites australis* Tidal Herbaceous Alliance (A.1477)
- *Pinus taeda* Woodland Alliance (A.526)

- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Sarcocornia perennis* - (*Distichlis spicata*, *Salicornia* spp.) Tidal Herbaceous Alliance (A.1704)
- *Spartina alterniflora* Tidal Herbaceous Alliance (A.1471)
- *Spartina patens* - (*Distichlis spicata*) Tidal Herbaceous Alliance (A.1481)
- *Typha* (*angustifolia*, *domingensis*) Tidal Herbaceous Alliance (A.1472)

DISTRIBUTION

Range: This system is found from the southern Maine coast south to the Chesapeake Bay.

Divisions: 202:C; 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NH, NJ, NY, RI, VA

Map Zones: 60:C, 65:C, 66:C

TNC Ecoregions: 58:C, 62:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723073#references

Description Author: R. Evans, mod. S.C. Gawler

Version: 12 Oct 2004

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN GULF OF MEXICO SEAGRASS BED (CES203.263)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9267

CONCEPT

Summary: Northern Gulf of Mexico seagrass beds are found behind protective barrier islands and in near-shore areas ranging about 560 km (350 miles) from the panhandle of Florida (approximately St. Marks National Wildlife Refuge, Lighthouse Point) westward to Mississippi. Within this area, the drowned alluvial plain and barriers protect the seagrass beds from normal storm surges; such protection is absent in the region immediately to the east. However, such protection alone is insufficient to allow for development of expansive beds. The total acreage of submerged vegetation in this region is relatively small, and individual patches rarely exceed several thousand acres. Beds are locally abundant in St. Joseph Bay, St. Andrews Bay, Santa Rosa Sound, Perdido Bay, Mississippi Sound, and Chandeleur Islands. Of the true seagrasses, *Ruppia maritima* displays the most tolerance to freshwater and consequently is an important component of this system. *Vallisneria americana*, which is not often considered a true seagrass, is a component of this system due to the prevalence of oligohaline waters. The other species, *Halodule*, *Thalassia*, and *Cymodocea*, are also present, usually in monospecific, typically small beds.

Similar Ecological Systems:

- East Gulf Coastal Plain Florida Big Bend Seagrass Bed (CES203.244)
- Southwest Florida Seagrass Bed (CES203.274)

Related Concepts:

- Seagrass Bed (FNAI 1990) Broader

DESCRIPTION

Environment: The largely temperate climate of the region tests the limits of many of the seagrass species which attain their best development in tropical climates. Further, the prevalence of sandy substrates is not optimal for rooting of most species which prefer softer, even mucky sediments. Finally, salinity in this region is dramatically affected by freshwater inputs from the Apalachicola, Mobile, and the Mississippi rivers, in the vicinity of which seagrasses are generally absent. Although most seagrasses are able to tolerate fluctuations in salinity, optimum salt concentrations vary by species. Long periods of exposure to freshwater kill seagrass leaves, rhizomes, and eventually decimate the entire plant (Wieland 1994a). Due to the large freshwater inputs in this system, *Vallisneria americana*, which is not often considered a true seagrass, is a component of this system, found in oligohaline waters.

Dynamics: *Thalassia* and *Cymodocea* do not grow in areas with low salinity levels (less than 17 ppt); significant leaf loss can occur at these levels. *Thalassia* does not photosynthesize well in less than full strength sea water (Zieman and Zieman 1989). Both species may be more damaged by the effects of freshwater runoff resulting from hurricanes than from high winds and tidal surges (Thomas et al. 1961).

MEMBERSHIP

Associations:

- *Cymodocea filiformis* - (*Thalassia testudinum*) Herbaceous Vegetation (CEGL004317, G4?)
- *Halodule beaudettei* Herbaceous Vegetation (CEGL004318, G4?)
- *Ruppia maritima* Louisianian Zone Herbaceous Vegetation (CEGL004450, G4G5)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)
- *Vallisneria americana* Estuarine Bayou Herbaceous Vegetation (CEGL004634, G3G5)

Alliances:

- *Cymodocea filiformis* Permanently Flooded - Tidal Herbaceous Alliance (A.1732)
- *Halodule beaudettei* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Ruppia maritima* Permanently Flooded - Tidal Temperate Herbaceous Alliance (A.1769)
- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)
- *Vallisneria americana* Permanently Flooded - Tidal Herbaceous Alliance (A.1770)

DISTRIBUTION

Range: Northern Gulf of Mexico seagrass beds range from the panhandle of Florida (approximately St. Marks National Wildlife Refuge, Lighthouse Point) westward to Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C
TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, Thomas et al. 1961, Wieland 1994a, Zieman and Zieman 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723223#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH FLORIDA DEPRESSION PONDShORE (CES411.054)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9228

CONCEPT

Summary: This system occupies shallow depressional wetlands in southern and south-central Florida. As currently defined, this system includes a variety of wetlands occupying somewhat different environments. Included for now in this concept are isolated drainages or seasonal ponds as well as solution holes (may have only subsurface or historic water presence), and possibly the shores of large natural lakes. Examples found in these different environments tend to have obviously different landscape contexts, and often different floristics. For instance, examples embedded in Florida Dry Prairie (CES203.380) and/or South Florida Pine Flatwoods (CES411.381) tend to display distinct vegetation zones (Winchester et al. 1985, Huffman and Judd 1998). In contrast, solution holes embedded in South Florida Pine Rockland (CES411.367) and/or South Florida Hardwood Hammock (CES411.287) are small (may be less than 1 to 15 m across and less than 1 to 3+ m deep) and therefore tend to lack zonal vegetation (M. Fellows pers. comm.). More detailed information is needed on the range of vegetation present across this system. Huffman and Judd (1998) provide information on some examples of this system in southwestern Florida.

Classification Comments: Examples of South Florida Slough, Gator Hole, and Willow Head (CES411.485) are generally larger and deeper water wetlands, usually connected with distinct drainageways.

Similar Ecological Systems:

- South Florida Slough, Gator Hole, and Willow Head (CES411.485)

Related Concepts:

- Depression Marsh (FNAI 1990) Broader

DESCRIPTION

Vegetation: According to Huffman and Judd (1998), some examples of this system tend to display distinct vegetation zones [see also Winchester et al. (1985)]. In these cases, *Aristida palustris* is characteristic and possibly *Hypericum fasciculatum*, depending upon fire history. A large number of other wetland species may be present, such as *Xyris jupicai*, *Rhexia cubensis*, *Rhynchospora filifolia*, and others. Deeper zones dominated by *Pontederia cordata*, as well as "heads" of woody species (*Cephalanthus occidentalis*, *Salix caroliniana*, *Persea palustris*), also may be present. More floristic information is needed from examples of this system found in other parts of south Florida.

MEMBERSHIP

Associations:

- *Eleocharis interstincta* - *Pontederia cordata* - *Crinum americanum* Herbaceous Vegetation (CEGL003975, G2G3)
- *Panicum hemitomon* Tropical Herbaceous Vegetation (CEGL003980, G3?)
- *Schoenoplectus tabernaemontani* Tropical Herbaceous Vegetation (CEGL003986, G3G5)
- *Typha domingensis* - *Pontederia cordata* Herbaceous Vegetation (CEGL003988, G3?)
- *Zizaniopsis miliacea* Subtropical Herbaceous Vegetation (CEGL003989, G2G4Q)

Alliances:

- *Eleocharis interstincta* - *Sagittaria lancifolia* Seasonally Flooded Herbaceous Alliance (A.1159)
- *Panicum hemitomon* Seasonally Flooded Tropical Herbaceous Alliance (A.1162)
- *Schoenoplectus tabernaemontani* Semipermanently Flooded Tropical Herbaceous Alliance (A.1173)
- *Typha domingensis* Semipermanently Flooded Tropical Herbaceous Alliance (A.1175)
- *Zizaniopsis miliacea* Semipermanently Flooded Subtropical Herbaceous Alliance (A.1176)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Florida Dry Prairie (CES203.380)
- South Florida Hardwood Hammock (CES411.287)
- South Florida Pine Flatwoods (CES411.381)
- South Florida Pine Rockland (CES411.367)

Adjacent Ecological System Comments: May be embedded in Florida Dry Prairie (CES203.380), South Florida Pine Flatwoods (CES411.381), South Florida Pine Rockland (CES411.367) and/or South Florida Hardwood Hammock (CES411.287).

DISTRIBUTION

Range: Endemic to south Florida.

Divisions: 411:C

Nations: US
Subnations: FL
Map Zones: 56:C
TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Fellows pers. comm., Huffman and Judd 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722656#references

Description Author: R. Evans

Version: 25 Aug 2003

Concept Author: R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

1483 SOUTH FLORIDA EVERGLADES SAWGRASS MARSH (CES411.286)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Extensive Wet Flat; Graminoid

Non-Diagnostic Classifiers: Herbaceous

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2483; ESLF 9204; ESP 1483

CONCEPT

Summary: This marsh system was a dominant type throughout much of the Everglades region of southeastern Florida. It consists largely of herbaceous marsh vegetation across a range of soil and hydrologic conditions, but generally falls within conditions outlined by Duever et al. (1986), i.e., hydroperiod of 225-275 days per year, maximum wet-season water level of 40 cm., and occurrence on peat soils. Several individual marsh community associations have been recognized based on species composition, structure, and aspect. Variations are largely due to the interrelated effects of fire, soils, and hydroperiod. Sawgrass beds or "glades" may have been the single most extensive component of this system (Hilsenbeck et al. 1979), and large areas may have the appearance of nearly monotypic stands of *Cladium mariscus ssp. jamaicense*. However, local variation in composition and stature are also often apparent. For example, two broad aspect types of *Cladium* marsh are often recognized based on density and/or height (Kushlan 1990, Gunderson and Loftus 1993) with denser and taller stands typically occurring on higher topographic positions and deeper organic soils, while sparser, shorter stands occur in lower topography on shallower soils. In addition, other marsh types are also interfingering in the sawgrass matrix where wetter depressions are found and/or where fires have burned away peat soils.

Classification Comments: The term "wet prairie" has often been used to describe a variety of marsh types which are included in the concept of this system. We follow the definition of Duever et al. (1986) in which prairies occupy mineral soils and marshes occupy peats. The community components of these systems are largely based on Davis (1943) and Hilsenbeck et al. (1979). Open and emergent marshes of the region are generally covered by South Florida Slough, Gator Hole, and Willow Head (CES411.485); these are generally small patches included in the sawgrass matrix.

Similar Ecological Systems:

- South Florida Slough, Gator Hole, and Willow Head (CES411.485)
- South Florida Wet Marl Prairie (CES411.370)

Related Concepts:

- Swale (FNAI 1990) Equivalent

DESCRIPTION

Environment: A range of conditions are present. Soils vary from shallow marl to relatively deep peat. Hydroperiod ranges from 5-12 months. The effect of fire is influenced by both factors and affects them in turn. For example, peat accumulates in the absence of fire, but under certain conditions, fires may burn away accumulated sawgrass peat resulting in a thin, residual, marly soil and relative increase of effective water depth (resulting in community change).

Vegetation: Marsh communities present in this system include tall and short-statured *Cladium mariscus ssp. jamaicense*, spikerush - beaksedge flats, and maidencane flats. In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

Dynamics: In the absence of fire, portions of stands will become dominated by *Salix caroliniana*. If fire continues to be absent, these areas may succeed to *Acer rubrum* until a replacement fire or mechanical activity restores the marsh.

MEMBERSHIP

Associations:

- Algal periphyton Nonvascular Vegetation (CEGL004390, G3?)
- *Cladium mariscus ssp. jamaicense* - *Bacopa caroliniana* Herbaceous Vegetation (CEGL003969, G3)
- *Cladium mariscus ssp. jamaicense* / Algal periphyton Herbaceous Vegetation (CEGL003970, G2?)
- *Eleocharis cellulosa* - *Rhynchospora tracyi* / (Algal Periphyton) Herbaceous Vegetation (CEGL003973, G2G3)
- *Panicum hemitomon* Tropical Herbaceous Vegetation (CEGL003980, G3?)
- *Salix caroliniana* / *Bacopa caroliniana* - *Blechnum serrulatum* Forest (CEGL007409, G2?)

Alliances:

- *Algal periphyton* Seasonally Flooded Nonvascular Alliance (A.1830)
- *Cladium mariscus ssp. jamaicense* Seasonally Flooded Tropical Herbaceous Alliance (A.1157)
- *Eleocharis cellulosa* - (*Rhynchospora tracyi*) Seasonally Flooded Herbaceous Alliance (A.1158)
- *Panicum hemitomon* Seasonally Flooded Tropical Herbaceous Alliance (A.1162)
- *Salix caroliniana* Seasonally Flooded Forest Alliance (A.332)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South Florida Slough, Gator Hole, and Willow Head (CES411.485)

DISTRIBUTION

Range: This system is endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Davis 1943, Duever et al. 1986, Gunderson and Loftus 1993, Hilsenbeck et al. 1979, Kushlan 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723202#references

Description Author: R. Evans, mod. M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH FLORIDA SLOUGH, GATOR HOLE, AND WILLOW HEAD (CES411.485)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: >180-day hydroperiod; Woody-Herbaceous; Herbaceous; Depressional [Peaty]

National Mapping Codes: ESLF 9407

CONCEPT

Summary: This system includes a series of wetlands of southern Florida, ranging in physiognomy from open and herbaceous-dominated to tree-dominated patches, including nearly monospecific stands of *Salix caroliniana* (Davis 1943, Loveless 1959, Craighead 1971). These wetlands hold water for much of the year and have some of the longest hydroperiods (8-12 months) in a region characterized by wetlands. Most are maintained, at least historically, by American alligators. Alligators were such a dominant disturbance force in many plant communities of south Florida that their role has been compared with that of bison in the prairies (Craighead 1971). Through constant movement, they create numerous small pools and ponds (analogous to buffalo wallows) as well as trails to and from these pools through sawgrass marshes. These paths eventually widen and deepen into creeks. Many of these small freshwater creeks have been invaded by mangroves and hardwoods, including *Salix caroliniana*, in the absence of fire and with decreases in alligator populations (Craighead 1971). Some emergent wetlands included within the concept of this system may also have originated from soil and topographic changes in former sawgrass marshes following severe fires that consume organic substrate and decrease soil elevation (Gunderson and Loope 1982b). One component of this system (″ heads″ may originate as circular or oval-shaped solution holes or basins, being maintained and possibly enhanced by the alligator activity. Without this activity, there would be a tendency for the hole or basin to fill with organic material and succeed to other systems. Soils are mucky peats. In addition, *Salix caroliniana* seeds are readily dispersed by wind and may rapidly colonize wet depressions and disturbed areas. In the absence of fire and disturbance, these areas may remain in a forested condition. Otherwise, they would cycle between different physiognomic states, including sawgrass marsh.

Similar Ecological Systems:

- Florida River Floodplain Marsh (CES203.055)
- Floridian Highlands Freshwater Marsh (CES203.077)
- South Florida Depression Pondshore (CES411.054)
- South Florida Everglades Sawgrass Marsh (CES411.286)
- South Florida Pond-apple/Popash Slough (CES411.486)

Related Concepts:

- Slough (FNAI 1990) Broader

DESCRIPTION

Environment: Examples of this system may originate as solution holes in sawgrass marsh, with a longer hydroperiod, but expand and contract in size and extent with disturbance, including fire and American alligator activity. Some examples are directly caused by alligator activity and/or the effect of severe fire in sawgrass marshes, South Florida Everglades Sawgrass Marsh (CES411.286) (Craighead 1971, Hilsenbeck et al. 1979). At least some examples attributed to this system occupy "marshes" with long hydroperiods (8-12 months) and deep organic soils (Hilsenbeck et al. 1979).

Vegetation: A number of discrete communities may be recognized as part of this system. Two of the most common types can be considered cattail marshes and flag - pickerelweed communities (Hilsenbeck et al. 1979). Also included are nearly monospecific stands of *Salix caroliniana* (Davis 1943, Loveless 1959, Craighead 1971) called "willow heads."

Dynamics: The American Alligators was a dominant force that helped maintain this system, at least historically. Their role has been compared with that of bison in the prairies (Craighead 1971). Through constant movement they create numerous small pools and ponds (analogous to buffalo wallows) as well as trails to and from these pools through sawgrass marshes. These paths eventually widen and deepen into creeks. Many of these small freshwater creeks have been invaded by mangroves and hardwoods in the absence of fire and decrease in Alligator populations (Craighead 1971). Other examples of this system may have originated following severe fires in former sawgrass marshes (Gunderson and Loope 1982).

MEMBERSHIP

Associations:

- *Najas guadalupensis* - *Ceratophyllum demersum* - *Utricularia inflata* Herbaceous Vegetation (CEGL004313, G2G4)
- *Nuphar lutea* ssp. *advena* / *Chara* sp. Tropical Herbaceous Vegetation (CEGL004315, G2G3)
- *Nymphaea odorata* Tropical Herbaceous Vegetation (CEGL004316, G4?)
- *Pistia stratiotes* Herbaceous Vegetation (CEGL004902, G4?)
- *Pontederia cordata* Tropical Herbaceous Vegetation (CEGL004261, G3G4)
- *Sabal palmetto* - *Quercus virginiana* - *Ulmus americana* - *Ficus aurea* / *Acrostichum danaeifolium* - *Nephrolepis exaltata* Forest (CEGL004409, G2?)

- *Sagittaria lancifolia* Herbaceous Vegetation (CEGL004262, G3?Q)
- *Salix caroliniana* / *Bacopa caroliniana* - *Blechnum serrulatum* Forest (CEGL007409, G2?)
- *Schoenoplectus tabernaemontani* Tropical Herbaceous Vegetation (CEGL003986, G3G5)
- *Thalia geniculata* - *Pontederia cordata* Herbaceous Vegetation (CEGL004264, G2)
- *Typha domingensis* - *Pontederia cordata* Herbaceous Vegetation (CEGL003988, G3?)
- *Zizaniopsis miliacea* Subtropical Herbaceous Vegetation (CEGL003989, G2G4Q)

Alliances:

- *Najas guadalupensis* - *Ceratophyllum demersum* - *Utricularia inflata* Permanently Flooded Herbaceous Alliance (A.1720)
- *Nuphar lutea* Permanently Flooded Tropical Herbaceous Alliance (A.1723)
- *Nymphaea odorata* Permanently Flooded Tropical Herbaceous Alliance (A.1725)
- *Pistia stratiotes* Permanently Flooded Herbaceous Alliance (A.1727)
- *Pontederia cordata* Semipermanently Flooded Tropical Herbaceous Alliance (A.1587)
- *Sabal palmetto* - *Quercus laurifolia* - *Quercus virginiana* - *Magnolia virginiana* - *Ulmus americana* Saturated Forest Alliance (A.380)
- *Sagittaria lancifolia* Semipermanently Flooded Herbaceous Alliance (A.1588)
- *Salix caroliniana* Seasonally Flooded Forest Alliance (A.332)
- *Schoenoplectus tabernaemontani* Semipermanently Flooded Tropical Herbaceous Alliance (A.1173)
- *Thalia geniculata* Semipermanently Flooded Herbaceous Alliance (A.1589)
- *Typha domingensis* Semipermanently Flooded Tropical Herbaceous Alliance (A.1175)
- *Zizaniopsis miliacea* Semipermanently Flooded Subtropical Herbaceous Alliance (A.1176)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South Florida Everglades Sawgrass Marsh (CES411.286)

Adjacent Ecological System Comments: This system is generally embedded in a matrix of South Florida Everglades Sawgrass Marsh (CES411.286).

DISTRIBUTION

Range: This system is endemic to south Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Craighead 1971, Davis 1943, Gunderson and Loope 1982b, Hilsenbeck et al. 1979, Loveless 1959, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723101#references

Description Author: R. Evans and C. Nordman, mod. M. Pyne

Version: 02 Feb 2007

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

1484 SOUTH FLORIDA WET MARL PRAIRIE (CES411.370)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Graminoid

Non-Diagnostic Classifiers: Herbaceous; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2484; ESLF 9205; ESP 1484

CONCEPT

Summary: This system includes marl prairies of the southern Florida Everglades region and related vegetation of the Florida Keys. This system occurs only on shallower soils with bedrock close to the surface (Gunderson and Loftus 1993). Composition and variability in this system is heavily influenced by hydrology, with the predominant community types occurring on seasonally flooded (3-7 months per year) soils; with diminished hydroperiod species composition changes (Hilsenbeck et al. 1979). Possibly the most unique vegetational component are small-patch communities found on elevated areas of oolitic rocks referred to as pinnacle rock (Gunderson and Loftus 1993) or table rock (Hilsenbeck et al. 1979). This system also includes embedded solution holes (depressions formed from limestone collapse).

Classification Comments: Plant community components have been variously and often confusingly described. For example, the term wet prairie has often been used to describe a variety of marsh types which are NOT included in the concept of this system [see South Florida Everglades Sawgrass Marsh (CES411.286)]. We follow the definition of Duever et al. (1986) in which prairies occupy mineral soils and marshes occupy peats.

Similar Ecological Systems:

- South Florida Everglades Sawgrass Marsh (CES411.286)

Related Concepts:

- Marl Prairie (FNAI 1990) Broader

MEMBERSHIP

Associations:

- *Croton linearis* - *Morinda umbellata* / *Sporobolus* spp. - *Panicum* spp. Shrub Herbaceous Vegetation (CEGL003999, G1)
- *Muhlenbergia filipes* - *Andropogon glomeratus* var. *pumilus* - *Saccharum giganteum* Herbaceous Vegetation (CEGL003977, GNA)
- *Muhlenbergia filipes* - *Rhynchospora microcarpa* - *Centella erecta* Herbaceous Vegetation (CEGL003978, G2)

Alliances:

- *Muhlenbergia filipes* Seasonally Flooded Tropical Herbaceous Alliance (A.1161)
- *Sporobolus* spp. - *Panicum* spp. Shrub Herbaceous Alliance (A.1184)

DISTRIBUTION

Range: Southern Florida Everglades region and related vegetation of the Florida Keys.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Duever et al. 1986, Gunderson and Loftus 1993, Hilsenbeck et al. 1979

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723146#references

Description Author: R. Evans

Version: 14 Dec 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHEASTERN COASTAL PLAIN INTERDUNAL WETLAND (CES203.258)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional; Coast

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9257

CONCEPT

Summary: This system encompasses the wettest dune swales and basins on barrier islands and coastal areas, supporting pond or marsh-like vegetation, from the Coastal Plain of Texas to Virginia. Most examples are permanently or semipermanently flooded with freshwater but are affected by salt spray or overwash during periodic storm events. It is broadly defined in terms of floristic composition and is wide-ranging throughout the southeastern Coastal Plain of the United States.

Classification Comments: This system is currently defined with a much broader geographic range than most other coastal systems in the Southeast. The extreme variability within even a limited geographic range limits the ability to find broader vegetational patterns. Examples may vary regionally with regard to the amount of wind or salt spray and the texture of the sand. The northern end of the range is not clearly defined.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.264)
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)

Related Concepts:

- Coastal Interdunal Swale (FNAI 1990) Intersecting

DESCRIPTION

Environment: Occurs on barrier islands and similar immediate coastal areas, in dune swales or other basins. The ponds have standing water well into the growing season, and most are permanently flooded. The water is from rainfall or the local water table and is fresh, except perhaps during storm events that produce overwash. Soils are sand, sometimes with a thin layer of muck accumulated in the pond.

Vegetation: Vegetation is characterized by emergent or drawdown wetland plants, often tall graminoids. Vegetation varies substantially from one example to the next.

Dynamics: This system occurs in a geologically dynamic environment, where wind and waves may change landforms quickly. However, ponds usually occur in stable portions of islands, where they may last for decades. Salt spray, salt overwash, and heavy rainfall from storms may affect component communities, limiting vegetation to species that are somewhat salt-tolerant.

MEMBERSHIP

Associations:

- (*Morella cerifera*) - *Panicum virgatum* - *Spartina patens* Herbaceous Vegetation (CEGL004129, G2G4)
- (*Stillingia aquatica*) / *Panicum tenerum* - *Dichantherium erectifolium* Herbaceous Vegetation (CEGL004954, G2?)
- *Carex hyalinolepis* Seasonally Flooded Herbaceous Vegetation (CEGL004724, G1G3)
- *Cladium mariscus* ssp. *jamaicense* - *Woodwardia virginica* Herbaceous Vegetation (CEGL004949, G2?)
- *Decodon verticillatus* Semipermanently Flooded Shrubland (CEGL005089, GNR)
- *Eleocharis elongata* - *Panicum tenerum* - *Nymphaea odorata* Herbaceous Vegetation (CEGL004961, G2?)
- *Fimbristylis castanea* - *Paspalum distichum* Herbaceous Vegetation (CEGL004110, G3)
- *Fimbristylis castanea* - *Schoenoplectus pungens* Seasonally Flooded Herbaceous Vegetation (CEGL003790, GNR)
- *Fuirena scirpoidea* - *Fuirena longa* - *Rhynchospora microcarpa* - *Rhynchospora divergens* Herbaceous Vegetation (CEGL004952, G2)
- *Hypericum reductum* - *Licania michauxii* / *Andropogon capillipes* - *Polygonella gracilis* - *Xyris caroliniana* Dwarf-shrubland (CEGL003953, G2)
- *Morella cerifera* - *Vaccinium corymbosum* Shrubland (CEGL003906, G2G4)
- *Panicum hemitomon* - (*Cladium mariscus* ssp. *jamaicense*, *Muhlenbergia filipes*) Herbaceous Vegetation (CEGL007716, G2G3)
- *Paspalum vaginatum* Herbaceous Vegetation (CEGL004114, G3G4)
- *Phragmites australis* Eastern North America Temperate Semi-natural Herbaceous Vegetation (CEGL004141, GNA)
- *Spartina bakeri* - *Muhlenbergia filipes* - *Andropogon glomeratus* - *Rhynchospora colorata* Herbaceous Vegetation (CEGL004511, G3?)
- *Spartina patens* - *Fimbristylis (caroliniana, castanea)* - (*Panicum virgatum*) Herbaceous Vegetation (CEGL007836, G2G3)
- *Typha domingensis* - *Setaria magna* Herbaceous Vegetation (CEGL004138, G2G3)
- *Typha domingensis* Seasonally Flooded Gulf Coastal Plain Herbaceous Vegetation (CEGL004137, G3?)

Alliances:

- *Carex hyalinolepis* Seasonally Flooded Herbaceous Alliance (A.1366)
- *Cladium mariscus* ssp. *jamaicense* Seasonally Flooded Temperate Herbaceous Alliance (A.1369)
- *Decodon verticillatus* Semipermanently Flooded Shrubland Alliance (A.1013)
- *Dichantheium (erectifolium, wrightianum) - Rhynchospora filifolia* Seasonally Flooded Herbaceous Alliance (A.1370)
- *Eleocharis (elongata, equisetoides) - Rhynchospora tracyi* Semipermanently Flooded Herbaceous Alliance (A.1428)
- *Fimbristylis castanea - Schoenoplectus pungens* Seasonally Flooded Herbaceous Alliance (A.1372)
- *Fuirena scirpoidea - Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1373)
- *Hypericum reductum* Temporarily Flooded Dwarf-shrubland Alliance (A.1088)
- *Morella (cerifera, pensylvanica) - Vaccinium formosum* Seasonally Flooded Shrubland Alliance (A.1010)
- *Panicum hemitomon* Seasonally Flooded Temperate Herbaceous Alliance (A.1379)
- *Panicum virgatum* Seasonally Flooded Herbaceous Alliance (A.1362)
- *Paspalum vaginatum* Temporarily Flooded Herbaceous Alliance (A.1344)
- *Phragmites australis* Semipermanently Flooded Herbaceous Alliance (A.1431)
- *Spartina bakeri* Seasonally Flooded Herbaceous Alliance (A.1389)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)
- *Typha domingensis* Seasonally Flooded Temperate Herbaceous Alliance (A.1392)

SPATIAL CHARACTERISTICS

Spatial Summary: Small patch.

Size: Occurs as small patches, with most individual ponds an acre or less in size. Often ponds will occur in complexes of up to a dozen.

Adjacent Ecological Systems:

- Central Atlantic Coastal Plain Maritime Forest (CES203.261)

Adjacent Ecological System Comments: Surrounded by maritime forest or maritime grassland systems.

DISTRIBUTION

Range: Ranges along the Atlantic and Gulf coasts, from southern Texas to central Virginia. It ranges into central and southern Florida as well.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS, NC, SC, TX, VA

Map Zones: 36:C, 37:C, 55:C, 56:C, 58:C, 60:C, 99:C

TNC Ecoregions: 31:C, 53:C, 54:?, 55:?, 56:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723228#references

Description Author: M. Schafale and R. Evans

Version: 23 Sep 2002

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN APPALACHIAN SEEPAGE WETLAND (CES202.317)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping

Non-Diagnostic Classifiers: Herbaceous; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 9259

CONCEPT

Summary: This system consists of seepage-fed wetlands in the southern Appalachians on gentle slopes, with substantial seepage flow. Vegetation is variable, both within and among examples, but lacks vegetation characteristic of bogs or floodplains. This is a small-patch system occurring over a wide elevational range, nearly to the highest peaks, but is generally lacking from flat valley bottoms.

Classification Comments: This system is fairly heterogeneous, covering a broad range of environments and vegetation, but without apparent breaks. At one extreme, the system contains rich, low-elevation, forb-dominated seeps closely related floristically to cove forests; at the other extreme, it contains acidic, sedge- and moss-dominated, bog-like, high-elevation seeps. This system is distinguished from Southern and Central Appalachian Bog and Fen (CES202.300) by occurrence in sloping settings rather than flat valley bottoms, with more rapid flow of water, and by lack of dominance by the characteristic bog or fen flora (though some of it may be present). The only other systems with wetland systems within its range, floodplains and upland pools, are more distinct floristically as well as associated with very different landforms.

Similar Ecological Systems:

- North-Central Appalachian Seepage Fen (CES202.607)
- Piedmont Seepage Wetland (CES202.298)
- Southern and Central Appalachian Bog and Fen (CES202.300)

DESCRIPTION

Environment: This system occurs in small patches where seepage creates saturated soil conditions permanently or seasonally. Wetness may vary substantially over short distances in response to amounts of seepage, flow, and pooling by topography or impermeable substrate. The system occurs over a wide elevational range, nearly to the highest peaks. Landforms are usually concave slopes but may be convex slopes or even ridgetop gaps. This system is almost never found on flat valley bottoms, though it may be found on the edge of them. Soils may be muck or coarse boulders but are usually saturated mineral soils. They may be residual or colluvial and deep or shallow. The most extensive and wettest examples occur at elevations above 1525 m (5000 feet), where cool temperatures and high rainfall make more water available. In Kentucky, this system consists of streamhead seepages on Pine and Cumberland mountains.

Vegetation: Vegetation consists of a series of forested and open associations united by presence of wetland flora but lack of floodplain species and most bog species. Vegetation consists of a series of forested and open associations united by presence of wetland flora but lack of floodplain species and most bog species. Some tree cover by mesophytic species is usually present, but often only by trees rooted on the edge of adjacent systems. Shrubs may be sparse, or may form dense zones around the edge. Shrub species are mostly mesophytic rather than obligate wetland species. The herb layer is generally well-developed, and is usually dominated either by characteristic forbs such as *Impatiens capensis*, *Impatiens pallida*, *Monarda didyma*, *Chelone* spp., and *Rudbeckia triloba*, or by *Carex* spp. *Sphagnum* may occur in a minority of examples.

Dynamics: The presence of seepage is the primary determinant of this system. Long-term droughts that affect seepage flow presumably have an effect, but this has not been documented. Canopy dynamics are not well known and potentially may vary substantially over short distances in response to wetness. Wetness may limit recruitment of most tree and shrub seedlings to drier microsites, making canopy gaps persist longer than in adjacent forests and creating a more open canopy. Fire may penetrate from the adjacent forest systems, but only in the driest conditions are they likely to be intense enough to have much effect within this system. Seeps are fairly permanent features of the landscape, but may potentially be created, destroyed, or changed in extent because of changes in groundwater flow, stream entrenchment or headward erosion, mass movement on slopes, or long-term climatic cycles. Examples are often left undisturbed when surrounding forests are logged. Effects of logging on water infiltration or surface flow may have significant indirect effects.

MEMBERSHIP

Associations:

- *Alnus serrulata* - *Lindera benzoin* / *Scutellaria lateriflora* - *Thelypteris noveboracensis* Shrubland (CEGL003909, G2?)
- *Calamagrostis cainii* - *Carex ruthii* - *Parnassia asarifolia* / *Sphagnum* spp. Herbaceous Vegetation (CEGL007877, G1Q)
- *Carex gynandra* - *Platanthera clavellata* - *Drosera rotundifolia* - *Carex ruthii* - *Carex atlantica* / *Sphagnum* spp. Herbaceous Vegetation (CEGL007697, G2)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* - *Laportea canadensis* Herbaceous Vegetation (CEGL004296, G3)

- *Glyceria striata* - *Carex gynandra* - *Chelone glabra* - *Symphotrichum puniceum* / *Sphagnum* spp. Herbaceous Vegetation (CEGL008438, G2G3)
- *Impatiens (capensis, pallida)* - *Monarda didyma* - *Rudbeckia laciniata* var. *humilis* Herbaceous Vegetation (CEGL004293, G3)
- *Schoenoplectus robustus* - *Juncus gerardii* - *Hordeum jubatum* - *Atriplex patula* Herbaceous Vegetation (CEGL006234, G1)

Alliances:

- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Carex ruthii* - *Carex gynandra* Saturated Herbaceous Alliance (A.1898)
- *Diphylleia cymosa* - *Saxifraga micranthidifolia* Saturated Herbaceous Alliance (A.1688)
- *Impatiens (capensis, pallida)* - *Monarda didyma* Saturated Herbaceous Alliance (A.1690)
- *Schoenoplectus robustus* Semipermanently Flooded Herbaceous Alliance (A.1434)
- *Symphotrichum puniceum* - *Vernonia noveboracensis* - *Solidago (patula, rugosa)* Saturated Herbaceous Alliance (A.2016)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, from less than one to no more than several acres in size, potentially surrounded by a number of different systems.

Size: Occurs as small patches, most less than one acre in size. The largest patches at high elevations are several acres. Patches occasionally occur in complexes but more often occur singly.

Adjacent Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Grass and Shrub Bald (CES202.294)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

Adjacent Ecological System Comments: This system may be embedded in a variety of other systems. Most common are Southern Appalachian Northern Hardwood Forest (CES202.029) and Southern and Central Appalachian Cove Forest (CES202.373).

DISTRIBUTION

Range: This system ranges throughout the southern Appalachians, from northern Georgia and South Carolina north through Virginia, and westward into Tennessee, Kentucky, and West Virginia.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, SC, TN, VA, WV?

Map Zones: 57:C, 61:C

TNC Ecoregions: 50:C, 51:C, 59:?

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723181#references

Description Author: M. Schafale and R. Evans, mod. S.C. Gawler

Version: 17 Apr 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

1515 SOUTHERN COASTAL PLAIN HERBACEOUS SEEP AND BOG (CES203.078)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Seepage-Fed Sloping; Graminoid

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: EVT 2515; ESLF 9404; ESP 1515

CONCEPT

Summary: This small-patch ecological system includes wet, fire-maintained, seepage communities in the outermost portions of the East Gulf Coastal Plain, east of the Mississippi River in Louisiana, Mississippi, Alabama, and extending across northern Florida. These wetlands are generally found on gentle, almost imperceptible slopes maintained by constant seepage zones and/or perched water tables. Examples are typically grass and sedge dominated, and are often species-rich. Pitcher plants (*Sarracenia* spp.) are notable indicators of many community types in this system. Shrubs frequently encroach in the absence of fire; due to greater topographic isolation, the most interior examples are often naturally shrubbier.

Classification Comments: Known from Clay County (Jennings State Forest) and Nassau County (Ralph E. Simmons State Forest), Florida, based on EORs reported from Florida (A. Johnson pers. comm.).

Similar Ecological Systems:

- East Gulf Coastal Plain Interior Shrub Bog (CES203.385)

Related Concepts:

- Seepage Slope (FNAI 1990) Undetermined

DESCRIPTION

Environment: Kindell et al. (1997) document examples for the Leefield, Albany, Pactolus, Pamlico, Rutledge, and Pansey soil series. Clewell (1981) describes these bogs as commonly occurring between bay swamps and pine flatwoods.

Vegetation: Examples are typically grass- and sedge dominated, and are often species-rich. Pitcher plants (*Sarracenia* spp.) are notable indicators of many community types in this system. *Rhynchospora* spp. are dominant or codominant in many examples. Shrubs (e.g., *Lyonia lucida*, *Ilex glabra*, *Cyrilla racemiflora*) frequently encroach in the absence of fire. Scattered *Pinus elliotii* var. *elliottii*, *Pinus palustris*, and/or *Pinus serotina* may be present.

Dynamics: Frequent fires are necessary to maintain this system. In the absence of fire, shrubs encroach, eventually shading out understory plants.

MEMBERSHIP

Associations:

- *Andropogon arctatus* - *Rhynchospora chapmanii* Herbaceous Vegetation (CEGL008596, G1G2)
- *Aristida beyrichiana* - *Rhynchospora oligantha* - *Panicum nudicaule* - (*Eurybia eryngiifolia*) Herbaceous Vegetation (CEGL004155, G2)
- *Arundinaria gigantea* ssp. *tecta* Shrubland (CEGL003843, G1)
- *Hypericum fasciculatum* - *Hypericum chapmanii* / *Aristida palustris* - *Sarracenia (flava, psittacina)* Shrubland (CEGL008594, G1)
- *Pinus elliotii* var. *elliottii* - (*Pinus serotina*) / *Aristida beyrichiana* - *Rhynchospora oligantha* - *Sarracenia (flava, minor, psittacina)* Woodland (CEGL003673, G2?)
- *Pinus palustris* - *Pinus serotina* / *Ilex glabra* - *Lyonia lucida* / *Ctenium aromaticum* Woodland (CEGL003860, G3)
- *Pinus serotina* / *Lyonia lucida* - *Ilex glabra* - (*Cyrilla racemiflora*) Shrubland (CEGL003846, G3)
- *Rhynchospora macra* - *Rhynchospora stenophylla* - *Panicum nudicaule* - *Xyris chapmanii* - *Carex exilis* Herbaceous Vegetation (CEGL004667, G1)
- *Rhynchospora oligantha* - *Sarracenia (alata, psittacina)* - *Carphephorus pseudoliatris* Herbaceous Vegetation (CEGL004687, G2)
- *Rhynchospora stenophylla* - *Rhynchospora macra* - *Panicum nudicaule* - *Eriocaulon nigrobacteatum* - *Pleea tenuifolia* Herbaceous Vegetation (CEGL004177, G1)

Alliances:

- *Arundinaria gigantea* Saturated Shrubland Alliance (A.801)
- *Hypericum (chapmanii, fasciculatum)* Seasonally Flooded Shrubland Alliance (A.844)
- *Lyonia lucida* - *Ilex glabra* Saturated Wooded Shrubland Alliance (A.805)
- *Pinus elliotii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Rhynchospora oligantha* - *Sarracenia* spp. - (*Aristida beyrichiana*, *Ctenium aromaticum*) - *Osmunda cinnamomea* / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1463)

DISTRIBUTION

Range: This systems is found in the northern Gulf of Mexico region, east of the Mississippi River in Louisiana, Mississippi, Alabama, and extending across northern Florida.

Divisions: 203:C

Nations: US

Subnations: AL, FL, LA, MS

Map Zones: 55:C, 99:C

TNC Ecoregions: 53:C, 56:C

SOURCES

References: Clewell 1981, Comer et al. 2003, Kindell et al. 1997

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723251#references

Description Author: R. Evans, mod. M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN COASTAL PLAIN SPRING-RUN STREAM AQUATIC VEGETATION (CES203.275)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Riverine / Alluvial [Whitewater]

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9258

CONCEPT

Summary: Spring-run streams are perennial water courses fed with artesian waters originating in karstic or limestone topography in the outer portions of the southeastern Coastal Plain of the United States. Such areas are rare in the Gulf and Atlantic coastal plains and apparently confined to Florida and small areas of Georgia. Waters are mineral-rich and circumneutral to alkaline with pH of 7.0-8.2 (FNAI 1990, Nordlie 1990). Water temperatures are relatively cool; clarity is often high. These factors contribute to sometimes lush growth of submerged aquatic vegetation which may include *Vallisneria americana*, *Sagittaria kurziana*, *Potamogeton* spp., and *Myriophyllum* spp. Emergent marshes dominated by *Cladium* and/or *Zizania* may occur along the edges. Floodplain development is not usually advanced, but many of these streams are bordered by forests in which *Taxodium distichum* is present.

Similar Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Southern Coastal Plain Hydric Hammock (CES203.501)

Related Concepts:

- Spring-run Stream (FNAI 1990) Equivalent

DESCRIPTION

Environment: Channels may have sandy bottoms or exposed limestone. Spring "boils" and "blue holes" are encountered with some frequency (Wharton 1978, FNAI 1990).

MEMBERSHIP

Associations:

- *Cladium mariscus* ssp. *jamaicense* - *Typha domingensis* - *Fimbristylis caroliniana* - *Bacopa monnieri* Herbaceous Vegetation (CEGL008591, G3?)
- *Nuphar lutea* ssp. *ulvacea* Herbaceous Vegetation (CEGL004329, G2)
- *Sagittaria kurziana* - *Potamogeton illinoensis* - *Vallisneria americana* Herbaceous Vegetation (CEGL004332, G2)
- *Stuckenia pectinata* - *Vallisneria americana* Herbaceous Vegetation (CEGL008590, G2G3)
- *Zizania aquatica* - *Cicuta maculata* - *Hydrocotyle umbellata* Herbaceous Vegetation (CEGL004716, G2?)

Alliances:

- *Cladium mariscus* ssp. *jamaicense* Seasonally Flooded Temperate Herbaceous Alliance (A.1369)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Vallisneria americana* Permanently Flooded Temperate Herbaceous Alliance (A.1757)
- *Zizania (aquatica, texana)* - *Potamogeton illinoensis* Semipermanently Flooded Herbaceous Alliance (A.1437)

DISTRIBUTION

Range: This system is endemic to Florida and Georgia.

Divisions: 203:C

Nations: US

Subnations: FL, GA

Map Zones: 55:C, 56:C, 99:C

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Comer et al. 2003, FNAI 1990, Nordlie 1990, Wharton 1978

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723211#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHWEST FLORIDA SEAGRASS BED (CES203.274)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Tidal / Estuarine; Aquatic Herb

Non-Diagnostic Classifiers: Herbaceous

National Mapping Codes: ESLF 9224

CONCEPT

Summary: This system is found along Florida's west coast ranging from Anclote Key (Tarpon Springs) south to Charlotte Harbor. Estuarine grassbeds of this region have been among the most extensively studied in Florida [see references in Zieman and Zieman (1989)] and at least 5 types of seagrass meadows are known to be present. Some types are comprised of mixed species while others are essentially pure stands of individual species. In general, these meadows are found along the fringes of Tampa Bay and Boca Ciega Bay landward of unvegetated sandbars. Composition varies according to water depth and position relative to shoals and shorelines. Mixed beds of *Halodule*, *Cymodocea*, and *Thalassia* are found in mid-bay shoals. Fringing beds support *Ruppia* nearest the shore in shallowest waters, followed by almost pure stands of *Halodule*, *Thalassia*, and *Cymodocea*.

Similar Ecological Systems:

- Atlantic Coastal Plain Indian River Lagoon Seagrass Bed (CES203.256)
- East Gulf Coastal Plain Florida Big Bend Seagrass Bed (CES203.244)
- Florida Keys Seagrass Bed (CES411.285)
- Northern Gulf of Mexico Seagrass Bed (CES203.263)

Related Concepts:

- Seagrass Bed (FNAI 1990) Broader

DESCRIPTION

Environment: This system is found along Florida's west coast ranging from Anclote Key (Tarpon Springs) south to Charlotte Harbor. Beds in this region are found behind barrier islands and within sounds and bays, protected from normal storm surges. Within this region, by far the largest acreages of submerged vegetation are found in the Pine Island Sound and Charlotte Harbor. Other large bays with abundant submerged vegetation include Tampa Bay, Boca Ciega Bay, and Sarasota Bay (Zieman and Zieman 1989). The seagrasses are rooted primarily in soft muddy sands and are essentially absent from sandier substrates. Beds occur generally landward of unvegetated sandbars which when destabilized may lead to the disappearance of the beds.

Vegetation: Seagrasses are monocots which carry out their entire life cycle completely submerged in the marine environment.

Dynamics: Colonization of seagrasses often follows a generalized successional sequence. Non-vegetated areas may first be colonized by rhizophytic macroalgae which have some sediment-binding capacity. Possibly more importantly they contribute sedimentary particles as they die and decompose (Zieman and Zieman 1989). *Halodule beaudettei* (= *Halodule wrightii*) is the local pioneering species which colonizes areas from seed or vegetative reproduction. *Cymodocea* often appears next and may mix with *Halodule*. *Thalassia* occupies beds as succession advances. This pattern marks a progressive increase of biomass in the system with increased leaf areas, increased sediment-trapping capacity, and increased microbial cycling.

MEMBERSHIP

Associations:

- *Halodule beaudettei* Herbaceous Vegetation (CEGL004318, G4?)
- *Halophila engelmannii* Herbaceous Vegetation (CEGL004688, G3?)
- *Ruppia maritima* Tropical Herbaceous Vegetation (CEGL004906, G4G5)
- *Thalassia testudinum* - *Cymodocea filiformis* Herbaceous Vegetation (CEGL008384, GNR)
- *Thalassia testudinum* Herbaceous Vegetation (CEGL004319, G4?)

Alliances:

- *Halodule beaudettei* Permanently Flooded - Tidal Herbaceous Alliance (A.1734)
- *Halophila engelmannii* Permanently Flooded - Tidal Herbaceous Alliance (A.1736)
- *Ruppia maritima* Permanently Flooded - Tidal Tropical Herbaceous Alliance (A.1737)
- *Thalassia testudinum* Permanently Flooded - Tidal Herbaceous Alliance (A.1739)

DISTRIBUTION

Range: This system is found along Florida's west coast ranging from Anclote Key south to Charlotte Harbor to the outlet of the Caloosahatche River.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 56:C
TNC Ecoregions: 55:C

SOURCES

References: Comer et al. 2003, Lewis et al. 1985a, Zieman and Zieman 1989

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723212#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

MIXED UPLAND AND WETLAND

CENTRAL APPALACHIAN RIVER FLOODPLAIN (CES202.608)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Intermittent Flooding; Short (<5 yrs) Flooding Interval; Forest and Woodland (Treed); Toeslope/Valley Bottom; Riverine / Alluvial; Broad-Leaved Deciduous Tree

Non-Diagnostic Classifiers: 1-29-day hydroperiod; 30-180-day hydroperiod; Moderate (100-500 yrs) Persistence; Lowland; Temperate; Eutrophic Soil; Deep Soil; Mineral: W/ A-Horizon >10 cm; Silt Soil Texture; Udic; Ustic; Unconsolidated; Short Disturbance Interval; Flood Scouring

National Mapping Codes: ESLF 9333

CONCEPT

Summary: This system encompasses floodplains of medium to large rivers from southern New England to Virginia. This system can include a complex of wetland and upland vegetation on deep alluvial deposits and scoured vegetation on depositional bars and on bedrock where rivers cut through resistant geology. This complex includes floodplain forests in which *Acer saccharinum*, *Populus deltoides*, and *Platanus occidentalis* are characteristic, as well as herbaceous sloughs, shrub wetlands, riverside prairies and woodlands. Most areas are underwater each spring; microtopography determines how long the various habitats are inundated. Depositional and erosional features may both be present depending on the particular floodplain.

Classification Comments: This system is distinguished from related floodplain systems; northward, Laurentian-Acadian Floodplain Forest (CES201.587) is characterized by the lack or unimportance of *Platanus occidentalis* and *Betula nigra*, for example; and westward, North-Central Interior Floodplain (CES202.694) drains to the midwestern rivers rather than northeastern rivers.

Determining the distinctions from South-Central Interior Large Floodplain (CES202.705), which overlaps the southern and western portions of this system, needs work.

Similar Ecological Systems:

- Central Appalachian Stream and Riparian (CES202.609)
- Laurentian-Acadian Floodplain Forest (CES201.587)
- North-Central Interior Floodplain (CES202.694)
- South-Central Interior Large Floodplain (CES202.705)

MEMBERSHIP

Associations:

- *Acer (rubrum, saccharinum) - Fraxinus pennsylvanica - Ulmus americana / Boehmeria cylindrica* Forest (CEGL006548, G4)
- *Acer (rubrum, saccharinum) - Ulmus americana* Forest (CEGL006975, GNR)
- *Acer negundo* Forest (CEGL005033, G4G5)
- *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Forest (CEGL006147, GNR)
- *Acer saccharinum - Ulmus americana / Onoclea sensibilis* Forest (CEGL006001, GNR)
- *Acer saccharinum - Ulmus americana / Physocarpus opulifolius* Forest (CEGL006042, GNR)
- *Acer saccharinum - Ulmus americana* Forest (CEGL002586, G4?)
- *Acer saccharinum / Onoclea sensibilis - Boehmeria cylindrica* Forest (CEGL006176, GNR)
- *Acer saccharum - Fraxinus americana / Carpinus caroliniana / Podophyllum peltatum* Forest (CEGL006459, G3?)
- *Acer saccharum - Fraxinus spp. - Tilia americana / Matteuccia struthiopteris - Ageratina altissima* Forest (CEGL006114, GNR)
- *Alnus incana - Viburnum recognitum / Calamagrostis canadensis* Shrubland [Provisional] (CEGL006546, GNR)
- *Alnus serrulata - Physocarpus opulifolius* Shrubland (CEGL006251, G5)
- *Alnus serrulata* Swamp Shrubland (CEGL005082, G4G5)
- *Andropogon gerardii - Panicum virgatum - Baptisia australis* Herbaceous Vegetation (CEGL006283, G2G3)
- *Arundinaria gigantea ssp. gigantea* Shrubland (CEGL003836, G2?)
- *Betula nigra - Platanus occidentalis / Impatiens capensis* Forest (CEGL006184, GNR)
- *Betula nigra - Platanus occidentalis* Forest (CEGL002086, G5)
- *Calamagrostis canadensis - Phalaris arundinacea* Herbaceous Vegetation (CEGL005174, G4G5)
- *Carex torta - Apocynum cannabinum - Cyperus spp.* Herbaceous Vegetation (CEGL006536, G4G5)
- *Carex torta* Herbaceous Vegetation (CEGL004103, G3G4)
- *Carex trichocarpa* Herbaceous Vegetation (CEGL006447, G3)
- *Carya cordiformis - Prunus serotina / Ageratina altissima* Forest (CEGL006445, GNR)
- *Cephalanthus occidentalis - Decodon verticillatus* Shrubland (CEGL006069, G4G5)
- *Cephalanthus occidentalis / Carex spp. - Lemna spp.* Southern Shrubland (CEGL002191, G4)

- *Cornus amomum* - *Alnus serrulata* Shrubland (CEGL006414, GNR)
- *Eragrostis hypnoides* - *Ludwigia palustris* - *Lindernia dubia* - *Cyperus squarrosus* Herbaceous Vegetation (CEGL006483, G3)
- *Fagus grandifolia* - *Quercus* spp. - *Acer rubrum* - *Juglans nigra* Forest (CEGL005014, G2G3)
- *Fraxinus pennsylvanica* - (*Juglans nigra*, *Platanus occidentalis*) Forest (CEGL006575, GNR)
- *Fraxinus pennsylvanica* - *Ulmus* spp. - *Celtis occidentalis* Forest (CEGL002014, G3G5)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Liriodendron tulipifera* - *Fraxinus* spp. / *Lindera benzoin* - *Viburnum prunifolium* / *Podophyllum peltatum* Forest (CEGL006314, GNR)
- *Liriodendron tulipifera* - *Pinus strobus* - (*Tsuga canadensis*) / *Carpinus caroliniana* / *Amphicarpaea bracteata* Forest (CEGL008405, G3)
- *Liriodendron tulipifera* - *Platanus occidentalis* - *Betula lenta* / *Lindera benzoin* / *Circaea lutetiana* ssp. *canadensis* Forest (CEGL006255, G3?)
- *Peltandra virginica* - *Saururus cernuus* - *Boehmeria cylindrica* / *Climacium americanum* Herbaceous Vegetation (CEGL007696, G2G3?)
- *Platanus occidentalis* - *Acer saccharinum* - *Juglans nigra* - *Ulmus rubra* Forest (CEGL007334, G4)
- *Platanus occidentalis* - *Liquidambar styraciflua* / *Carpinus caroliniana* - *Asimina triloba* Forest (CEGL007340, G5)
- *Platanus occidentalis* / *Aesculus flava* Forest [Provisional] (CEGL006466, GNR)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Vegetation (CEGL004725, G4?)
- *Quercus* (*phellos*, *palustris*, *michauxii*) - *Liquidambar styraciflua* / *Cinna arundinacea* Forest (CEGL006605, G3G4)
- *Quercus bicolor* - *Acer rubrum* / *Carpinus caroliniana* Forest (CEGL006386, GNR)
- *Quercus palustris* - *Acer rubrum* / *Carex grayi* - *Geum canadense* Forest (CEGL006185, GNR)
- *Salix nigra* - *Betula nigra* / *Schoenoplectus pungens* Wooded Herbaceous Vegetation [Provisional] (CEGL006463, GNR)
- *Salix sericea* Shrubland (CEGL006305, GNR)
- *Spiraea alba* Shrubland [Provisional] (CEGL006595, GNR)
- *Tilia americana* - *Acer saccharum* - *Acer nigrum* / *Laportea canadensis* Forest (CEGL006405, GNR)
- *Verbesina alternifolia* - *Teucrium canadense* - *Elymus riparius* - (*Solidago gigantea*) Herbaceous Vegetation (CEGL006480, GNR)

Alliances:

- *Acer* (*rubrum*, *saccharinum*) - *Ulmus americana* Temporarily Flooded Forest Alliance (A.299)
- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Acer saccharum* - *Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
- *Alnus incana* Seasonally Flooded Shrubland Alliance (A.986)
- *Alnus serrulata* Seasonally Flooded Shrubland Alliance (A.994)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Calamagrostis canadensis* Seasonally Flooded Herbaceous Alliance (A.1400)
- *Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Eragrostis hypnoides* - *Lipocarpa micrantha* - *Micranthemum umbrosum* Seasonally Flooded Herbaceous Alliance (A.1816)
- *Eupatorium* spp. - *Polygonum* spp. Temporarily Flooded Depositional Shore and Bar Herbaceous Alliance (A.3038)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis* (*occidentalis*, *laevigata*) Temporarily Flooded Forest Alliance (A.286)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Pontederia cordata* - *Peltandra virginica* Semipermanently Flooded Herbaceous Alliance (A.1669)
- *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Permanently Flooded Herbaceous Alliance (A.1754)
- *Quercus* (*phellos*, *laurifolia*) Seasonally Flooded Forest Alliance (A.327)
- *Quercus bicolor* - *Acer rubrum* Temporarily Flooded Forest Alliance (A.3004)
- *Quercus palustris* - *Acer rubrum* Temporarily Flooded Forest Alliance (A.301)
- *Salix sericea* Seasonally Flooded Shrubland Alliance (A.3028)
- *Schoenoplectus pungens* Semipermanently Flooded Wooded Herbaceous Alliance (A.3034)
- *Spiraea* (*alba*, *tomentosa*) - *Rubus* spp. Seasonally Flooded Shrubland Alliance (A.3022)
- *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest Alliance (A.171)

DISTRIBUTION

Range: Southern New England west to Lake Erie and south to Virginia. The James River in Virginia marks the southern extent of this system.

Divisions: 202:C

Nations: US

Subnations: CT, MA, MD, NH, NJ?, NY, OH, PA, VA, VT, WV

Map Zones: 53:C, 59:C, 60:C, 61:C, 62:C, 63:P, 64:P, 65:C

TNC Ecoregions: 49:C, 52:C, 59:C, 60:P, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723001#references

Description Author: S.C. Gawler, mod. J. Teague

Version: 01 Feb 2007

Concept Author: S.C. Gawler, mod. NCR Review Team

Stakeholders: East, Midwest, Southeast

ClassifResp: East

CENTRAL APPALACHIAN STREAM AND RIPARIAN (CES202.609)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Intermittent Flooding; Lowland; Riverine / Alluvial; Very Short Disturbance Interval; Flood Scouring

Non-Diagnostic Classifiers: Short (<5 yrs) Flooding Interval; Short (50-100 yrs) Persistence; Forest and Woodland (Treed);

Sideslope; Toeslope/Valley Bottom; Temperate; Mesotrophic Soil; Udic; Ustic

National Mapping Codes: ESLF 9331

CONCEPT

Summary: This riparian system ranges from southern New England to Virginia and West Virginia and occurs over a wide range of elevations. It develops on floodplains and shores along river channels that lack a broad flat floodplain due to steeper sideslopes, higher gradient, or both. It may include communities influenced by flooding, erosion, or groundwater seepage. The vegetation is often a mosaic of forest, woodland, shrubland, and herbaceous communities. Common trees include *Betula nigra*, *Platanus occidentalis*, and *Acer negundo*. Open, flood-scoured rivershore prairies feature *Panicum virgatum* and *Andropogon gerardii*, and *Carex torta* is typical of wetter areas near the channel.

Classification Comments: This is a high-gradient system, unlike the low-gradient system described in Central Appalachian River Floodplain (CES202.608). To the south in the Appalachians and interior, this system is replaced by South-Central Interior Small Stream and Riparian (CES202.706).

Similar Ecological Systems:

- Central Appalachian River Floodplain (CES202.608)
- Cumberland Riverscour (CES202.036)
- South-Central Interior Small Stream and Riparian (CES202.706)

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus (pennsylvanica, americana)* / *Lindera benzoin* / *Symplocarpus foetidus* Forest (CEGL006406, G4G5)
- *Acer rubrum* - *Fraxinus americana* - *Fraxinus nigra* - *Betula alleghaniensis* / *Veratrum viride* - *Carex bromoides* Forest (CEGL008416, G3)
- *Acer rubrum* - *Nyssa sylvatica* / *Ilex verticillata* - *Vaccinium fuscum* / *Osmunda cinnamomea* Forest (CEGL007853, G3G4)
- *Alnus serrulata* - *Physocarpus opulifolius* Shrubland (CEGL006251, G5)
- *Andropogon gerardii* - *Campanula rotundifolia* - *Solidago simplex* Sparse Vegetation (CEGL006284, G2)
- *Andropogon gerardii* - *Panicum virgatum* - *Baptisia australis* Herbaceous Vegetation (CEGL006283, G2G3)
- *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Herbaceous Vegetation (CEGL006536, G4G5)
- *Carex torta* Herbaceous Vegetation (CEGL004103, G3G4)
- *Carex trichocarpa* Herbaceous Vegetation (CEGL006447, G3)
- *Deschampsia caespitosa* - *Carex viridula* Herbaceous Vegetation (CEGL006969, GNR)
- *Eragrostis hypnoides* - *Ludwigia palustris* - *Lindernia dubia* - *Cyperus squarrosus* Herbaceous Vegetation (CEGL006483, G3)
- *Hudsonia tomentosa* - *Paronychia argyrocoma* Dwarf-shrubland (CEGL006232, G1)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Leersia oryzoides* - *Sagittaria latifolia* Herbaceous Vegetation (CEGL006461, GNR)
- *Liriodendron tulipifera* - *Platanus occidentalis* - *Betula lenta* / *Lindera benzoin* / *Circaea lutetiana* ssp. *canadensis* Forest (CEGL006255, G3?)
- *Lysimachia ciliata* - *Apocynum cannabinum* Sparse Vegetation (CEGL006554, GNR)
- *Panicum virgatum* - *Andropogon gerardii* Gravel Wash Herbaceous Vegetation (CEGL006477, G2G3)
- *Pinus rigida* - *Hudsonia tomentosa* - *Pityopsis falcata* Sparse Vegetation (CEGL006391, GNR)
- *Pinus strobus* - *Betula populifolia* / *Comptonia peregrina* / *Schizachyrium scoparium* Woodland (CEGL006004, G2)
- *Platanus occidentalis* - *Betula nigra* - *Salix (caroliniana, nigra)* Woodland (CEGL003896, G4G5)
- *Podostemum ceratophyllum* Herbaceous Vegetation (CEGL004331, G3G5)
- *Populus tremuloides* - *Betula populifolia* Forest (CEGL006560, GNR)
- *Quercus (phellos, palustris, michauxii)* - *Liquidambar styraciflua* / *Cinna arundinacea* Forest (CEGL006605, G3G4)
- *Rhododendron arborescens* / *Marshallia grandiflora* - *Triantha glutinosa* - *Platanthera flava* var. *herbiola* Herbaceous Vegetation (CEGL006598, G1)
- *Salix nigra* / *Phalaris arundinacea* - *Apocynum cannabinum* Temporarily Flooded Shrubland (CEGL006065, G4?)
- *Salix nigra* Temporarily Flooded Shrubland (CEGL003901, G4?)
- *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest (CEGL007143, G3)
- *Tsuga canadensis* - *Betula alleghaniensis* / *Veratrum viride* - *Carex scabrata* - *Oclemena acuminata* Forest (CEGL008533, G2)

- *Verbesina alternifolia* - *Teucrium canadense* - *Elymus riparius* - (*Solidago gigantea*) Herbaceous Vegetation (CEGL006480, GNR)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Saturated Forest Alliance (A.3035)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
- Cobble/Gravel Shore Sparsely Vegetated Alliance (A.1850)
- *Deschampsia caespitosa* Seasonally Flooded Herbaceous Alliance (A.1408)
- *Eragrostis hypnoides* - *Lipocarpha micrantha* - *Micranthemum umbrosum* Seasonally Flooded Herbaceous Alliance (A.1816)
- *Eupatorium* spp. - *Polygonum* spp. Temporarily Flooded Depositional Shore and Bar Herbaceous Alliance (A.3038)
- *Fraxinus nigra* - *Acer rubrum* Saturated Forest Alliance (A.347)
- *Hudsonia tomentosa* Temporarily Flooded Dwarf-shrubland Alliance (A.1087)
- Inland Dune Sparsely Vegetated Alliance (A.1857)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Leersia oryzoides* - *Glyceria striata* Seasonally Flooded Herbaceous Alliance (A.1399)
- Open Pavement Sparsely Vegetated Alliance (A.1843)
- *Pinus strobus* - *Betula populifolia* Woodland Alliance (A.682)
- *Platanus occidentalis* - (*Betula nigra*, *Salix* spp.) Temporarily Flooded Woodland Alliance (A.633)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Podostemum ceratophyllum* Permanently Flooded Herbaceous Alliance (A.1752)
- *Populus tremuloides* - *Betula papyrifera* Forest Alliance (A.269)
- *Quercus* (*phellos*, *laurifolia*) Seasonally Flooded Forest Alliance (A.327)
- *Salix nigra* Temporarily Flooded Shrubland Alliance (A.948)
- *Triantha glutinosa* - *Parnassia glauca* Saturated Herbaceous Alliance (A.1697)
- *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest Alliance (A.171)
- *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (A.447)

DISTRIBUTION

Range: This system ranges from southern New England west to Lake Erie and south to Virginia and West Virginia. The James River in Virginia marks its southern extent.

Divisions: 202:C

Nations: US

Subnations: CT, MA, MD, NH, NJ?, NY, OH, PA, VA, VT, WV

Map Zones: 53:C, 60:C, 61:C, 62:C, 63:P, 64:P, 65:C

TNC Ecoregions: 49:C, 52:C, 59:C, 60:?, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723000#references

Description Author: S.C. Gawler, mod. J. Teague

Version: 01 Feb 2007

Concept Author: S.C. Gawler, mod. NCR Review Team

Stakeholders: East, Midwest, Southeast

ClassifResp: East

1453 CENTRAL FLORIDA PINE FLATWOODS (CES203.382)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Woody-Herbaceous; Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2453; ESLF 9122; ESP 1453

CONCEPT

Summary: This system is endemic to Florida, ranging in the north from approximately Levy and St. Johns counties (ca. 30 degrees N latitude) southward to approximately Hillsborough, Osceola and Polk counties. It was once an extensive system within its historic range. As currently conceived, this system includes both "scrubby flatwoods" that occur on well-drained soils and typical flatwoods that occur on more poorly drained soils. The vegetation is naturally dominated by either *Pinus palustris* or *Pinus elliottii* var. *elliottii*, and less frequently includes *Pinus serotina*. Examples vary in aspect from well-developed understory layers or scrub species to more herbaceous, savanna-like conditions. There is a dense ground cover of low shrubs, grasses, and herbs. Frequent, low-intensity fire is the dominant natural ecological force.

Classification Comments: This system includes at least two predominant expressions which could individually constitute distinct systems. Scrubby flatwoods are much more well-drained, uplands with characteristically shrubby understories, while flatwoods are much more poorly drained and savanna-like in aspect (Abrahamson et al. 1984).

Similar Ecological Systems:

- East Gulf Coastal Plain Near-Coast Pine Flatwoods (CES203.375)--is closely related and found to the north.

DESCRIPTION

Vegetation: The southern limit of this system marks the approximate natural distribution limit for both *Pinus serotina* and *Pinus elliottii* var. *elliottii* (see Abrahamson and Hartnett 1990). The associations comprising this system are not well documented; more information is needed to describe additional communities that are believed to be present. The vegetation varies between examples of this system based on fire history, geographic location, and the soils on which it occurs. The most well-drained examples may be considered "scrubby flatwoods" that support a characteristic understory layer of xeromorphic adapted species, such as *Quercus geminata*, *Lyonia fruticosa*, *Lyonia ferruginea*, *Sideroxylon tenax* (= *Bumelia tenax*), and *Persea humilis*; *Quercus inopina* is especially diagnostic (Abrahamson et al. 1984). These conditions range to examples on more poorly drained soils that include scattered *Pinus elliottii* var. *elliottii* or *Pinus palustris* over *Serenoa repens* and other species such as *Panicum abscissum* and *Aristida beyrichiana*.

MEMBERSHIP

Associations:

- *Pinus elliottii* var. *densa* / *Quercus minima* / *Panicum abscissum* Woodland (CEGL003650, G2?)
- *Pinus elliottii* var. *elliottii* / *Serenoa repens* - *Ilex glabra* Woodland (CEGL003643, G4?)
- *Pinus palustris* - *Pinus serotina* / *Ilex glabra* - *Lyonia lucida* - (*Serenoa repens*) Woodland (CEGL004791, G3G4)
- *Pinus palustris* / *Quercus (chapmanii, myrtifolia)* - *Serenoa repens* / *Aristida beyrichiana* - *Chapmannia floridana* Woodland (CEGL007750, G2G3)
- *Pinus serotina* / *Gordonia lasianthus* - *Persea palustris* Saturated Woodland (CEGL007996, G3?Q)
- *Pinus serotina* / *Ilex glabra* / *Aristida beyrichiana* Woodland (CEGL003795, G2G3)

Alliances:

- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris* - *Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* Woodland Alliance (A.520)
- *Pinus serotina* Saturated Woodland Alliance (A.581)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central Florida Herbaceous Pondshore (CES203.890)
- Central Florida Wet Prairie and Herbaceous Seep (CES203.491)
- Florida Longleaf Pine Sandhill (CES203.284)
- Southern Coastal Plain Hydric Hammock (CES203.501)

DISTRIBUTION

Range: Endemic to Florida, ranging in the north from approximately Levy and St. Johns counties southward to approximately Hillsborough and Polk counties.

Divisions: 203:C

Nations: US
Subnations: FL
Map Zones: 55:C, 56:C
TNC Ecoregions: 55:C

SOURCES

References: Abrahamson and Hartnett 1990, Abrahamson et al. 1984, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723134#references

Description Author: R. Evans, mod. M. Pyne

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast
ClassifResp: Southeast

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Central Interior and Appalachian (202)**Land Cover Class:** Mixed Upland and Wetland**Spatial Scale & Pattern:** Large patch, Linear**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland**Diagnostic Classifiers:** Very Short Flooding Interval; Short (<5 yrs) Flooding Interval; Forest and Woodland (Treed); Toeslope/Valley Bottom; Aluvial; Temperate; Riverine / Alluvial; Flood Scouring; Broad-Leaved Deciduous Tree**FGDC Crosswalk:** Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy**National Mapping Codes:** EVT 2471; ESLF 9140; ESP 1471

CONCEPT

Summary: This systems group encompasses large-river floodplains over much of the eastern United States. Mostly forested, these systems occur on floodplains of medium to large rivers where topography and process have resulted in the development of a relatively flat, well-developed floodplain with a complex of upland and wetland temperate alluvial vegetation. Many examples of these systems will contain well-drained levees, terraces and stabilized bars, and some will include herbaceous sloughs and shrub wetlands, particularly in abandoned channels. The substrate is primarily alluvium. The generally fertile soils are usually sandy to loamy but include local clayey and gravelly areas. This complex includes floodplain forests as well as herbaceous sloughs and shrub wetlands. Emergent and vegetated bars of gravel to cobble are included here as well, as are scoured bedrock areas. The dominant structure is forest, where characteristic trees include *Acer saccharinum*, *Populus deltoides*, *Betula nigra*, *Celtis laevigata*, *Liquidambar styraciflua* (in the southern half of this group's range), willows, especially *Salix nigra* in the wettest areas, and *Platanus occidentalis*, with *Fraxinus pennsylvanica*, *Ulmus americana*, *Liriodendron tulipifera*, *Quercus michauxii*, *Quercus pagoda*, and (at least in the Midwest) *Quercus macrocarpa* in more well-drained areas. The particular mix of tree species will vary across the geographic range of this systems group, with some trees absent over parts of the range; for example, *Celtis*, *Liquidambar*, and *Quercus macrocarpa* are absent from the Susquehanna drainage in Pennsylvania. Understory species are mixed but include shrubs, such as *Cephalanthus occidentalis*, *Cornus drummondii*, and *Asimina triloba*, sedges (*Carex* spp.) and grasses (such as *Elymus hystrix*, *Elymus canadensis*, *Chasmanthium latifolium*, and others) which sometimes form savanna-like vegetation. Oxbows may support herbaceous vegetation dominated by species including *Nelumbo lutea* and *Typha latifolia*. Canebrakes dominated by *Arundinaria gigantea* ssp. *gigantea* are present in some areas. Frequently reworked gravelbars may be dominated by young *Salix nigra*, *Platanus occidentalis*, or *Betula nigra*, or they may have sparse vegetation of a wide variety of annual and perennial herbs of weedy habits. Occasional bedrock-scour areas in gorges have distinctive vegetation dominated by perennial herbs rooted in pockets and crevices. Most floodplains are underwater each spring, and some areas may be submerged by high-water events during the growing season. Microtopography determines how long the various habitats are inundated. Floodplain morphology can be altered by occasional severe floods. Depositional and erosional features may both be present depending on the particular floodplain, although there is a history of deposition in the floodplain formation.

DESCRIPTION

Environment: This systems group encompasses large-river floodplains over much of the eastern United States. Mostly forested, these systems occur on floodplains of medium to large rivers where topography and process have resulted in the development of a relatively flat, well-developed floodplain with a complex of upland and wetland temperate alluvial vegetation. Many examples of these systems will contain well-drained levees, terraces and stabilized bars, and some will include herbaceous sloughs and shrub wetlands, particularly in abandoned channels. The substrate is primarily alluvium. The generally fertile soils are usually sandy to loamy but include local clayey and gravelly areas. This complex includes floodplain forests as well as herbaceous sloughs and shrub wetlands. Emergent and vegetated bars of gravel to cobble are included here as well, as are scoured bedrock areas.

Vegetation: The dominant structure is forest, where characteristic trees include *Acer saccharinum*, *Populus deltoides*, *Betula nigra*, *Celtis laevigata*, *Liquidambar styraciflua* (in the southern half of this group's range), willows, especially *Salix nigra* in the wettest areas, and *Platanus occidentalis*, with *Fraxinus pennsylvanica*, *Ulmus americana*, *Liriodendron tulipifera*, *Quercus michauxii*, *Quercus pagoda*, and (at least in the Midwest) *Quercus macrocarpa* in more well-drained areas. The particular mix of tree species will vary across the geographic range of this systems group, with some trees absent over parts of the range; for example, *Celtis*, *Liquidambar*, and *Quercus macrocarpa* are absent from the Susquehanna drainage in Pennsylvania. Understory species are mixed but include shrubs, such as *Cephalanthus occidentalis*, *Cornus drummondii*, and *Asimina triloba*, sedges (*Carex* spp.) and grasses (such as *Elymus hystrix*, *Elymus canadensis*, *Chasmanthium latifolium*, and others) which sometimes form savanna-like vegetation. Oxbows may support herbaceous vegetation dominated by species including *Nelumbo lutea* and *Typha latifolia*. Canebrakes dominated by *Arundinaria gigantea* ssp. *gigantea* are present in some areas. Frequently reworked gravelbars may be dominated by young *Salix nigra*, *Platanus occidentalis*, or *Betula nigra*, or they may have sparse vegetation of a wide variety of annual and perennial herbs of weedy habits. Occasional bedrock-scour areas in gorges have distinctive vegetation dominated by perennial herbs rooted in pockets and crevices.

Dynamics: Flooding is the primary dynamic process, but drought, grazing, and fire have all had historical influence on these floodplains. Federal reservoirs have had a serious and negative effect, along with agriculture that has converted much floodplain

acreage to drained agricultural land. In the remaining less altered floodplains, flood duration varies according to the river's gradient. Flooding is most common in the winter and spring but may occur in other seasons. The sorting of plant communities by depositional landforms of different height reflects the importance of depth and periodicity of flood waters. Flood waters have significant energy, and scouring and reworking of sediment are an important factor in bar and bank communities. However, in the forested floodplains, flood disturbances that kill established woody plants are rare, and canopy population dynamics are dominated by windthrow. In addition to disturbance, floods bring nutrient input, deposit sediment, and disperse plant seeds.

MEMBERSHIP

Standard Ecological Systems:

- Central Appalachian River Floodplain (CES202.608)
- North-Central Interior Floodplain (CES202.694)
- South-Central Interior Large Floodplain (CES202.705)
- Southern Piedmont Large Floodplain Forest (CES202.324)

DISTRIBUTION

Range: This systems group encompasses large-river floodplains over much of the eastern United States, from southern New England south to Georgia, and west to the Dakotas and eastern Oklahoma.

Divisions: 202:C; 205:C

Nations: US

Subnations: AL, AR, CT, GA, IA, IL, IN, KS, KY, MA, MD, MI, MN, MO, NC, ND, NE, NH, NJ, NY, OH, OK, PA, SC, SD, TN, VA, VT, WI, WV

Map Zones: 32:P, 38:C, 39:?, 40:?, 41:P, 42:C, 43:C, 44:C, 47:C, 48:C, 49:C, 50:C, 51:C, 52:C, 53:C, 54:C, 57:C, 59:C, 60:C, 61:C, 62:C, 63:P, 64:C, 65:C

USFS Ecomap Regions: 211F:CC, 211J:CC, 221A:CC, 221B:CC, 221D:CC, 221E:CC, 221F:CC, 222H:CC, 222I:CC, 222U:CC, M221Aa:CCC, M221Ab:CCC, M221B:CC, M221Ca:CCP, M221Cb:CCC, M221Da:CCC

TNC Ecoregions: 32:P, 35:C, 36:C, 37:C, 38:C, 39:C, 44:C, 45:C, 46:C, 47:?, 48:?, 49:C, 50:C, 51:C, 52:C, 59:C, 60:P, 61:C

SOURCES

References: Evans 1991, Midwestern Ecology Working Group n.d., Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.784935#references

Description Author: S.C. Gawler

Version: 24 Jan 2007

Concept Author: Midwestern Ecology Group

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Central Interior and Appalachian (202)**Land Cover Class:** Mixed Upland and Wetland**Spatial Scale & Pattern:** Linear**Required Classifiers:** Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland**Diagnostic Classifiers:** Intermittent Flooding; Short (<5 yrs) Flooding Interval; Riparian Mosaic; Lowland; Temperate; Riverine / Alluvial; Flood Scouring**FGDC Crosswalk:** Vegetated, Tree-dominated, Open tree canopy, Mixed evergreen-deciduous open tree canopy**National Mapping Codes:** EVT 2472; ESLF 9141; ESP 1472

CONCEPT

Summary: This riverscour-influenced systems group occurs on moderately to very high-gradient streams over a wide range of elevations. It develops on small floodplains and shores along river channels that lack a broad, flat floodplain due to steeper sideslopes, higher gradient, or both. Flooding is the major process affecting the vegetation, with the substrate more rapidly drained than in flat floodplain areas. These systems are affected by flood-scouring in some areas and deposition in others. The vegetation is often a mosaic including various combinations of forest, woodland, shrubland, and herbaceous communities. The non-forested components are particularly distinctive. The succession of woody plants (particularly trees) is retarded by the force of "flashy," high-velocity water traveling down the stream channels. Common trees include *Betula nigra*, *Platanus occidentalis*, and *Acer negundo*. Where somewhat more stable, linear forests develop; typical trees include *Liriodendron tulipifera*, *Liquidambar styraciflua*, *Acer rubrum*, *Celtis laevigata*, *Fraxinus pennsylvanica*, *Quercus michauxii*, and *Quercus pagoda*. Some common shrubs, occurring as forest/woodland understory or as non-forested shrublands, include *Alnus serrulata*, *Cephalanthus occidentalis*, *Cornus amomum*, *Lindera benzoin*, *Salix caroliniana* and other *Salix* spp., *Toxicodendron radicans*, and, over parts of the range, *Fothergilla major*, *Hypericum densiflorum*, *Itea virginica*, and *Rhododendron arborescens*. More southern examples may contain *Hydrangea quercifolia*, *Hypericum densiflorum*, and *Morella cerifera* (= *Myrica cerifera* var. *cerifera*); *Hamamelis vernalis* is characteristic in the Ozark/Ouachita region. Open, flood-scoured rivershore prairies feature *Andropogon gerardii*, *Sorghastrum nutans*, *Schizachyrium scoparium*, *Chasmanthium latifolium*, *Tripsacum dactyloides*, and/or *Panicum virgatum*. *Carex torta* is typical of wetter areas near the channel. Forbs are diverse and variable from occurrence to occurrence. Some characteristic forbs are *Baptisia australis*, *Conoclinium coelestinum* (= *Eupatorium coelestinum*), *Coreopsis pubescens*, *Coreopsis tripteris*, *Elephantopus carolinianus*, *Helenium autumnale*, *Hydrocotyle* sp., *Ludwigia leptocarpa*, *Lycopus* spp., *Orontium aquaticum*, *Osmunda regalis* var. *spectabilis*, *Oxypolis rigidior*, *Phlox carolina*, *Pityopsis graminifolia* var. *latifolia*, *Rudbeckia laciniata*, and *Vernonia gigantea*. Distinctive shoals with *Hymenocallis coronaria* and/or *Justicia americana* may be present as well. Small seeps and fens can often be found within these habitats, especially at the headwaters and terraces of streams. These areas are typically dominated by primarily wetland obligate species of sedges (*Carex* spp.), ferns (*Osmunda* spp.), and other herbaceous species such as *Impatiens capensis*. Flood-scouring is a powerful and ecologically important abrasive force along these riparian habitats. However, in contrast to larger floodplain systems, these systems have little to no floodplain development (i.e., floodplains, if present, are not differentiated into levees, sloughs, ridges, terraces, and abandoned channel segments) and often contain cobblebars and steep banks. They are typically higher gradient than larger floodplains and experience periodic, strong flooding of short duration.

Classification Comments: This systems group includes graminoid-dominated vegetation sometimes called "scoured riverbank prairies," "riverside prairies," "linear prairies," "rivershore grasslands," or "scoured riverine bluff prairie."

DESCRIPTION

Dynamics: Flood-scouring is a powerful and ecologically important abrasive force along the riverbanks where these systems are found. Small rivers and streams, with small watersheds, have more variable flooding regimes than larger rivers. Floods tend to be of short duration and unpredictably variable as to season and depth. Flood waters may have significant energy in higher gradient systems, with scouring and reworking of sediment rarely affecting primarily small patches.

MEMBERSHIP

Standard Ecological Systems:

- Central Appalachian Stream and Riparian (CES202.609)
- Cumberland Riverscour (CES202.036)
- Ozark-Ouachita Riparian (CES202.703)
- South-Central Interior Small Stream and Riparian (CES202.706)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

DISTRIBUTION

Range: This systems group encompasses small stream riparian systems over much of the eastern United States, from southern New England south to Georgia, and west to Illinois and eastern Oklahoma.

Divisions: 202:C; 203:C**Nations:** US

Subnations: AL, AR, CT, GA, IL, IN, KY, MA, MD, MO, NC, NH, NJ?, NY, OH, OK, PA, SC, TN, VA, VT, WV
Map Zones: 44:C, 46:C, 47:C, 48:C, 49:C, 53:C, 54:C, 57:C, 59:C, 60:C, 61:C, 62:C, 63:P, 64:C, 65:C
USFS Ecomap Regions: 211F:CC, 211J:CC, 221A:CC, 221B:CC, 221D:CC, 221E:CC, 221F:CC, 222I:CC, M221A:CC, M221B:CC, M221C:CC, M221D:C?
TNC Ecoregions: 38:C, 39:C, 43:C, 44:C, 49:C, 50:C, 51:C, 52:C, 59:C, 60:?, 61:C

SOURCES

References: Bailey and Coe 2001, Evans 1991, Midwestern Ecology Working Group n.d., NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1985

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.784936#references

Description Author: S.C. Gawler

Version: 24 Jan 2007

Concept Author: Midwestern Ecology Group

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

1435 EAST GULF COASTAL PLAIN DUNE AND COASTAL GRASSLAND (CES203.500)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2435; ESLF 7148; ESP 1435

CONCEPT

Summary: This system includes vegetation of coastal dunes along the northern Gulf of Mexico, including the northwestern panhandle of Florida, southern Alabama, and southeastern Mississippi. The vegetation consists largely of herbaceous and embedded shrublands on barrier islands and other near-coastal areas where salt spray, saltwater overwash, and sand movement are important ecological forces. This vegetation differs from that of other regions of the Gulf, and this region forms a natural unit with similar climate and substrate (Johnson 1997). There are a number of diagnostic and endemic plant species which characterize this system, including *Ceratiola ericoides*, *Chrysoma pauciflosculosa*, *Schizachyrium maritimum*, *Paronychia erecta*, and *Helianthemum arenicola* (Johnson and Barbour 1990).

Similar Ecological Systems:

- East Gulf Coastal Plain Maritime Forest (CES203.503)

Related Concepts:

- Beach Dune (FNAI 1990) Intersecting
- Coastal Grassland (FNAI 1990) Intersecting

MEMBERSHIP

Associations:

- (*Iva imbricata*) / *Sporobolus virginicus* - *Spartina patens* - (*Paspalum distichum*, *Sesuvium portulacastrum*) Herbaceous Vegetation (CEGL007839, G3?)
- *Ceratiola ericoides* - (*Chrysoma pauciflosculosa*) / *Polygonella polygama* / *Cladonia leporina* Shrubland (CEGL003864, G2?)
- *Fuirena scirpoidea* - *Panicum tenerum* - *Dichanthelium wrightianum* - *Andropogon capillipes* Herbaceous Vegetation (CEGL004953, G2?)
- *Quercus myrtifolia* - *Quercus geminata* - *Ceratiola ericoides* - *Conradina canescens* Shrubland (CEGL003824, G2)
- *Schizachyrium maritimum* - (*Heterotheca subaxillaris*) Herbaceous Vegetation (CEGL004057, G2)
- *Spartina patens* - *Schizachyrium maritimum* - *Solidago sempervirens* Herbaceous Vegetation (CEGL008445, G3?)
- *Spartina patens* - *Setaria parviflora* - *Hydrocotyle bonariensis* Herbaceous Vegetation (CEGL004257, G3)

Alliances:

- *Ceratiola ericoides* Shrubland Alliance (A.817)
- *Fuirena scirpoidea* - *Rhynchospora* spp. Seasonally Flooded Herbaceous Alliance (A.1373)
- *Quercus geminata* - *Quercus myrtifolia* - *Quercus chapmanii* Shrubland Alliance (A.779)
- *Schizachyrium maritimum* Herbaceous Alliance (A.1222)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)

DISTRIBUTION

Range: Coastal dunes along the northern Gulf of Mexico, including the northwestern panhandle of Florida, southern Alabama, and southeastern Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, Johnson 1997, Johnson and Barbour 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723088#references

Description Author: R. Evans

Version: 06 Feb 2003

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1454 EAST GULF COASTAL PLAIN NEAR-COAST PINE FLATWOODS (CES203.375)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Forest and Woodland (Treed); Extensive Wet Flat; Short Disturbance Interval; Needle-Leaved Tree

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2454; ESLF 9123; ESP 1454

CONCEPT

Summary: This system of open forests or woodlands occupies broad, sandy flatlands in a relatively narrow band along the northern Gulf of Mexico coast east of the Mississippi River [see map in Peet and Allard (1993)]. This range corresponds roughly to Ecoregion 75a (EPA 2004). These areas, often called "flatwoods" or "flatlands," are subject to high fire-return intervals even though they are subject to seasonally high water tables. Overstory vegetation is characterized by *Pinus palustris* and to a lesser degree by *Pinus elliottii*. Understory conditions range from densely shrubby to open and herbaceous-dominated, based largely upon fire history. Fire is naturally frequent, with a fire-return time of from one to four years.

Classification Comments: There was some consideration of splitting out the slash pine flatwoods from this system due to presumed differences in both moisture status and fire history when compared with typical longleaf. There is considerable variation between wet and "non-wet" flatwoods implied in this system.

Similar Ecological Systems:

- Central Florida Pine Flatwoods (CES203.382)
- East Gulf Coastal Plain Interior Upland Longleaf Pine Woodland (CES203.496)
- Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods (CES203.536)

Related Concepts:

- Mesic Flatwoods (FNAI 1990) Intersecting
- Scrubby Flatwoods (FNAI 1990) Intersecting
- Wet Flatwoods (FNAI 1990) Intersecting

DESCRIPTION

Environment: This system occupies broad, sandy flatlands which are subject to high fire-return intervals even though they are subject to seasonally high water tables. These areas are often called "flatwoods" or "flatlands."

Vegetation: Overstory vegetation is characterized by *Pinus palustris* and to a lesser degree by *Pinus elliottii*. Some stands include *Pinus serotina*. Shrubs include *Quercus geminata*, *Quercus minima* - *Quercus pumila*, *Serenoa repens*, *Cyrilla racemiflora*, *Ilex coriacea*, *Ilex glabra*, *Ilex vomitoria*, and *Lyonia lucida*. Herbaceous species may include *Aristida beyrichiana*, *Ctenium aromaticum*, *Muhlenbergia expansa*, *Schizachyrium scoparium*, *Sporobolus floridanus*, *Carphephorus pseudoliatris*, *Sarracenia alata*, *Agalinis filicaulis*, *Polygala cymosa*, *Rhynchospora* spp., and *Helianthus radula*.

Dynamics: Fire is naturally frequent, with a fire-return time of from one to four years.

MEMBERSHIP

Associations:

- *Pinus (palustris, elliottii* var. *elliottii) / (Quercus geminata) / Serenoa repens / Aristida beyrichiana* Woodland (CEGL007714, G3?)
- *Pinus elliottii* var. *elliottii* - *Taxodium ascendens / Polygala cymosa - Rhynchospora* spp. Woodland (CEGL004556, G2?)
- *Pinus elliottii* var. *elliottii / Serenoa repens - Ilex glabra* Woodland (CEGL003643, G4?)
- *Pinus palustris - (Pinus elliottii* var. *elliottii) / Ctenium aromaticum - Carphephorus pseudoliatris - (Sarracenia alata)* Woodland (CEGL003645, G3?)
- *Pinus palustris - (Pinus elliottii* var. *elliottii) / Ilex coriacea - Cyrilla racemiflora* Woodland (CEGL003656, G3G4)
- *Pinus palustris - (Pinus elliottii* var. *elliottii) / Ilex vomitoria / Muhlenbergia expansa - Agalinis filicaulis* Woodland (CEGL004792, G1?)
- *Pinus palustris - Pinus serotina / Ilex glabra - Lyonia lucida - (Serenoa repens)* Woodland (CEGL004791, G3G4)
- *Pinus palustris / Quercus minima - Quercus pumila / Aristida beyrichiana* Woodland (CEGL003808, G3?)
- *Pinus palustris / Schizachyrium scoparium - Muhlenbergia expansa - Helianthus radula* Woodland (CEGL004956, G2?)
- *Pinus serotina / Sporobolus floridanus - Aristida beyrichiana* Woodland (CEGL003797, G2)

Alliances:

- *Pinus elliottii - Taxodium ascendens* Saturated Woodland Alliance (A.692)
- *Pinus elliottii* Saturated Temperate Woodland Alliance (A.574)
- *Pinus palustris - Pinus (elliottii, serotina)* Saturated Woodland Alliance (A.578)
- *Pinus palustris* Woodland Alliance (A.520)
- *Pinus serotina* Saturated Woodland Alliance (A.581)

DISTRIBUTION

Range: This system is conceived of as including wet and dry pine flatwoods of the near-coastal zone of the East Gulf Coastal Plain. For a definition of this range, see map in Peet and Allard (1993). It corresponds roughly to Ecoregion 75a (EPA 2004).

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA, LA, MS

Map Zones: 55:C, 99:C

TNC Ecoregions: 53:C

SOURCES

References: Comer et al. 2003, EPA 2004, FNAI 1990, Griffith et al. 2001, Peet 2006, Peet and Allard 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723141#references

Description Author: R. Evans, mod. M. Pyne

Version: 05 Jul 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

NORTHERN ATLANTIC COASTAL PLAIN CALCAREOUS RAVINE (CES203.069)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Ravine; Slope; Seepage-Fed Sloping; Calcareous

Non-Diagnostic Classifiers: Forest and Woodland (Treed)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: ESLF 4156

CONCEPT

Summary: This system occurs on dry to mesic ravine slopes and bottoms of the northern Atlantic Coastal Plain where erosion has exposed Tertiary-aged shell deposits or limesands. These calcium-bearing sediments produce soils that range from slightly acidic to circumneutral and moderately to very strongly calcareous. The fertile soils support a rich diversity of plant species that distinguishes this system from the more widespread dry-mesic, acidic (poor) ravines. This system includes upland forests and woodlands on slopes and low interfluvial and seepage wetlands found along the base of slopes. Species composition varies with the environmental setting. The communities of this system often contain species that are disjunct from their primary ranges in the mountains or Piedmont, such as *Actaea pachypoda*, *Caltha palustris*, *Pedicularis lanceolata*, *Solidago flexicaulis*, *Quercus muehlenbergii*, *Verbesina virginica* var. *virginica*, *Hexalectris spicata*, *Corallorhiza wisteriana*, *Campanulastrum americanum*, *Celastrus scandens*, *Muhlenbergia sobolifera*, *Muhlenbergia tenuiflora*, *Sanicula marilandica*, and *Thalictrum revolutum*.

DESCRIPTION

Environment: This system is naturally rare and restricted to the calcium-rich, shell-containing formations exposed in ravines of downcutting streams along the northern Atlantic Coastal Plain of Virginia, Maryland, Delaware and New Jersey. It comprises mesic and dry uplands and seepage wetlands associated with these base-rich areas. Occurrences are typically linear or small patch and uncommon.

Vegetation: Forests of mesic slopes and low interfluvial areas are characterized by *Fagus grandifolia*, *Liriodendron tulipifera*, *Quercus alba*, *Carya cordiformis*, and *Quercus rubra* in the overstory. Other canopy dominants and associates may include *Quercus muehlenbergii*, *Fraxinus americana*, *Tilia americana*, and *Acer barbatum*. The understory is often dense and may include *Asimina triloba*, *Lindera benzoin*, *Viburnum prunifolium*, *Ulmus rubra*, *Ilex opaca*, *Magnolia tripetala*, and *Cercis canadensis* var. *canadensis*. The ground cover is lush though sometimes patchy and may include *Podophyllum peltatum*, *Arisaema triphyllum*, *Sanguinaria canadensis*, *Circaea lutetiana* ssp. *canadensis*, *Maianthemum racemosum* ssp. *racemosum*, *Cardamine concatenata*, and *Polystichum acrostichoides*. More locally abundant herbs include *Cystopteris protrusa*, *Deparia acrostichoides*, *Diplazium pycnocarpon*, *Actaea racemosa* (= *Cimicifuga racemosa*), *Phegopteris hexagonoptera*, *Nemophila aphylla*, and *Actaea pachypoda*.

Drier, more southerly facing convex slopes are characterized by a more open canopy of *Quercus muehlenbergii*; common associates may include *Acer barbatum*, *Carya cordiformis*, *Fagus grandifolia*, *Fraxinus americana*, *Quercus alba*, *Quercus rubra*, and *Quercus prinus*. The understory may include *Juniperus virginiana* var. *virginiana*, *Cercis canadensis* var. *canadensis*, *Dirca palustris*, *Ilex opaca* var. *opaca*, *Sideroxylon lycioides*, and *Viburnum rufidulum*. The herb layer is usually patchy but contains a diversity of species, including *Aquilegia canadensis*, *Erigeron pulchellus* var. *pulchellus*, *Bromus pubescens*, *Dichanthelium boscii*, *Verbesina virginica* var. *virginica*, *Campanulastrum americanum*, *Smallanthus uvedalius*, *Silphium trifoliatum* var. *trifoliatum*, *Desmodium pauciflorum*, *Hexalectris spicata*, and *Piptochaetium avenaceum*.

Forested seepage wetlands are often found along stream bottoms and at the base of slopes. Braided streams and hummock-and-hollow microtopography are characteristic of the environmental setting. The tree canopy is characterized by *Fraxinus pennsylvanica*, *Acer rubrum*, *Liquidambar styraciflua*, *Nyssa biflora*, and others. The shrub layer is comprised of *Lindera benzoin*, *Morella cerifera* (= *Myrica cerifera*), and *Cornus foemina*. Vines are abundant, especially *Decumaria barbara*. The herbaceous layer is characterized by *Caltha palustris*, *Carex bromoides*, *Packera aurea* (= *Senecio aureus*), *Scirpus lineatus*, *Thelypteris palustris*, *Pedicularis lanceolata*, *Carex tetanica*, *Liparis loeselii*, and *Carex granularis* on drier hummocks, and *Saururus cernuus*, *Bidens laevis*, *Pilea fontana*, *Glyceria striata*, and *Impatiens capensis* in wetter hollows and seepage rivulets.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus pennsylvanica* / *Packera aurea* - *Carex bromoides* - *Pilea fontana* - *Bidens laevis* Forest (CEGL006413, G2)
- *Fagus grandifolia* - *Acer barbatum* - *Quercus muehlenbergii* / *Sanguinaria canadensis* Forest (CEGL007181, G2?)
- *Fagus grandifolia* - *Liriodendron tulipifera* - *Carya cordiformis* / *Lindera benzoin* / *Podophyllum peltatum* Forest (CEGL006055, G4?)
- *Quercus muehlenbergii* / *Cercis canadensis* / *Dichanthelium boscii* - *Bromus pubescens* - *Erigeron pulchellus* var. *pulchellus* - *Aquilegia canadensis* Forest (CEGL007748, G1)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Saturated Forest Alliance (A.3035)
- *Fagus grandifolia* - *Acer saccharum* - (*Liriodendron tulipifera*) Forest Alliance (A.227)
- *Fagus grandifolia* - *Quercus alba* Forest Alliance (A.228)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)

SPATIAL CHARACTERISTICS

Spatial Summary: Small, linear patch.

DISTRIBUTION

Range: This system is known from the northern Atlantic Coastal Plain of Virginia and Maryland, possibly ranging north into Delaware and New Jersey.

Divisions: 203:C

Nations: US

Subnations: DE, MD, NJ, VA

Map Zones: 60:C

TNC Ecoregions: 57:C, 58:C

SOURCES

References: Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.798077#references

Description Author: G. Fleming and J. Teague

Version: 01 Feb 2007

Concept Author: NCR Review Team

Stakeholders: East, Southeast

ClassifResp: East

1436 NORTHERN ATLANTIC COASTAL PLAIN DUNE AND MARITIME GRASSLAND (CES203.264)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: North Atlantic Coastal Plain; Beach (Substrate); Graminoid; Coast

Non-Diagnostic Classifiers: Herbaceous; Depressional; Isolated Wetland [Partially Isolated]

FGDC Crosswalk: Vegetated, Herbaceous / Nonvascular-dominated, Herbaceous - grassland, Perennial graminoid grassland

National Mapping Codes: EVT 2436; ESLF 7149; ESP 1436

CONCEPT

Summary: This system consists of vegetation of barrier islands and other coastal areas, ranging from northern North Carolina northward to southern Maine (where extensive sandy coastlines are replaced by rocky coasts). A range of plant communities may be present, but natural vegetation is predominately herbaceous. Shrublands resulting from succession from grasslands may occur in limited areas, but they are generally not natural components of this system in the southern part of its range (M. Schafale pers. comm.). Both upland and non-flooded wetland vegetation are also included in this system. Small patches of natural woodland may also be present in limited areas, especially in the northern range of this system. Dominant ecological processes are those associated with the maritime environment, including frequent salt spray, saltwater overwash, and sand movement.

Classification Comments: This system was separated from Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273) to parallel broad-scale biogeographic and climatic differences believed to be important in this environment. This system occupies the northern part of this broad transition which was labeled by Cowardin et al. (1979) as the Virginian Province, although the demarcated boundary differs somewhat from that used here. A useful vegetation indicator of this transition is the shift in herbaceous dominance on the dunes from *Uniola paniculata* in the south to *Ammophila breviligulata* in the north. Although the location of this shift itself is somewhat imprecise because of widespread planting of both species on artificially enhanced dunes, this boundary appears to be well approximated by Omernik Ecoregion 63g vs. 63d (EPA 2004). Along the northern boundary, there is extensive turnover of associations in TNC Ecoregion 58 with very little overlap southward.

This system is distinguished from Northern Atlantic Coastal Plain Maritime Forest (CES203.302) by the lack of dominant woody vegetation. This distinction becomes blurred where dunes have been artificially enhanced and an unnatural succession to woody vegetation is occurring. The boundary at the northern end is the end of extensive sandy coastlines and the beginning of rocky coasts.

Southeastern Coastal Plain Interdunal Wetland (CES203.258) is distinguished from this system by the presence of standing water for a significant part of the growing season. This corresponds to a break between open-water and tall-graminoid marsh vegetation in the ponds and low-graminoid- or forb-dominated vegetation in the grasslands.

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Heathland and Grassland (CES203.895)
- Northern Atlantic Coastal Plain Maritime Forest (CES203.302)
- Northern Atlantic Coastal Plain Sandy Beach (CES203.301)--occurs between this system and the high tide line.
- Southeastern Coastal Plain Interdunal Wetland (CES203.258)
- Southern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.273)--occurs to the south.

DESCRIPTION

Environment: This system occurs on barrier islands and similar coastal strands, on sand dunes and sand flats. Strong salt spray is an important influence on vegetation in many parts. Overwash by sea water during storms is important on sand flats not protected by continuous dunes. On dunes, present or recent sand movement is an important factor. The combination of these factors prevents the dominance of woody vegetation. Sites may be either dry or saturated by freshwater from rainfall and the local water table. Areas connected to tidal influence and areas with ponded freshwater are placed in other systems. Soils are sandy, with little organic matter and little or no horizon development. Soils may be excessively drained on the higher dunes. Soils are low in nutrient-holding capacity, but aerosol input of sea salt provides a continuous source of nutrients.

Vegetation: Vegetation consists of a set of grassland and herbaceous to shrubby associations. *Ammophila breviligulata* is the characteristic dominant on the youngest dunes and those most exposed to salt spray. These communities tend to be low in plant species richness but have a characteristic set of forbs and occasional low shrubs associated with them. Wetter sand flats and dune swales may be dominated by a variety of herbs and sometimes have fairly high species richness.

Dynamics: The environment of this system is one of the most dynamic in existence for terrestrial vegetation. Reworking of sand by storms or by slower eolian processes may completely change the local environment in a short time, changing one association to another or changing this system into a different system. Many of these sites are fairly early in the process of primary succession on recent surfaces. Chronic salt spray is an ongoing stress. Overwash and extreme salt spray in storms are frequent disturbances. Vegetation interacts strongly with geologic processes; the presence of grass is an important factor in the development of new dunes. Alteration of dynamic processes, such as artificial enhancement of dunes by planting or sand fencing, can have drastic effects on this system, causing large areas to succeed to woody vegetation. Fire is probably not a major natural factor in this system, but may have

been important locally. Most vegetation is too sparse to carry fire well.

MEMBERSHIP

Associations:

- (*Morella cerifera*) - *Panicum virgatum* - *Spartina patens* Herbaceous Vegetation (CEGL004129, G2G4)
- *Ammophila breviligulata* - *Lathyrus japonicus* Herbaceous Vegetation (CEGL006274, G4?)
- *Ammophila breviligulata* - *Panicum amarum* var. *amarum* Herbaceous Vegetation (CEGL004043, G2)
- *Cladium mariscoides* / *Vaccinium macrocarpon* - *Morella pensylvanica* Dwarf-shrubland (CEGL006141, G2G3)
- *Hudsonia tomentosa* - *Arctostaphylos uva-ursi* Dwarf-shrubland (CEGL006143, G2G3)
- *Hudsonia tomentosa* / *Panicum amarum* var. *amarulum* Dwarf-shrubland (CEGL003950, G2G3)
- *Juncus (dichotomus, scirpoides)* - *Drosera intermedia* Herbaceous Vegetation (CEGL004111, G2G3)
- *Juniperus virginiana* var. *virginiana* / *Morella pensylvanica* Woodland (CEGL006212, G2)
- *Morella (pensylvanica, cerifera)* / *Schizachyrium littorale* - *Eupatorium hyssopifolium* Shrub Herbaceous Vegetation (CEGL004240, G2)
- *Morella cerifera* / *Hydrocotyle verticillata* Shrubland (CEGL003840, G2G3)
- *Morella cerifera* / *Spartina patens* Shrubland (CEGL003839, G3G4)
- *Morella pensylvanica* - *Prunus maritima* Shrubland (CEGL006295, G4)
- *Morella pensylvanica* / *Diodia teres* Shrubland (CEGL003881, G2)
- *Morella pensylvanica* / *Schizachyrium littorale* - *Danthonia spicata* Shrub Herbaceous Vegetation (CEGL006067, G2)
- *Myrica gale* - *Morella pensylvanica* Saturated Shrubland (CEGL006339, GNR)
- *Pinus rigida* / *Hudsonia tomentosa* Woodland (CEGL006117, G2G3)
- *Pinus taeda* / *Hudsonia tomentosa* Woodland (CEGL006052, G1G2)
- *Prunus serotina* / *Morella cerifera* / *Smilax rotundifolia* Scrub Forest (CEGL006319, G1G2)
- *Quercus virginiana* - (*Ilex vomitoria*) Shrubland (CEGL003833, G3)
- *Schoenoplectus pungens* - *Fimbristylis (castanea, caroliniana)* Herbaceous Vegetation (CEGL004117, G1G2)
- *Schoenoplectus pungens* var. *pungens* - *Juncus canadensis* Herbaceous Vegetation (CEGL006935, GNR)
- *Smilax glauca* - *Toxicodendron radicans* Vine-Shrubland (CEGL003886, G1G2)
- *Spartina patens* - *Eleocharis parvula* Herbaceous Vegetation (CEGL006342, GNR)
- *Spartina patens* - *Schoenoplectus pungens* - *Solidago sempervirens* Herbaceous Vegetation (CEGL004097, G2G3)
- *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Shrubland (CEGL006371, G4)
- *Vitis rotundifolia* / *Triplasis purpurea* - *Panicum amarum* - *Schizachyrium littorale* Mid-Atlantic Coastal Meda±o Sparse Vegetation (CEGL004397, G1)

Alliances:

- *Ammophila breviligulata* Herbaceous Alliance (A.1207)
- *Fimbristylis castanea* - *Schoenoplectus pungens* Seasonally Flooded Herbaceous Alliance (A.1372)
- *Hudsonia tomentosa* Dwarf-shrubland Alliance (A.1062)
- *Juncus dichotomus* Seasonally Flooded Herbaceous Alliance (A.1427)
- *Juniperus virginiana* Woodland Alliance (A.545)
- *Morella cerifera* Saturated Shrubland Alliance (A.1906)
- *Morella pensylvanica* - (*Prunus maritima*) Shrubland Alliance (A.902)
- *Myrica gale* Saturated Shrubland Alliance (A.1022)
- *Panicum virgatum* Seasonally Flooded Herbaceous Alliance (A.1362)
- *Pinus rigida* Woodland Alliance (A.524)
- *Pinus taeda* Woodland Alliance (A.526)
- *Prunus serotina* - *Acer rubrum* - *Amelanchier canadensis* - *Quercus* spp. Forest Alliance (A.237)
- *Quercus virginiana* - *Ilex vomitoria* - (*Morella cerifera*) Shrubland Alliance (A.785)
- *Schizachyrium littorale* Shrub Herbaceous Alliance (A.1533)
- *Smilax* spp. - *Toxicodendron radicans* Vine-Shrubland Alliance (A.909)
- *Spartina patens* - (*Schoenoplectus pungens*) Herbaceous Alliance (A.1274)
- *Spartina patens* Seasonally Flooded Herbaceous Alliance (A.1390)
- *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
- *Vaccinium formosum* - *Vaccinium fuscum* - *Vaccinium corymbosum* Seasonally Flooded Shrubland Alliance (A.992)
- *Vaccinium macrocarpon* Saturated Dwarf-shrubland Alliance (A.1094)
- *Vitis rotundifolia* - *Parthenocissus quinquefolia* / *Triplasis purpurea* Unstabilized Dune Sparsely Vegetated Alliance (A.1858)

SPATIAL CHARACTERISTICS

Spatial Summary: Occurs as a large-patch or local matrix system.

Size: Occurs in narrow to broad bands, up to several miles wide, extending along the length of barrier islands. Individual patches may cover a thousand or more acres. However, some of the best remnants are naturally small, occurring on smaller islands.

DISTRIBUTION

Range: This system ranges from northern North Carolina (Omernik ecoregion 63d) and southeastern Virginia to southern Maine. The southern limit is a transition zone from around Kitty Hawk, North Carolina, to the Virginia-North Carolina border. The northern limit is Merrymeeting Bay, Maine.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NC, NH, NJ, NY, RI, VA

Map Zones: 60:C, 65:C, 66:C

USFS Ecomap Regions: 211Db:CCC, 221Aa:CCC, 221Ab:CCC, 221Ac:CCC, 221Ad:CCC, 221Ak:CCC, 221An:CCC, 232Ab:CCC, 232Hc:CCC

TNC Ecoregions: 57:C, 58:C, 62:C, 63:C

SOURCES

References: Comer et al. 2003, Cowardin et al. 1979, Eastern Ecology Working Group n.d., EPA 2004, Schafale pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723222#references

Description Author: R. Evans, mod. M. Pyne

Version: 02 Feb 2007

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN STREAM AND RIVER (CES203.070)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Riverine / Alluvial

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Stream terrace (undifferentiated)

FGDC Crosswalk: Vegetated, Tree-dominated, Closed tree canopy, Deciduous closed tree canopy

National Mapping Codes: ESLF 4157

CONCEPT

Summary: This system is found throughout the northern Atlantic Coastal Plain, ranging from Virginia to New Jersey. Examples occur along low-gradient small streams and rivers. There may be little to moderate floodplain development. This system is influenced by overbank flooding, groundwater seepage and occasional beaver impoundments. The vegetation is a mosaic of forests, woodlands, shrublands, and herbaceous communities. Canopy composition and cover can vary within examples of this system, but typical tree species may include *Quercus palustris*, *Quercus phellos*, *Chamaecyparis thyoides*, *Acer rubrum*, *Fraxinus pennsylvanica*, *Nyssa sylvatica*, *Betula nigra*, *Liquidambar styraciflua*, and *Platanus occidentalis*. Shrubs and herbaceous layers can vary in richness and cover. Some characteristic shrubs may include *Alnus maritima*, *Carpinus caroliniana*, *Lindera benzoin*, and *Viburnum nudum*. Seepage forests dominated by *Acer rubrum* and *Magnolia virginiana* can often be found within this system, especially at the headwaters and terraces of streams.

Similar Ecological Systems:

- Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247)
- Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248)
- Atlantic Coastal Plain Large River Floodplain Forest (CES203.066)
- Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249)
- Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250)

DESCRIPTION

Environment: This system occurs on small streams and rivers, and as a result, many of the depositional landforms may be poorly developed.

Dynamics: This system is influenced by periodic flooding and groundwater seepage.

MEMBERSHIP

Associations:

- *Acer rubrum* - *Fraxinus pennsylvanica* / *Saururus cernuus* Forest (CEGL006606, GNR)
- *Acer rubrum* - *Nyssa sylvatica* - *Magnolia virginiana* / *Viburnum nudum* var. *nudum* / *Osmunda cinnamomea* - *Woodwardia areolata* Forest (CEGL006238, G3?)
- *Betula nigra* - *Platanus occidentalis* / *Impatiens capensis* Forest (CEGL006184, GNR)
- *Chamaecyparis thyoides* - *Acer rubrum* - *Magnolia virginiana* Forest (CEGL006078, GNR)
- *Chamaecyparis thyoides* / *Alnus maritima* Woodland (CEGL006307, GNR)
- *Cornus amomum* - *Alnus serrulata* Shrubland (CEGL006414, GNR)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* / *Lindera benzoin* / *Arisaema triphyllum* Forest (CEGL004418, G4)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) / *Asimina triloba* Forest (CEGL006603, G3G4)
- *Platanus occidentalis* - *Liquidambar styraciflua* / *Carpinus caroliniana* - *Asimina triloba* Forest (CEGL007340, G5)
- *Quercus* (*phellos*, *palustris*, *michauxii*) - *Liquidambar styraciflua* / *Cinna arundinacea* Forest (CEGL006605, G3G4)

Alliances:

- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Chamaecyparis thyoides* - *Acer rubrum* Saturated Forest Alliance (A.448)
- *Chamaecyparis thyoides* Seasonally Flooded Woodland Alliance (A.571)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Quercus* (*phellos*, *laurifolia*) Seasonally Flooded Forest Alliance (A.327)

SPATIAL CHARACTERISTICS

Spatial Summary: Small, linear patch.

Size: Can be quite long but never very wide.

DISTRIBUTION

Range: This system ranges along the northern Atlantic Coastal Plain from the vicinity of the James River in Virginia north into New Jersey.

Divisions: 203:C

Nations: US

Subnations: DE, MD, NJ, VA

Map Zones: 60:C

USFS Ecomap Regions: 232A:CC, 232H:CC

TNC Ecoregions: 57:C, 58:C, 62:C

SOURCES

References: Eastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.798071#references

Description Author: J. Teague

Version: 01 Feb 2007

Concept Author: NCR Review Team

Stakeholders: East, Southeast

ClassifResp: East

1446 SOUTH FLORIDA PINE FLATWOODS (CES411.381)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Matrix

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Diagnostic Classifiers: Needle-Leaved Tree

Non-Diagnostic Classifiers: Woody-Herbaceous; Extensive Wet Flat

FGDC Crosswalk: Vegetated, Tree-dominated, Open tree canopy, Evergreen open tree canopy

National Mapping Codes: EVT 2446; ESLF 9115; ESP 1446

CONCEPT

Summary: This system is endemic to Florida, ranging from approximately Lee, Desoto, Highlands, and Okeechobee counties southward. It was once an extensive system within its historic range. The vegetation is naturally dominated by *Pinus elliottii* var. *densa*, being largely outside the natural range of *Pinus serotina*, *Pinus elliottii* var. *elliottii*, and *Pinus palustris*. In natural condition, examples are generally open with a variety of low shrub and grass species forming a dense ground cover. Frequent, low-intensity fire was the dominant natural ecological force, but most areas have undergone long periods of fire suppression resulting in greater dominance of shrubs and saw palmetto, as well as denser canopies of slash pine (Huffman and Judd 1998, Noel et al. 1998).

Classification Comments: No associations have currently been described in the USNVC for this system. More information is needed. The floristic composition of this system overlaps Florida Dry Prairie (CES203.380); the primary difference lies in taller and denser shrub cover (especially of *Serenoa repens*) (Huffman and Judd 1998). There is considerable variation between wet and "non-wet" flatwoods implied in this system.

Similar Ecological Systems:

- Florida Dry Prairie (CES203.380)
- South Florida Pine Rockland (CES411.367)--is also dominated almost exclusively by *Pinus elliottii* var. *densa* in the canopy, but occurs on limestone and has a richer, diverse mix of tropical and temperate species in the understory.

Related Concepts:

- Mesic Flatwoods (FNAI 1990) Intersecting
- Pine Forest (Duever et al. 1986) Finer
- Scrubby Flatwoods (FNAI 1990) Intersecting
- Wet Flatwoods (FNAI 1990) Intersecting

DESCRIPTION

Vegetation: According to Huffman and Judd (1998) examples of this system have generally open canopies composed of *Pinus elliottii* var. *densa* and, more rarely, *Pinus palustris*. *Serenoa repens*, *Lyonia lucida*, *Lyonia fruticosa*, *Ilex glabra*, *Vaccinium darrowii*, *Vaccinium myrsinites*, and *Quercus minima* are common shrubs. Grasses are typically abundant, including *Aristida beyrichiana* and *Schizachyrium scoparium* var. *stoloniferum*; most other grass and herbaceous species found are in common with Florida Dry Prairie (CES203.380).

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- South Florida Depression Pondshore (CES411.054)

DISTRIBUTION

Range: This system is found in southern Florida, extending north to mid-peninsula.

Divisions: 203:C; 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C, 55:C

SOURCES

References: Comer et al. 2003, Huffman and Judd 1998, McPherson 1986, Noel et al. 1998

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723135#references

Description Author: R. Evans and C. Nordman

Version: 17 Jan 2006

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

SOUTH-CENTRAL INTERIOR LARGE FLOODPLAIN (CES202.705)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Floodplain; Forest and Woodland (Treed); Herbaceous

National Mapping Codes: ESLF 9334

CONCEPT

Summary: This floodplain system is found in the Interior Highlands as far west as eastern Oklahoma, as well as throughout the Interior low Plateau, Cumberlands, Southern Ridge and Valley, and Western Allegheny Plateau, and lower elevations of the Southern Blue Ridge. Examples occur along large rivers or streams where topography and alluvial processes have resulted in a well-developed floodplain. A single occurrence may extend from river's edge across the outermost extent of the floodplain or to where it meets a wet meadow or upland system. Many examples of this system will contain well-drained levees, terraces and stabilized bars, and some will include herbaceous sloughs and shrub wetlands resulting, in part, from beaver activity. A variety of soil types may be found within the floodplain from very well-drained sandy substrates to very dense clays. It is this variety of substrates in combination with different flooding regimes that creates the mix of vegetation. Most areas, except for the montane alluvial forests, are inundated at some point each spring; microtopography determines how long the various habitats are inundated. Although vegetation is quite variable in this broadly defined system, examples may include *Acer saccharinum*, *Platanus occidentalis*, *Liquidambar styraciflua*, and *Quercus* spp. Understory species are mixed, but include shrubs, such as *Cephalanthus occidentalis* and *Arundinaria gigantea* ssp. *gigantea*, and sedges (*Carex* spp.). This system likely floods at least once annually and can be altered by occasional severe floods. Impoundments and conversion to agriculture can also impact this system.

Classification Comments: Montane alluvial forests may be difficult to place within this system because they share traits with both this system and Southern and Central Appalachian Cove Forest (CES202.373), at least in the southern Appalachians. This split from Central Appalachian River Floodplain (CES202.608) may appear somewhat arbitrary but is based on our knowledge of the Freshwater Systems classification. This system grades into Western Great Plains Floodplain (CES303.678) in the Crosstimbers region of east-central Oklahoma as eastern cottonwood (*Populus deltoides*) and willows (*Salix* spp.) become more dominant.

Similar Ecological Systems:

- Central Appalachian River Floodplain (CES202.608)
- South-Central Interior Small Stream and Riparian (CES202.706)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)
- Western Great Plains Floodplain (CES303.678)

Related Concepts:

- Bottomland Hardwood Forest (Evans 1991) Intersecting
- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Coastal Plain Slough (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Floodplain Ridge/Terrace Forest (Evans 1991) Intersecting
- Floodplain Slough (Evans 1991) Intersecting
- Riparian Forest (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: This system inhabits broad floodplains along large creeks and rivers that are usually inundated for at least part of each year.

Vegetation: Vegetation varies quite widely, encompassing shrubby and herbaceous communities, as well as forested communities with a wide array of canopy types. Examples may include *Acer saccharinum*, *Platanus occidentalis*, *Liquidambar styraciflua*, and *Quercus* spp. Understory species are mixed but include shrubs, such as *Cephalanthus occidentalis* and *Arundinaria gigantea* ssp. *gigantea*, and sedges (*Carex* spp.).

Dynamics: Flooding dynamics are an important factor in the development and maintenance of this system.

MEMBERSHIP

Associations:

- (*Diospyros virginiana*, *Platanus occidentalis*) / *Eupatorium serotinum* - *Diodia virginiana* Herbaceous Vegetation (CEGL003910, GNA)
- *Acer negundo* Forest (CEGL005033, G4G5)

- *Acer rubrum* var. *trilobum* - *Fraxinus pennsylvanica* / *Carex crinita* - *Peltandra virginica* Forest (CEGL004420, G1)
- *Acer saccharinum* - *Betula nigra* / *Cephalanthus occidentalis* Forest (CEGL007810, G3Q)
- *Acer saccharinum* - *Celtis laevigata* - *Carya illinoensis* Forest (CEGL002431, G3G4)
- *Acer saccharinum* - *Ulmus americana* Forest (CEGL002586, G4?)
- *Acer saccharum* - *Carya cordiformis* / *Asimina triloba* Floodplain Forest (CEGL005035, G2)
- *Alnus serrulata* - *Xanthorhiza simplicissima* Shrubland (CEGL003895, G3G4)
- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Carex torta* Herbaceous Vegetation (CEGL004103, G3G4)
- *Cephalanthus occidentalis* / *Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191, G4)
- *Fagus grandifolia* - *Quercus* spp. - *Acer rubrum* - *Juglans nigra* Forest (CEGL005014, G2G3)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis laevigata* / *Ilex decidua* Forest (CEGL002427, G4G5)
- *Hypericum densiflorum* - *Alnus serrulata* / *Tripsacum dactyloides* Shrubland (CEGL008495, G1G2)
- *Juglans nigra* / *Verbesina alternifolia* Forest (CEGL007879, GNA)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* - (*Platanus occidentalis*) / *Carpinus caroliniana* - *Halesia tetraptera* / *Amphicarpaea bracteata* Forest (CEGL007880, G3G4)
- *Liquidambar styraciflua* - *Quercus michauxii* - *Carya laciniosa* / *Fagus grandifolia* - (*Aesculus flava*) Forest (CEGL007702, G2G3Q)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Osmunda regalis* var. *spectabilis* Seepage Scour Herbaceous Vegetation (CEGL008404, G3?)
- *Platanus occidentalis* - *Acer saccharinum* - *Juglans nigra* - *Ulmus rubra* Forest (CEGL007334, G4)
- *Platanus occidentalis* - *Betula nigra* - *Celtis laevigata* - *Fraxinus pennsylvanica* / *Arundinaria gigantea* Temporarily Flooded Forest (CEGL007999, G3?)
- *Platanus occidentalis* - *Fraxinus pennsylvanica* - *Quercus imbricaria* Forest (CEGL007339, G2Q)
- *Platanus occidentalis* - *Liriodendron tulipifera* - *Betula (alleghaniensis, lenta)* / *Alnus serrulata* - *Leucothoe fontanesiana* Forest (CEGL004691, G2?)
- *Populus deltoides* - *Salix nigra* Forest (CEGL002018, G3G4)
- *Quercus michauxii* - *Quercus shumardii* - *Liquidambar styraciflua* / *Arundinaria gigantea* Forest (CEGL002099, G3G4)
- *Quercus nigra* - *Quercus (alba, phellos)* Forest (CEGL004979, G3?)
- *Quercus palustris* - (*Fraxinus nigra*) / *Lindera benzoin* / *Carex bromoides* Forest (CEGL007399, GNR)
- *Quercus palustris* - (*Quercus stellata*) - *Quercus pagoda* / *Isoetes* spp. Forest (CEGL002101, G2G3)
- *Quercus phellos* - (*Quercus lyrata*) / *Carex* spp. - *Leersia* spp. Forest (CEGL002102, G3G4Q)
- *Quercus stellata* - *Quercus marilandica* - *Quercus falcata* / *Schizachyrium scoparium* Sand Woodland (CEGL002417, G2)
- *Quercus stellata* / (*Danthonia spicata*, *Croton willdenowii*) Woodland (CEGL005057, G1)
- *Salix caroliniana* Temporarily Flooded Shrubland (CEGL003899, G4?)
- *Salix nigra* Forest (CEGL002103, G4)
- *Salix nigra* Large River Floodplain Forest (CEGL007410, G3G5)
- *Taxodium distichum* / *Lemna minor* Forest (CEGL002420, G4G5)
- Tennessee Valley Impoundment Mudflat Sparse Vegetation (CEGL004049, GNA)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance (A.316)
- *Acer saccharinum* Temporarily Flooded Forest Alliance (A.279)
- *Acer saccharum* - *Carya cordiformis* Temporarily Flooded Forest Alliance (A.302)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
- *Cephalanthus occidentalis* Semipermanently Flooded Shrubland Alliance (A.1011)
- *Eupatorium serotinum* - *Diodia virginiana* Artificial Drawdown Temporarily Flooded Herbaceous Alliance (A.2017)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Fraxinus pennsylvanica* - *Ulmus americana* - *Celtis (occidentalis, laevigata)* Temporarily Flooded Forest Alliance (A.286)
- *Juglans nigra* Forest Alliance (A.1932)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- Non-tidal Mudflat Seasonally/Temporarily Flooded Sparsely Vegetated Alliance (A.1878)
- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Osmunda (cinnamomea, regalis)* Saturated Herbaceous Alliance (A.1692)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Populus deltoides* Temporarily Flooded Forest Alliance (A.290)
- *Quercus (michauxii, pagoda, shumardii)* - *Liquidambar styraciflua* Temporarily Flooded Forest Alliance (A.291)
- *Quercus (phellos, nigra, laurifolia)* Temporarily Flooded Forest Alliance (A.292)

- *Quercus palustris* - (*Quercus bicolor*) Seasonally Flooded Forest Alliance (A.329)
- *Quercus phellos* Seasonally Flooded Forest Alliance (A.330)
- *Quercus stellata* - *Quercus marilandica* Woodland Alliance (A.625)
- *Salix caroliniana* Temporarily Flooded Shrubland Alliance (A.946)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Taxodium distichum* Semipermanently Flooded Forest Alliance (A.346)

SPATIAL CHARACTERISTICS

Size: Examples can range in size from very small (<1 acre) to hundreds of acres in larger floodplain areas.

Adjacent Ecological Systems:

- Western Great Plains Floodplain (CES303.678)

Adjacent Ecological System Comments: This system grades into Western Great Plains Floodplain (CES303.678) in the Crosstimbers region of east-central Oklahoma as eastern cottonwood (*Populus deltoides*) and willows (*Salix* spp.) become more dominant.

DISTRIBUTION

Range: This system ranges from the Ozarks, Arkansas River Valley, and Interior Low Plateau to the Southern Blue Ridge and north into the Western Allegheny Plateau.

Divisions: 202:C; 205:C

Nations: US

Subnations: AL, AR, GA, IL, IN, KY, MO, NC, OH, OK, PA, SC?, TN, VA, WV

Map Zones: 32:P, 37:P, 38:?, 43:C, 44:C, 47:C, 48:C, 49:C, 53:C, 57:C, 61:C, 62:C

TNC Ecoregions: 32:P, 37:C, 38:C, 39:C, 44:C, 49:C, 50:C, 51:C

SOURCES

References: Comer et al. 2003, Woods et al. 2002

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722955#references

Description Author: S. Menard, M. Pyne, R. Evans, R. White

Version: 17 Jan 2006

Concept Author: S. Menard, M. Pyne, R. Evans, R. White

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

SOUTH-CENTRAL INTERIOR SMALL STREAM AND RIPARIAN (CES202.706)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Mixed Upland and Wetland

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland; Wetland

Non-Diagnostic Classifiers: Forest and Woodland (Treed); Stream terrace (undifferentiated)

National Mapping Codes: ESLF 9335

CONCEPT

Summary: This system is found throughout the Interior Low Plateau, Southern Ridge and Valley, Western Allegheny Plateau, and lower elevations of the Southern Blue Ridge. Examples occur along small streams and floodplains with low to moderately high gradients. There may be little to moderate floodplain development. Flooding and scouring both influence this system, and the nature of the landscape prevents the kind of floodplain development found on larger rivers. This system may contain cobble bars with adjacent wooded vegetation and rarely have any marsh development, except through occasional beaver impoundments. The vegetation is a mosaic of forests, woodlands, shrublands, and herbaceous communities. Canopy cover can vary within examples of this system, but typical tree species may include *Platanus occidentalis*, *Acer rubrum* var. *trilobum*, *Betula nigra*, *Liquidambar styraciflua*, and *Quercus* spp. Shrubs and herbaceous layers can vary in richness and cover. Some characteristic shrubs may include *Hypericum densiflorum*, *Salix* spp., and *Alnus* spp. Small seeps dominated by sedges (*Carex* spp.), ferns (*Osmunda* spp.), and other herbaceous species can often be found within this system, especially at the headwaters and terraces of streams.

Classification Comments: This system is closely related to Central Appalachian Stream and Riparian (CES202.609) but has been distinguished based on the precepts of the Freshwater Systems classification. This system has been divided from Central Appalachian Riparian roughly by the Mid-Continental Divide. This means that Ecoregions 50 and 51 are included in this system, whereas Ecoregions 52 and 59 are considered part of Central Appalachian Riparian. In contrast to floodplain systems, this system has little to no floodplain development. In comparison with South-Central Interior Large Floodplain (CES202.705), this system typically has somewhat higher gradients, is sometimes rocky, and may experience flash floods. Stands from somewhat larger rivers have been placed here if the river lacks substantial floodplain development (e.g., the Ocoee gorge of Tennessee).

Similar Ecological Systems:

- Central Appalachian Stream and Riparian (CES202.609)
- Cumberland Riverscour (CES202.036)--is essentially a more extreme and local variant of this broader concept, found in the major rivers of the Cumberland Plateau and related areas of Tennessee, Kentucky, and adjacent states.
- Ozark-Ouachita Riparian (CES202.703)--is the Ozark-Ouachita equivalent of this system.
- South-Central Interior Large Floodplain (CES202.705)

Related Concepts:

- Alluvial Forest (Evans 1991) Intersecting
- Bottomland Hardwood Forest (Evans 1991) Intersecting
- Bottomland Hardwood Swamp (Evans 1991) Intersecting
- Bottomland Marsh (Evans 1991) Intersecting
- Coastal Plain Bottomland Hardwood Forest (Evans 1991) Intersecting
- Cypress/Tupelo Swamp (Evans 1991) Intersecting
- Floodplain Ridge/Terrace Forest (Evans 1991) Intersecting
- Floodplain Slough (Evans 1991) Intersecting
- Gravel/Cobble Bar (Evans 1991) Finer
- Riparian Forest (Evans 1991) Intersecting
- Shrub Swamp (Evans 1991) Intersecting

DESCRIPTION

Environment: Found along fairly high-energy streams and rivers with steep banks, this system is subject to frequent flooding and can even be subject to scouring depending upon the substrate.

Vegetation: There is wide variation in vegetation depending upon the frequency of the flooding cycle (more frequent flooding creates a better environment for forbs and shrubs, less frequent may create a better environment for the establishment of trees). Typical tree species may include *Platanus occidentalis*, *Acer rubrum* var. *trilobum*, *Betula nigra*, *Liquidambar styraciflua*, and *Quercus* spp. Shrubs and herbaceous layers can vary in richness and cover. Some characteristic shrubs may include *Hypericum densiflorum*, *Salix* spp., and *Alnus* spp. Small seeps dominated by sedges (*Carex* spp.), ferns (*Osmunda* spp.), and other herbaceous species can often be found within this system, especially at the headwaters and terraces of streams.

Dynamics: Flooding and seed propagule dispersal caused by flooding events are the two most important processes affecting this system. The two processes vary widely depending upon size of stream, upstream land use and topography, presence or absence of invasive exotics that may displace native community types, etc.

MEMBERSHIP

Associations:

- *Acer negundo* - (*Platanus occidentalis*, *Populus deltoides*) Forest (CEGL004690, G4)
- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Osmunda cinnamomea* - *Chasmanthium laxum* - *Carex intumescens* / *Sphagnum lescurii* Forest (CEGL007443, G3?)
- *Acer rubrum* var. *trilobum* - *Nyssa sylvatica* / *Rhododendron canescens* - *Viburnum nudum* var. *nudum* / *Woodwardia areolata* Forest (CEGL004425, G2G3)
- *Alnus serrulata* - *Xanthorhiza simplicissima* Shrubland (CEGL003895, G3G4)
- *Alnus serrulata* Interior Shrubland (CEGL003894, G4?)
- *Alnus serrulata* Saturated Southern Shrubland (CEGL003912, G4)
- *Arundinaria gigantea* ssp. *gigantea* Shrubland (CEGL003836, G2?)
- *Betula nigra* - *Platanus occidentalis* / *Alnus serrulata* / *Boehmeria cylindrica* Forest (CEGL007312, G4G5)
- *Betula nigra* - *Platanus occidentalis* Forest (CEGL002086, G5)
- *Carex crinita* - *Osmunda* spp. / *Physocarpus opulifolius* Seep Herbaceous Vegetation (CEGL002392, G2)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Herbaceous Vegetation (CEGL002263, G2G3)
- *Carex torta* Herbaceous Vegetation (CEGL004103, G3G4)
- *Fagus grandifolia* - *Quercus alba* / *Kalmia latifolia* - *Rhododendron canescens* - *Symplocos tinctoria* Forest (CEGL008551, G3?)
- *Fagus grandifolia* - *Quercus* spp. - *Acer rubrum* - *Juglans nigra* Forest (CEGL005014, G2G3)
- *Hymenocallis coronaria* - *Justicia americana* Herbaceous Vegetation (CEGL004285, G1)
- *Juncus effusus* - *Chelone glabra* - *Scirpus* spp. Southern Blue Ridge Beaver Pond Herbaceous Vegetation (CEGL008433, G4?)
- *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112, G5)
- *Justicia americana* Herbaceous Vegetation (CEGL004286, G4G5)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*) Temporarily Flooded Forest (CEGL007330, GNA)
- *Liquidambar styraciflua* - *Liriodendron tulipifera* - (*Platanus occidentalis*) / *Carpinus caroliniana* - *Halesia tetraptera* / *Amphicarpaea bracteata* Forest (CEGL007880, G3G4)
- *Nuphar lutea* ssp. *advena* - *Nymphaea odorata* Herbaceous Vegetation (CEGL002386, G4G5)
- *Orontium aquaticum* Permanently Flooded Herbaceous Vegetation (CEGL008480, G3G4)
- *Osmunda regalis* var. *spectabilis* Seepage Scour Herbaceous Vegetation (CEGL008404, G3?)
- *Paulownia tomentosa* Woodland (CEGL003687, GNA)
- *Pinus taeda* - *Liriodendron tulipifera* / *Lindera benzoin* / *Carex crinita* Forest (CEGL007546, GNA)
- *Platanus occidentalis* - *Betula nigra* - *Salix (caroliniana, nigra)* Woodland (CEGL003896, G4G5)
- *Platanus occidentalis* - *Celtis laevigata* - *Liriodendron tulipifera* / *Lindera benzoin* - *Arundinaria gigantea* / *Amphicarpaea bracteata* Forest (CEGL008429, G4?)
- *Platanus occidentalis* - *Liquidambar styraciflua* / *Carpinus caroliniana* - *Asimina triloba* Forest (CEGL007340, G5)
- *Platanus occidentalis* - *Liriodendron tulipifera* - *Betula (alleghaniensis, lenta)* / *Alnus serrulata* - *Leucothoe fontanesiana* Forest (CEGL004691, G2?)
- *Podostemum ceratophyllum* Herbaceous Vegetation (CEGL004331, G3G5)
- *Polygonum (hydropiperoides, punctatum)* - *Leersia (lenticularis, virginica)* Herbaceous Vegetation (CEGL004290, G4?)
- *Quercus alba* - (*Liriodendron tulipifera*, *Liquidambar styraciflua*) / *Calycanthus floridus* / *Athyrium filix-femina* Forest (CEGL008428, G3G4)
- *Quercus alba* - *Carya (alba, ovata)* - *Liriodendron tulipifera* - (*Quercus phellos*) / *Cornus florida* Forest (CEGL007709, G4)
- *Salix caroliniana* Temporarily Flooded Forest (CEGL007373, G4)
- *Salix nigra* - *Platanus occidentalis* Forest (CEGL004626, G5)
- *Schizachyrium scoparium* - *Schoenoplectus americanus* - *Juncus marginatus* - *Eupatorium serotinum* Herbaceous Vegetation (CEGL008496, G2)
- *Sparganium americanum* - (*Sparganium erectum* ssp. *stoloniferum*) - *Epilobium leptophyllum* Herbaceous Vegetation (CEGL004510, G2G3)
- *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest (CEGL007143, G3)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Vine-Shrubland (CEGL004620, GNA)

Alliances:

- *Acer negundo* Temporarily Flooded Forest Alliance (A.278)
- *Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance (A.348)
- *Alnus serrulata* Saturated Shrubland Alliance (A.1014)
- *Alnus serrulata* Temporarily Flooded Shrubland Alliance (A.943)
- *Arundinaria gigantea* Temporarily Flooded Shrubland Alliance (A.795)
- *Betula nigra* - (*Platanus occidentalis*) Temporarily Flooded Forest Alliance (A.280)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Carex torta* Temporarily Flooded Herbaceous Alliance (A.1340)
- *Fagus grandifolia* - *Quercus rubra* - *Quercus alba* Forest Alliance (A.229)
- *Fagus grandifolia* Temporarily Flooded Forest Alliance (A.284)
- *Juncus effusus* Seasonally Flooded Herbaceous Alliance (A.1375)
- *Justicia americana* Temporarily Flooded Herbaceous Alliance (A.1657)
- *Liquidambar styraciflua* - (*Liriodendron tulipifera*, *Acer rubrum*) Temporarily Flooded Forest Alliance (A.287)

- *Nymphaea odorata* - *Nuphar* spp. Permanently Flooded Temperate Herbaceous Alliance (A.1984)
- *Orontium aquaticum* - (*Schoenoplectus subterminalis*) Permanently Flooded Herbaceous Alliance (A.1931)
- *Osmunda* (*cinnamomea*, *regalis*) Saturated Herbaceous Alliance (A.1692)
- *Paulownia tomentosa* Woodland Alliance (A.609)
- *Pinus taeda* - *Liriodendron tulipifera* Temporarily Flooded Forest Alliance (A.434)
- *Platanus occidentalis* - (*Betula nigra*, *Salix* spp.) Temporarily Flooded Woodland Alliance (A.633)
- *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance (A.288)
- *Platanus occidentalis* - (*Liquidambar styraciflua*, *Liriodendron tulipifera*) Temporarily Flooded Forest Alliance (A.289)
- *Podostemum ceratophyllum* Permanently Flooded Herbaceous Alliance (A.1752)
- *Polygonum* spp. (section *Persicaria*) Seasonally Flooded Herbaceous Alliance (A.1881)
- *Quercus alba* - (*Quercus rubra*, *Carya* spp.) Forest Alliance (A.239)
- *Salix caroliniana* Temporarily Flooded Forest Alliance (A.296)
- *Salix nigra* Temporarily Flooded Forest Alliance (A.297)
- *Schizachyrium scoparium* Temporarily Flooded Herbaceous Alliance (A.1346)
- *Sparganium americanum* Seasonally Flooded Herbaceous Alliance (A.1388)
- *Tsuga canadensis* - (*Pinus strobus*) Temporarily Flooded Forest Alliance (A.171)
- *Vitis rotundifolia* - *Ampelopsis arborea* - *Campsis radicans* Seasonally Flooded Vine-Shrubland Alliance (A.993)

SPATIAL CHARACTERISTICS

Spatial Summary: Small, linear patch.

Size: Can be quite long but never very wide.

DISTRIBUTION

Range: This system ranges from the Interior Low Plateau to the Southern Blue Ridge and north into the Western Allegheny Plateau. There would be limited and peripheral presence in the Upper East Gulf Coastal Plain.

Divisions: 202:C; 203:C

Nations: US

Subnations: AL, GA, IL, IN, KY, NC, OH, PA, SC, TN, VA

Map Zones: 46:P, 47:C, 48:C, 49:C, 53:C, 57:C, 61:P, 62:C

TNC Ecoregions: 43:C, 44:C, 49:C, 50:C, 51:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.722954#references

Description Author: S. Menard, M. Pyne, R. Evans, R. White, D. Faber-Langendoen

Version: 17 Apr 2006

Concept Author: S. Menard, M. Pyne, R. Evans, R. White, D. Faber-Langendoen

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

SPARSELY VEGETATED

ATLANTIC COASTAL PLAIN SEA ISLAND BEACH (CES203.383)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Beach (Substrate); Coastal plain

National Mapping Codes: ESLF 3150

CONCEPT

Summary: This system represents beaches and overwash flats in the Sea Island region of South Carolina and Georgia. The entire region is distinctive on the Atlantic Coast, and wave energy is generally lower here than any other point along the Atlantic Coast (Tanner 1960). Huge quantities of fine-textured sediments are deposited by alluvial rivers in the region, many of which drain relatively large interior areas of the Piedmont, where clay is an abundant by-product of weathering and erosion. Thus, as opposed to other beaches of the Atlantic Coast, these beaches are characterized by the prevalence of fine-textured sediments. In addition, the extensive Continental Shelf coupled with low wave energy contribute to a paucity of shell components of the beach substrates.

Similar Ecological Systems:

- Southern Atlantic Coastal Plain Beach (CES203.535)--dovetails this system to the south.

DESCRIPTION

Environment: Beaches are found on the true barrier islands present in the region. Low wave energy and high tidal range contribute relatively short barrier islands (as opposed to long narrow islands of North Carolina and the Gulf).

Vegetation: See descriptions in Hillestad et al. (1975) from Cumberland Island.

MEMBERSHIP

Associations:

- *Cakile edentula* ssp. *harperi* Sparse Vegetation (CEGL004401, G3)

Alliances:

- *Cakile edentula* Sparsely Vegetated Alliance (A.1861)

DISTRIBUTION

Range: This system is found in the Sea Island region of South Carolina and Georgia, extending to the St. Johns River in northern Florida.

Divisions: 203:C

Nations: US

Subnations: FL, GA, SC

Map Zones: 55:C, 58:C

TNC Ecoregions: 56:C

SOURCES

References: Comer et al. 2003, Hillestad et al. 1975, Tanner 1960

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723133#references

Description Author: R. Evans

Version: 27 Sep 2005

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1388 ATLANTIC COASTAL PLAIN XERIC RIVER DUNE (CES203.497)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Dune (Substrate)

FGDC Crosswalk: Vegetated, Shrub-dominated, Shrubland, Mixed evergreen-deciduous shrubland

National Mapping Codes: EVT 2388; ESLF 5319; ESP 1388

CONCEPT

Summary: This system encompasses a range of vegetation present on inland sand dunes of the Coastal Plain of Georgia. These dunes are associated with certain rivers such as the Ohoopsee and Canoochee (Wharton 1978) and are apparently eolian in origin, formed of riverine alluvial sands. The sandy soils are deep, coarse, and xeric in nature. The vegetation consists of an assemblage of xeric communities that also occur in other xeric habitats in the Coastal Plain. These include *Pinus palustris* - *Quercus laevis* communities and a scrub community akin to Inland Florida Scrub, but lacking *Pinus clausa*. This system is distinguished from more typical xeric sandhills of the Coastal Plain by its occurrence on the deep sands of river dunes. In addition this environment is naturally topographically isolated and consequently has a lower fire-return interval than other upland systems of which *Pinus palustris* is a component.

DESCRIPTION

Environment: These dunes are apparently eolian in origin, formed of riverine alluvial sands. The sandy soils are deep, coarse, and xeric in nature.

Vegetation: Upland plant communities include longleaf - turkey oak, dwarf oak, oak hammock, and rosemary scrub (Wharton 1978).

MEMBERSHIP

Associations:

- *Ceratiola ericoides* - (*Chrysoma pauciflosculosa*) / *Polygonella polygama* / *Cladonia leporina* Shrubland (CEGL003864, G2?)
- *Chrysoma pauciflosculosa* - (*Clinopodium coccineum*) Dwarf-shrubland (CEGL003946, G1G2)
- *Quercus myrtifolia* - *Quercus geminata* - *Hamamelis virginiana* - (*Elliottia racemosa*) Shrubland (CEGL004715, G1Q)

Alliances:

- *Ceratiola ericoides* Shrubland Alliance (A.817)
- *Chrysoma pauciflosculosa* Dwarf-shrubland Alliance (A.1061)
- *Quercus geminata* - *Quercus myrtifolia* - *Quercus chapmanii* Shrubland Alliance (A.779)

DISTRIBUTION

Range: This system is endemic to river-associated dunes in the Coastal Plain of Georgia, such as along the Ohoopsee and Canoochee rivers.

Divisions: 203:C

Nations: US

Subnations: GA

Map Zones: 55:C

TNC Ecoregions: 56:C

SOURCES

References: Comer et al. 2003, Wharton 1978

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723089#references

Description Author: R. Evans, mod. C.W. Nordman

Version: 08 Jun 2006

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1496 CARIBBEAN COASTAL BEACH SYSTEMS (CES411.644)

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Caribbean (411)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Beach (Substrate); Tropical/Subtropical

FGDC Crosswalk: Vegetated, No dominant lifeform, Sparsely vegetated

National Mapping Codes: EVT 2496; ESLF 3109; ESP 1496

CONCEPT

Summary: This systems group represents sand beaches derived from carbonate or shell fragments of the south Florida coast and mangrove islands, including the Florida Keys. It is differentiated from beaches further north along the coast by its tropical flora elements. Differences in wave energy appear to be related to species composition and substrate morphology. The vegetation is poorly documented. Carbonate beaches apparently include at least one endemic species, *Chamaesyce garberi*; other diagnostic species may include *Piscidia piscipula* and *Pithecellobium keyense*. The more calcareous substrates (from an abundance of calcareous shell fragments) are distinguished by the highest species richness, greatest cover of succulents, and high cover of *Iva imbricata* and several tropical species. Other important species include *Uniola paniculata*, *Oenothera humifusa*, *Scaevola plumieri*, and *Sesuvium portulacastrum*.

Similar Ecological Systems:

- Gulf and Atlantic Coastal Plain Sparsely Vegetated Systems (CES203.646)

MEMBERSHIP

Standard Ecological Systems:

- South Florida Shell Hash Beach (CES411.271)
- Southeast Florida Beach (CES411.272)
- Southwest Florida Beach (CES411.276)

DISTRIBUTION

Range: This systems group occurs along the coast and nearby islands of southern Florida.

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Barbour et al. 1987, FNAI 1990, Johnson and Barbour 1990, Southeastern Ecology Working Group n.d., Tanner 1960

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.785014#references

Description Author: S.C. Gawler

Version: 23 Jan 2007

Concept Author: Southeastern Ecology Group

Stakeholders: Southeast

ClassifResp: Southeast

CENTRAL ATLANTIC COASTAL PLAIN SANDY BEACH (CES203.064)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Herbaceous; Beach (Substrate); Coast

National Mapping Codes: ESLF 3162

CONCEPT

Summary: This system includes ocean beaches along the Mid-Atlantic coast ranging from approximately Bodie Island, North Carolina, to approximately Myrtle Beach, South Carolina, a range which is largely represented by Omernik Level IV Ecoregion 63g (EPA 2004). Examples of this system generally include the outermost zone of coastal vegetation extending seaward from foredunes on barrier islands and also limited wash-over flats behind breached foredunes. Substrates consist of unconsolidated sand and shell sediments that are constantly shifting. Although these habitats are situated just above the mean high tide limit, they are constantly impacted by waves and are prone to major impact from storm surges and hurricane events. Under normal conditions constant salt spray and rainwater maintain generally moist conditions. Dynamic disturbance regimes largely limit vegetation to pioneering, salt-tolerant, succulent annuals.

Classification Comments: To the north this system is replaced by Northern Atlantic Coastal Plain Sandy Beach (CES203.301) and to the south by Atlantic Coastal Plain Sea Island Beach (CES203.383). This system provides habitat for the threatened plant seabeach amaranth (*Amaranthus pumilus*).

Similar Ecological Systems:

- Northern Atlantic Coastal Plain Sandy Beach (CES203.301)

DESCRIPTION

Environment: Examples of this system generally extend seaward from foredunes on barrier islands and also limited wash-over flats behind breached foredunes. Substrates consist of unconsolidated sand and shell sediments that are constantly shifting.

Dynamics: Extensive construction of high, artificial dunes along the Atlantic Coast has reduced the extent of these habitats by increasing oceanside beach erosion and eliminating the disturbance regime that creates and maintains overwash flats.

MEMBERSHIP

Associations:

- *Cakile edentula* ssp. *edentula* - *Chamaesyce polygonifolia* Sparse Vegetation (CEGL004400, G4G5)
- *Sesuvium portulacastrum* - *Atriplex* spp. - *Suaeda* spp. Sparse Vegetation (CEGL004406, G3)

Alliances:

- *Cakile edentula* Sparsely Vegetated Alliance (A.1861)
- *Sesuvium* spp. - *Atriplex* spp. - *Suaeda* spp. Tidal Sparsely Vegetated Alliance (A.1868)

DISTRIBUTION

Range: This system ranges along the Mid-Atlantic coast ranging from approximately Bodie Island, North Carolina, to approximately Myrtle Beach, South Carolina, a range which is largely represented by Omernik Level IV Ecoregion 63g (EPA 2004), but extends southward into the coastal portion of 63h in Horry County, South Carolina.

Divisions: 203:C

Nations: US

Subnations: NC, SC

Map Zones: 55:C, 58:C

TNC Ecoregions: 57:C

SOURCES

References: EPA 2004, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.730725#references

Description Author: R.E. Evans, mod. M. Pyne

Version: 02 Feb 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

CENTRAL INTERIOR ACIDIC CLIFF AND TALUS (CES202.689)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Non-Diagnostic Classifiers: Talus (Landform); Acidic Soil; Cliff (Landform)

National Mapping Codes: ESLF 3149

CONCEPT

Summary: This system is found primarily in the Interior Highlands, including the Ozarks, Ouachita, and Interior Low Plateau ecoregions, extending marginally north and west along the Missouri and Mississippi rivers. Sandstone outcrops and talus ranging from moist to dry typify this system. It is typically sparsely vegetated; however, on moister sites with more soil development, several fern species and sedges (*Carex* spp.) can establish. Wind and water erosion are the major dynamic processes influencing this system.

Classification Comments: In Kentucky, this system covers the sandstone cliffs of the Shawnee Hills (Interior Low Plateau). In Illinois, one exemplary example is the "Garden of the Gods" in the Shawnee National Forest.

Similar Ecological Systems:

- North-Central Appalachian Acidic Cliff and Talus (CES202.601)

Related Concepts:

- Dry Sandstone Cliff (Evans 1991) Intersecting
- Moist Sandstone Cliff (Evans 1991) Intersecting

DESCRIPTION

Environment: Sandstone outcrops and talus ranging from moist to dry typify this system.

Vegetation: This system is typically sparsely vegetated; however, on moister sites with more soil development, several fern species and sedges (*Carex* spp.) can establish. Some taxa that could be present include *Ribes cynosbati*, *Deschampsia flexuosa*, *Dryopteris marginalis*, and *Dennstaedtia punctilobula*, as well as *Carex interior*, *Carex lurida*, *Carex leptalea*, *Parnassia grandifolia*, *Rhynchospora capillacea*, *Osmunda cinnamomea*, *Rhynchospora capitellata*, *Heuchera parviflora* var. *puberula*, and *Xyris jupicai* on wetter sites.

Dynamics: Wind and water erosion are the major dynamic processes influencing this system.

MEMBERSHIP

Associations:

- (*Carex interior*, *Carex lurida*) - *Carex leptalea* - *Parnassia grandifolia* - *Rhynchospora capillacea* Herbaceous Vegetation (CEGL002404, G2G3)
- (*Hydrangea arborescens*, *Ribes cynosbati*) / *Deschampsia flexuosa* - *Dryopteris marginalis* - *Dennstaedtia punctilobula* Shrubland (CEGL007820, G2?)
- Chert Ozark Dry Cliff Sparse Vegetation (CEGL002285, G3?)
- Chert Ozark Moist Cliff Sparse Vegetation (CEGL002288, G2G3)
- Igneous Ozark Dry Cliff Sparse Vegetation (CEGL002286, G4)
- Igneous Ozark Moist Cliff Sparse Vegetation (CEGL002289, G4Q)
- Igneous Ozark Talus Sparse Vegetation (CEGL005203, G4)
- *Osmunda cinnamomea* - *Rhynchospora capitellata* - *Heuchera parviflora* var. *puberula* - *Xyris jupicai* Herbaceous Vegetation (CEGL007837, G1Q)
- Sandstone Dry Cliff Sparse Vegetation (CEGL002045, G4G5)
- Sandstone Interior Highlands Talus Sparse Vegetation (CEGL002309, G4G5)
- Sandstone Midwest Moist Cliff Sparse Vegetation (CEGL002287, G4G5)

Alliances:

- (*Hydrangea* spp., *Philadelphus* spp.) / *Heuchera* spp. Shrubland Alliance (A.1905)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Carex lurida* - *Carex leptalea* - (*Carex atlantica*, *Carex interior*, *Parnassia grandifolia*) Saturated Herbaceous Alliance (A.1452)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- Open Cliff Sparsely Vegetated Alliance (A.1836)

DISTRIBUTION

Range: This system is found primarily in the Interior Highlands, including the Ozark, Ouachita, and Interior Low Plateau ecoregions. It extends marginally into the Central Tallgrass Prairie Ecoregion along the Missouri and Mississippi rivers.

Divisions: 202:C

Nations: US

Subnations: AR, IA?, IL, IN, KY, MO, TN

Map Zones: 43:P, 44:C, 47:C, 48:C, 49:C, 53:C
TNC Ecoregions: 36:C, 38:C, 39:C, 44:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722970#references

Description Author: S. Menard, T. Foti, R. Evans, mod. M. Pyne

Version: 17 Apr 2006

Concept Author: S. Menard, T. Foti, R. Evans

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

1497 CENTRAL INTERIOR AND APPALACHIAN SPARSELY VEGETATED SYSTEMS (CES202.645)

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Ridge/Summit/Upper Slope; Rock Outcrops/Barrens/Glades; Unglaciated

FGDC Crosswalk: Vegetated, No dominant lifeform, Sparsely vegetated

National Mapping Codes: EVT 2497; ESLF 3110; ESP 1497

CONCEPT

Summary: This systems group occurs on rock outcrops in the southern and central Appalachians (and less commonly on the adjacent Piedmont) and is distinguished by having sparse vegetation amid large expanses of bare rock. The outcrops may be vertical to horizontal, smooth or fractured rock outcrops or (in periglacial areas) boulderfields of peaks, ridgetops, monadnocks, upper slopes, and other topographically exposed locations. Most of the substrate is dry and exposed, but small areas of seepage may be present. Vegetation is confined to thin soil mats developing in local pockets and protected spots. Vegetation occurs as a series of small patches in the thin soil mats, with the kind of vegetation closely related to depth of the mat. Expanses of bare rock are characterized by crustose or other lichens and may have moss patches. The thinnest soils usually have a set of fine forbs, many of them annual. Slightly deeper soils often have grasses dominating. The few pockets of deeper soil support shrubs or occasionally small trees. The overall character is one of sparse herb-dominated vegetation and lichen-encrusted rocks. Higher elevation examples occur from 1200 to 2030 m; other examples may be found at elevations of 305 m (1000 feet) in foothills or as low as 75 m (245 feet) in the Piedmont. Typical rock outcrop herbs in the southern Appalachians include *Saxifraga michauxii*, *Carex misera*, *Paronychia argyrocoma*, *Minuartia glabra*, *Heuchera villosa*, *Krigia montana*, *Talinum teretifolium*, *Selaginella* spp., and *Hylotelephium telephioides* (= *Sedum telephioides*); more widespread herbs include *Danthonia spicata*, *Danthonia compressa*, *Schizachyrium scoparium*, *Potentilla canadensis*, *Polypodium virginianum*, and *Houstonia caerulea*. *Toxicodendron radicans* is a characteristic woody vine at some locations.

MEMBERSHIP

Standard Ecological Systems:

- North-Central Appalachian Acidic Cliff and Talus (CES202.601)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)

DISTRIBUTION

Range: This systems group occurs in the southern Appalachian Mountains from the Carolinas to Georgia and Tennessee, and in the central Appalachians north through Pennsylvania to the New Jersey line.

Divisions: 202:C

Nations: US

Subnations: GA, NC, NJ, PA, SC, TN, VA, WV

Map Zones: 53:P, 54:P, 57:C, 59:P, 60:P, 61:C

USFS Ecomap Regions: 211Fc:CCC, 221Da:CCC, 231A:CC, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Da:CCC

TNC Ecoregions: 51:C, 52:C, 59:C, 61:C

SOURCES

References: Fleming et al. 2006, Flenniken 1999, Schafale and Weakley 1990, Southeastern Ecology Working Group n.d., Wisser and White 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.785015#references

Description Author: S.C. Gawler

Version: 26 Jul 2007

Concept Author: Southeastern Ecology Group

Stakeholders: East, Southeast

ClassifResp: Southeast

CENTRAL INTERIOR CALCAREOUS CLIFF AND TALUS (CES202.690)

CLASSIFIERS

Conf.: 2 - Moderate

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

National Mapping Codes: ESLF 3148

CONCEPT

Summary: This system is found primarily in non-Appalachian portions of the Central Interior Division. It ranges from the Ouachitas east to the Cumberlands and north into the Western Allegheny Plateau and Lake states. Limestone and dolomite outcrops and talus distinguish this system. Examples range from moist to dry and from sparsely to moderately well-vegetated. Woodland species such as *Thuja occidentalis* can establish along the ridgetops. Understory species can range from grassland species, such as *Andropogon gerardii* on drier slopes, to more mesic species in areas with higher moisture and more soil development. Wind and water erosion along with fire are the primary natural dynamics influencing this system. Some associations included here are rocky openings in forest stands, sometimes with moisture present from groundwater seepage. Also included are wet and dry cliffs. The flora of these wetter examples may include (across the broad range of the system) *Aconitum noveboracense*, *Adiantum capillus-veneris*, *Adoxa moschatellina*, *Aquilegia canadensis*, *Asplenium rhizophyllum*, *Boehmeria cylindrica*, *Chrysosplenium iowense*, *Cystopteris bulbifera*, *Cystopteris bulbifera*, *Dichanthelium depauperatum*, *Heuchera americana*, *Heuchera americana* var. *hirsuticaulis*, *Heuchera villosa* var. *arkansana*, *Hydrangea arborescens*, *Impatiens pallida*, *Lobelia siphilitica*, *Toxicodendron radicans*, and *Woodsia obtusa*.

Classification Comments: Similar examples in the driftless region of Minnesota, Wisconsin, Iowa and Illinois should be considered part of Paleozoic Plateau Bluff and Talus (CES202.704).

Similar Ecological Systems:

- North-Central Appalachian Circumneutral Cliff and Talus (CES202.603)
- Paleozoic Plateau Bluff and Talus (CES202.704)
- Southern Interior Calcareous Cliff (CES202.356)--includes circumneutral cliff and talus communities from southern Virginia south.
- Southern Interior Sinkhole Wall (CES202.357)

Related Concepts:

- Dry Limestone Cliff (Evans 1991) Finer
- Moist Limestone Cliff (Evans 1991) Finer

DESCRIPTION

Environment: Limestone and dolomite outcrops and talus distinguish this system.

Vegetation: Examples range from moist to dry and from sparsely to moderately well-vegetated. Woodland species such as *Thuja occidentalis* can establish along the ridgetops. Understory species can range from grassland species, such as *Andropogon gerardii* on drier slopes, to more mesic species in areas with higher moisture and more soil development. The flora of some moister examples (e.g., rocky openings in forest stands, with moisture present from groundwater seepage as well as wet cliffs) includes (across the broad range of the system) *Aconitum noveboracense*, *Adiantum capillus-veneris*, *Adoxa moschatellina*, *Aquilegia canadensis*, *Asplenium rhizophyllum*, *Boehmeria cylindrica*, *Chrysosplenium iowense*, *Cystopteris bulbifera*, *Cystopteris bulbifera*, *Dichanthelium depauperatum*, *Heuchera americana*, *Heuchera americana* var. *hirsuticaulis*, *Heuchera villosa* var. *arkansana*, *Hydrangea arborescens*, *Impatiens pallida*, *Lobelia siphilitica*, *Toxicodendron radicans*, and *Woodsia obtusa*.

Dynamics: Wind and water erosion along with fire are the primary natural dynamics influencing this system.

MEMBERSHIP

Associations:

- (*Hydrangea arborescens*, *Toxicodendron radicans*) / *Heuchera americana* - (*Dichanthelium depauperatum*, *Woodsia obtusa*) Shrubland (CEGL004395, G3?)
- *Acer saccharum* - *Tilia americana* - *Fraxinus americana* / *Ostrya virginiana* / *Geranium robertianum* Woodland (CEGL005058, G3G5)
- *Adiantum capillus-veneris* - *Boehmeria cylindrica* - *Lobelia siphilitica* Herbaceous Vegetation (CEGL004728, G2G3)
- *Andropogon gerardii* - *Chasmanthium latifolium* - *Amsonia tabernaemontana* var. *salicifolia* Herbaceous Vegetation (CEGL004739, G2G3)
- *Cystopteris bulbifera* - *Asplenium rhizophyllum* Ozark Sparse Vegetation [Provisional] (CEGL008486, GNR)
- *Hydrangea arborescens* / *Heuchera* (*americana* var. *hirsuticaulis*, *villosa* var. *arkansana*) - *Aquilegia canadensis* Shrubland (CEGL007819, G3?)
- *Hydrangea arborescens* / *Impatiens* (*capensis*, *pallida*) - *Heuchera villosa* Shrubland (CEGL004708, G3)
- *Impatiens pallida* - *Cystopteris bulbifera* - *Adoxa moschatellina* - (*Chrysosplenium iowense*, *Aconitum noveboracense*) Herbaceous Vegetation (CEGL002387, G2)
- Limestone - Dolostone Midwest Dry Cliff Sparse Vegetation (CEGL002291, G4G5)

- Limestone - Dolostone Midwest Moist Cliff Sparse Vegetation (CEGL002292, G4G5)
- Limestone - Dolostone Talus Sparse Vegetation (CEGL002308, G4G5)
- *Rhus aromatica* - *Celtis tenuifolia* / *Carex eburnea* Shrubland (CEGL004393, G3)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Bedrock Bluff Herbaceous Vegetation (CEGL002245, G3G4)
- *Schizachyrium scoparium* - *Sporobolus compositus* var. *compositus* - *Rudbeckia fulgida* var. *fulgida* Wooded Herbaceous Vegetation (CEGL004078, G2)
- Small Eroding Bluffs Midwestern Sparse Vegetation (CEGL002315, GNR)
- *Thuja occidentalis* / *Carex eburnea* - *Pellaea atropurpurea* Woodland (CEGL002596, G2G3)
- *Thuja occidentalis* Cliff Woodland (CEGL002451, G3)

Alliances:

- (*Hydrangea* spp., *Philadelphus* spp.) / *Heuchera* spp. Shrubland Alliance (A.1905)
- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)
- *Andropogon gerardii* - (*Sorghastrum nutans*) Temporarily Flooded Herbaceous Alliance (A.1337)
- *Cystopteris bulbifera* - *Asplenium rhizophyllum* Sparsely Vegetated Alliance (A.1834)
- *Impatiens pallida* - *Cystopteris bulbifera* - *Adoxa moschatellina* Herbaceous Alliance (A.1598)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- *Schizachyrium scoparium* - *Bouteloua curtipendula* Herbaceous Alliance (A.1225)
- Small Eroding Bluffs Sparsely Vegetated Alliance (A.1872)
- *Thuja occidentalis* Woodland Alliance (A.544)
- *Tilia americana* - *Fraxinus americana* - (*Acer saccharum*) Woodland Alliance (A.628)

DISTRIBUTION

Range: This system is found primarily in non-Appalachian portions of the Central Interior Division.

Divisions: 201:?, 202:C; 205:P

Nations: US

Subnations: AR, IA, IL, IN, KY?, MI, MN, MO, NY, OH, OK, PA, TN, WI

Map Zones: 41:?, 42:P, 43:P, 44:C, 47:C, 48:C, 49:P, 50:C, 51:C, 52:C, 53:C, 61:C, 62:C, 63:C, 64:C

USFS Ecomap Regions: 222M:CC

TNC Ecoregions: 36:C, 38:C, 39:C, 44:C, 45:C, 46:C, 47:?, 48:C, 49:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.722969#references

Description Author: S. Menard, mod. J. Drake and M. Pyne

Version: 01 Feb 2007

Concept Author: S. Menard

Stakeholders: East, Midwest, Southeast

ClassifResp: Midwest

CUMBERLAND ACIDIC CLIFF AND ROCKHOUSE (CES202.309)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate); Acidic Soil

National Mapping Codes: ESLF 3119

CONCEPT

Summary: This sandstone cliff system is found in the Cumberland Plateau and Mountain regions of the southeastern United States. Examples are extremely steep or vertical rock faces exposed along bluffs often associated with rivers. Aspect is variable but best developed south and west. Vascular plants, lichens, and nonvascular plants are all infrequent due to the lack of crevices capable of accumulating soil, the highly acidic nature of the bedrock, and the frequent weathering and erosion of the substrate. These cliffs are also prone to harsh climatic conditions; frequent disturbances include drought stress and wind and storm damage. As a result, examples are characterized by sparse herbaceous cover and few, if any, trees. Vegetation consists of scattered individuals of *Asplenium montanum*, *Silene rotundifolia*, and other species rooted in crevices and erosion pockets. In some parts of its range, this system is the primary or sole habitat for rare endemic species, such as *Minuartia cumberlandensis* and *Ageratina luciae-brauniae*. This system includes a mosaic of cavelike features (often called "rockhouses") and associated sandstone box canyons in the western Appalachian foothills regions of Kentucky, Alabama, West Virginia, and possibly southeastern Ohio. Where present, the rockhouses are a prominent and diagnostic feature of the system.

Classification Comments: It is unclear whether or not this system should range into the Interior Low Plateau. Also debatable is whether or not wet and dry cliffs should be included as well as the number of different physical settings possible. See also Southern Appalachian Montane Cliff and Talus (CES202.330).

Similar Ecological Systems:

- North-Central Appalachian Acidic Cliff and Talus (CES202.601)
- Southern Appalachian Montane Cliff and Talus (CES202.330)

Related Concepts:

- Dry Sandstone Cliff (Evans 1991) Intersecting
- Moist Sandstone Cliff (Evans 1991) Intersecting

DESCRIPTION

Environment: The rockhouses are the most unique and diagnostic feature of the system. These unusual geologic features are created by spray and rock-cracking from seasonal flowing waterfalls at the heads of canyons amidst thick layers of sandstone from the Pennsylvanian geologic period. The ceiling of the rockhouse may be 50 m tall, and they can be as much as 100 m deep (A. Weakley pers. comm. 2006). They require sufficient flowing water and freezing and thawing to weather the thick beds of sandstone. These conditions seem to be restricted to the western margin of the Appalachian Plateau.

Vegetation: Examples of this system usually include a vegetational mosaic that includes hemlock bluffs, sandstone cliffs, or overhangs near the base of a cliff (often with a sandy area beneath the overhang which is shaded and protected from direct rainfall, as well as gladelike vegetation at the horizontal portion of the cliffs). The rockhouses in the southern parts of the range are habitats for rare vascular plant species such as *Minuartia cumberlandensis* and *Ageratina luciae-brauniae* and sometimes support populations of rare nonvascular plants as well.

MEMBERSHIP

Associations:

- *Asplenium montanum* - *Heuchera parviflora* var. *parviflora* - *Silene rotundifolia* Sparse Vegetation (CEGL004392, G3G4)
- *Heuchera parviflora* var. *parviflora* - *Trichomanes boschianum* - *Thalictrum mirabile* - (*Ageratina luciae-brauniae*, *Solidago albopilosa*) Herbaceous Vegetation (CEGL004301, G2)
- *Osmunda cinnamomea* - *Rhynchospora capitellata* - *Thalictrum mirabile* Cumberland Seepage Cliff Herbaceous Vegetation (CEGL008432, G1G2Q)
- *Pinus virginiana* - *Pinus (rigida, echinata)* - (*Quercus prinus*) / *Vaccinium pallidum* Forest (CEGL007119, G4?)
- *Schizachyrium scoparium* - *Danthonia sericea* - *Liatris microcephala* - (*Eurybia surculosa*) Wooded Herbaceous Vegetation (CEGL004061, G3)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Asplenium montanum* Sparsely Vegetated Alliance (A.1831)
- *Carex crinita* - *Osmunda* spp. / *Sphagnum* spp. Saturated Herbaceous Alliance (A.1451)
- *Pinus virginiana* Forest Alliance (A.131)
- *Vittaria appalachiana* - *Heuchera parviflora* Saturated Herbaceous Alliance (A.1696)

DISTRIBUTION

Range: This system occurs in a limited area of the Cumberland Plateau of northern Alabama, northwestern Georgia, eastern Kentucky, eastern Tennessee, West Virginia, and possibly southwestern Virginia. It may occur in southeastern Ohio (Rockhouse 349) and in western Pennsylvania.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, OH?, PA?, TN, VA?, WV

Map Zones: 46:C, 47:C, 48:C, 53:C, 57:C, 62:?

TNC Ecoregions: 50:C

SOURCES

References: Comer et al. 2003, Weakley pers. comm.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723185#references

Description Author: R. Evans, mod. M. Pyne

Version: 17 Apr 2006

Concept Author: R. Evans

Stakeholders: East, Midwest, Southeast

ClassifResp: Southeast

EAST GULF COASTAL PLAIN DRY CHALK BLUFF (CES203.492)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate)

National Mapping Codes: ESLF 3117

CONCEPT

Summary: The system is endemic to the Black Belt region of Alabama and Mississippi. Examples are relatively sheer surfaces of exposed chalk generally devoid of vegetation. In most cases these bluffs extend directly to the edge of rivers or streams.

MEMBERSHIP

Associations:

- *Adiantum capillus-veneris* Cahaba River Bluff Herbaceous Vegetation (CEGL007796, G2G3)

Alliances:

- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)

DISTRIBUTION

Range: Endemic to the Black Belt region of Alabama and Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, MS

Map Zones: 46:C

TNC Ecoregions: 43:C

SOURCES

References: Comer et al. 2003, Gunn 1985, Morris et al. 1993

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723094#references

Description Author: A. Schotz and R. Evans

Version: 06 Feb 2003

Concept Author: A. Schotz and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

FLORIDA PANHANDLE BEACH VEGETATION (CES203.266)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: East Gulf Coastal Plain; Beach (Substrate); Graminoid; Coast

National Mapping Codes: ESLF 3147

CONCEPT

Summary: The panhandle beach system ranges from northwestern Florida (Ochlockonee River) to southeastern Mississippi. It includes the outermost zone of coastal vegetation extending seaward from foredunes. Within the northern Gulf of Mexico, the natural boundaries of this system are fairly distinct; the western boundary is mineralogical and the eastern is defined by a region of sunken, flooded coast line where beaches are absent. In addition, these beaches are distinguished by high cover of *Uniola paniculata* and *Schizachyrium maritimum*, along with local endemic species of *Chrysoma* and *Paronychia* (Barbour et al. 1987).

Similar Ecological Systems:

- Southwest Florida Dune and Coastal Grassland (CES203.539)

Related Concepts:

- Beach Dune (FNAI 1990) Intersecting
- Unconsolidated Substrate (FNAI 1990) Intersecting

DESCRIPTION

Environment: These beaches are rich in pyroxene, epidote, and garnet (Barbour et al. 1987). Within the northern Gulf of Mexico the sandy substrate of this system is uniquely rich in medium, nutritionally poor sands. Especially low concentrations of potassium may be of great importance to plant growth and species distributions (Barbour et al. 1987).

MEMBERSHIP

Associations:

- *Cakile constricta* Sparse Vegetation (CEGL004398, G2G3)
- *Sesuvium portulacastrum* - *Atriplex* spp. - *Suaeda* spp. Sparse Vegetation (CEGL004406, G3)
- *Uniola paniculata* - *Panicum amarum* var. *amarulum* - *Iva imbricata* Herbaceous Vegetation (CEGL004041, G2)

Alliances:

- *Cakile constricta* Sparsely Vegetated Alliance (A.1860)
- *Sesuvium* spp. - *Atriplex* spp. - *Suaeda* spp. Tidal Sparsely Vegetated Alliance (A.1868)
- *Uniola paniculata* Temperate Herbaceous Alliance (A.1199)

DISTRIBUTION

Range: Ranges from northwestern Florida (Ochlockonee River) to southeastern Mississippi.

Divisions: 203:C

Nations: US

Subnations: AL, FL, MS

Map Zones: 55:C, 99:C

TNC Ecoregions: 53:C

SOURCES

References: Barbour et al. 1987, Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723220#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

1498 GULF AND ATLANTIC COASTAL PLAIN SPARSELY VEGETATED SYSTEMS (CES203.646)

CLASSIFIERS

Classification Status: Nonstandard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch, Linear, Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Herbaceous; Beach (Substrate); Temperate

FGDC Crosswalk: Vegetated, No dominant lifeform, Sparsely vegetated

National Mapping Codes: EVT 2498; ESLF 3111; ESP 1498

CONCEPT

Summary: This systems group includes ocean beaches along the Gulf and Atlantic coasts from southern Maine to Texas. Examples generally include the outermost zone of coastal vegetation extending seaward from foredunes on barrier islands and also limited overwash flats behind breached foredunes. Substrates consist of unconsolidated sand and shell sediments that are constantly shifting. Although these habitats are situated just above the mean high tide limit, they are constantly impacted by wind and salt spray and may be flooded by storm surges or altered by hurricane events. Under normal conditions, constant salt spray and rainwater maintain generally moist conditions. Dynamic disturbance regimes largely limit vegetation to pioneering, salt-tolerant, succulent annuals and strongly rooted perennial grasses. Individual systems within this group are distinguished by geography, differences in wave energy affecting geomorphology, substrate texture and mineralogy, and dominant plant species. Substrates range from fine-textured beaches of the Sea Islands region, where clay may be an important component, to sandy beaches of the Florida panhandle that are rich in pyroxene, epidote, and garnet and low in potassium, to beaches combining sand and shell fractions. Characteristic plants of the North Atlantic beaches include *Cakile edentula* ssp. *edentula*, *Salsola kali* (= *Salsola caroliniana*), *Suaeda linearis*, *Suaeda maritima*, and *Atriplex cristata* (= *Atriplex pentandra*). *Uniola paniculata* is the classic grass on beaches from the Carolinas to the Florida panhandle. Louisiana beaches are distinguished by dominance of *Spartina patens* instead of *Uniola paniculata*. Also characteristic are *Cenchrus spinifex* (= *Cenchrus incertus*) and *Sporobolus virginicus*. On Texas beaches, characteristic dominants are xerophytes and include the perennials *Ipomoea pes-caprae* and *Ipomoea imperati* and the annual *Cakile geniculata*.

Classification Comments: This systems group ranges south to central Florida but does not include the southern coasts of Florida, which are distinguished by more tropical elements [see Caribbean Coastal Beach Systems (CES411.644)].

Similar Ecological Systems:

- Caribbean Coastal Beach Systems (CES411.644)

DESCRIPTION

Dynamics: Beaches and barrier islands are inherently unstable and highly impacted by attempts to limit the natural erosion and accretion processes. Extensive construction along the Atlantic and Gulf coasts has reduced the extent of these habitats by increasing oceanside beach erosion and eliminating the disturbance regime that creates and maintains dunes and overwash flats.

MEMBERSHIP

Standard Ecological Systems:

- Atlantic Coastal Plain Sea Island Beach (CES203.383)
- Central Atlantic Coastal Plain Sandy Beach (CES203.064)
- Florida Panhandle Beach Vegetation (CES203.266)
- Louisiana Beach (CES203.469)
- Northern Atlantic Coastal Plain Sandy Beach (CES203.301)
- Southern Atlantic Coastal Plain Beach (CES203.535)
- Texas Coastal Bend Beach (CES203.463)
- Upper Texas Coast Beach (CES203.544)

DISTRIBUTION

Range: This systems group is distributed along the coast of the Gulf and Atlantic coastal plains from southern Maine to Texas.

Divisions: 203:C; 301:C

Nations: US

Subnations: AL, CT, DE, FL, GA, LA, MA, MD, ME, MS, NC, NH, NJ, NY, RI, SC, TX, VA

Map Zones: 36:C, 37:C, 46:C, 55:C, 56:C, 58:C, 60:C, 65:C, 66:C, 98:C, 99:C

USFS Ecomap Regions: 221A:CC, 232A:CC

TNC Ecoregions: 31:C, 43:C, 53:C, 55:C, 56:C, 57:C, 58:C, 62:C

SOURCES

References: Barbour et al. 1987, Fleming et al. 2001, FNAI 1990, Gunn 1985, Hillestad et al. 1975, Johnson and Muller 1993a, Morris et al. 1993, Southeastern Ecology Working Group n.d., Tanner 1960

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.785016#references

Description Author: S.C. Gawler
Version: 23 Jan 2007
Concept Author: Southeastern Ecology Group

Stakeholders: East, Southeast
ClassifResp: Southeast

NORTH-CENTRAL APPALACHIAN ACIDIC CLIFF AND TALUS (CES202.601)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate); Talus (Substrate); Temperate; Acidic Soil

Non-Diagnostic Classifiers: Lowland; Sideslope; Very Shallow Soil; Ustic; Landslide

National Mapping Codes: ESLF 3154

CONCEPT

Summary: This system comprises sparsely vegetated to partially wooded cliffs and talus slopes in the Central Appalachians, occurring on rocks of acidic lithology and lacking any indicators of enriched conditions. This cliff system occurs at low to mid elevations from central New England south to Virginia, and up to 1500 m in West Virginia. It consists of vertical or near-vertical cliffs and the talus slopes below, formed on hills of granitic, sandstone, or otherwise acidic bedrock. In some cases, especially in periglacial areas, this system may take the form of upper-slope boulderfields without adjacent cliffs, where talus forms from freeze/thaw action cracking the bedrock. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present. Vegetation in seepage areas tends to be more well-developed and floristically different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places. *Juniperus virginiana* is a characteristic tree species, *Toxicodendron radicans* a characteristic woody vine, and *Polypodium virginianum* a characteristic fern.

Similar Ecological Systems:

- Central Interior Acidic Cliff and Talus (CES202.689)--occurs farther west.
- Cumberland Acidic Cliff and Rockhouse (CES202.309)--occurs to the south.
- Laurentian-Acadian Acidic Cliff and Talus (CES201.569)

DESCRIPTION

Environment: This cliff system consists of vertical or near-vertical cliffs at low to mid elevations and the talus slopes below, formed on hills of granitic, sandstone, or otherwise acidic bedrock. Most of the substrate is dry and exposed, but small (occasionally large) areas of seepage are often present.

Vegetation: Vegetation in seepage areas tends to be more well-developed and floristically different from the surrounding dry cliffs. The vegetation is patchy and often sparse, punctuated with patches of small trees that may form woodlands in places. *Juniperus virginiana* is a characteristic tree species, *Toxicodendron radicans* a characteristic woody vine, and *Polypodium virginianum* a characteristic fern.

MEMBERSHIP

Associations:

- Appalachian - Alleghenian Sandstone Dry Cliff Sparse Vegetation (CEGL006435, GNR)
- *Asplenium montanum* Central Appalachian Sandstone Sparse Vegetation (CEGL004391, GNR)
- *Betula alleghaniensis* - *Quercus rubra* / *Polypodium virginianum* Woodland (CEGL006320, G3G5)
- *Betula lenta* - *Quercus prinus* / *Parthenocissus quinquefolia* Woodland (CEGL006565, G3G4)
- *Juniperus virginiana* - *Corydalis sempervirens* Cliff Sparse Vegetation (CEGL006422, G4)
- *Lasallia (papulosa, pensylvanica)* - *Dimelaena oreina* - (*Melanelia culbertsonii*) Nonvascular Vegetation (CEGL004142, G4?)
- *Lasallia papulosa* - *Stereocaulon glaucescens* - *Chrysothrix chlorina* Nonvascular Vegetation (CEGL004143, G1?)
- Sandstone Dry Cliff Sparse Vegetation (CEGL002045, G4G5)
- Sandstone Midwest Moist Cliff Sparse Vegetation (CEGL002287, G4G5)
- *Umbilicaria mammulata* Nonvascular Vegetation (CEGL004387, G4?)
- *Umbilicaria muehlenbergii* - *Lasallia papulosa* - (*Melanelia stygia*) Nonvascular Vegetation (CEGL004389, G2?)

Alliances:

- *Asplenium montanum* Sparsely Vegetated Alliance (A.1831)
- *Lasallia (papulosa, pensylvanica)* Nonvascular Alliance (A.1824)
- Open Cliff Sparsely Vegetated Alliance (A.1836)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)
- *Umbilicaria mammulata* Nonvascular Alliance (A.1827)
- *Umbilicaria muehlenbergii* Nonvascular Alliance (A.1825)

DISTRIBUTION

Range: This system is found from central New England and New York south to Virginia.

Divisions: 202:C

Nations: US

Subnations: CT, MA, MD?, NY, OH, PA, VA, WV

Map Zones: 60:C, 61:C, 62:C, 63:P, 64:P, 65:C
USFS Ecomap Regions: 221E:CC, M221A:CC, M221B:CC, M221D:CC
TNC Ecoregions: 49:C, 52:?, 59:C, 60:?, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723008#references

Description Author: S.C. Gawler

Version: 26 Jul 2007

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

NORTH-CENTRAL APPALACHIAN CIRCUMNEUTRAL CLIFF AND TALUS (CES202.603)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate); Talus (Substrate); Temperate; Alkaline Soil

Non-Diagnostic Classifiers: Moderate (100-500 yrs) Persistence; Lowland; Sideslope; Circumneutral Soil; Very Shallow Soil; Ustic; Landslide

National Mapping Codes: ESLF 3153

CONCEPT

Summary: This cliff system occurs at low to mid elevations from central New England south to Virginia and West Virginia. It consists of vertical or near-vertical cliffs and steep talus slopes where weathering and/or bedrock lithology produce circumneutral to calcareous pH and enriched nutrient availability. Substrates include limestone, dolomite and other rocks. The vegetation varies from sparse to patches of small trees, in places forming woodland or even forest vegetation. *Fraxinus* spp., *Tilia americana*, and *Staphylea trifolia* are woody indicators of the enriched setting. The herb layer is typically not extensive but includes at least some species that are indicators of enriched conditions, e.g., *Impatiens pallida*, *Pellaea atropurpurea*, *Asplenium platyneuron*, or *Woodsia obtusa*.

Similar Ecological Systems:

- Central Appalachian Alkaline Glade and Woodland (CES202.602)--overlaps with this system in all but the northernmost portions of the range; it is closely related but distinguished by being in a setting other than cliff/talus (e.g., rocky ridges) and by having a greater prominence of graminoids in the ground layer.
- Central Interior Calcareous Cliff and Talus (CES202.690)
- Laurentian-Acadian Calcareous Cliff and Talus (CES201.570)--occurs farther north.
- Southern Interior Calcareous Cliff (CES202.356)--includes circumneutral cliff and talus communities from southern Virginia south.

MEMBERSHIP

Associations:

- (*Hydrangea arborescens*, *Toxicodendron radicans*) / *Heuchera americana* - (*Dichanthelium depauperatum*, *Woodsia obtusa*) Shrubland (CEGL004395, G3?)
- *Acer saccharum* - *Fraxinus americana* - *Juglans cinerea* / *Staphylea trifolia* / *Adlumia fungosa* Forest (CEGL006577, GNR)
- *Acer saccharum* - *Quercus muehlenbergii* Forest (CEGL005010, GNR)
- *Acer saccharum* - *Tilia americana* - *Fraxinus americana* / *Ostrya virginiana* / *Geranium robertianum* Woodland (CEGL005058, G3G5)
- *Asplenium ruta-muraria* - *Pellaea atropurpurea* Sparse Vegetation (CEGL004476, G3G4)
- *Thuja occidentalis* / *Carex eburnea* - *Pellaea atropurpurea* Woodland (CEGL002596, G2G3)
- *Tilia americana* - *Fraxinus americana* / *Acer pensylvanicum* - *Ostrya virginiana* / *Parthenocissus quinquefolia* - *Impatiens pallida* Woodland (CEGL008528, G3)
- *Tilia americana* - *Fraxinus americana* / *Cornus florida* Woodland (CEGL006054, G3G5)

Alliances:

- (*Hydrangea* spp., *Philadelphus* spp.) / *Heuchera* spp. Shrubland Alliance (A.1905)
- *Acer saccharum* - *Fraxinus americana* - *Tilia americana* Forest Alliance (A.217)
- *Asplenium ruta-muraria* - *Pellaea atropurpurea* Sparsely Vegetated Alliance (A.1832)
- *Quercus muehlenbergii* - (*Acer saccharum*) Forest Alliance (A.1912)
- *Thuja occidentalis* Woodland Alliance (A.544)
- *Tilia americana* - *Fraxinus americana* - (*Acer saccharum*) Woodland Alliance (A.628)

DISTRIBUTION

Range: This system ranges from central New England and New York south to Virginia and West Virginia. The extent of the Virginia range remains to be documented, but it appears to be absent from the Southern Blue Ridge and Southern Ridge and Valley portions of the state.

Divisions: 202:C

Nations: US

Subnations: MA, MD, NH, NJ, NY, OH, PA, VA, VT, WV

Map Zones: 53:C, 59:P, 61:C, 62:?, 63:P, 64:C, 65:C, 66:P

USFS Ecomap Regions: 221B:CC, 221D:CC, 221E:CC, M221A:CC, M221B:CC

TNC Ecoregions: 52:?, 59:P, 60:?, 61:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723006#references

Description Author: S.C. Gawler, mod. M. Pyne

Version: 26 Jul 2007

Concept Author: S.C. Gawler

Stakeholders: East, Midwest, Southeast

ClassifResp: East

NORTHERN ATLANTIC COASTAL PLAIN SANDY BEACH (CES203.301)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Beach (Substrate); Graminoid; Coast

National Mapping Codes: ESLF 3124

CONCEPT

Summary: This system includes sparsely vegetated ocean beaches constituting the outermost zone of coastal vegetation ranging from northern North Carolina (north of Bodie Island) northward to the terminus of extensive sandy coastlines and the beginning of rocky coasts. Examples generally extend seaward from foredunes but may include flats behind breached foredunes. Although these habitats are situated just above the mean high tide limit, they are constantly impacted by waves and may be flooded by high spring tides and storm surges (Fleming et al. 2001). Constant salt spray and rainwater maintain generally moist conditions. Substrates consist of unconsolidated sand and shell sediments that are constantly shifted by winds and floods. Dynamic disturbance regimes largely limit vegetation to pioneering, salt-tolerant, succulent annuals. *Cakile edentula ssp. edentula* and *Salsola kali* (= *Salsola caroliniana*) are usually most numerous and characteristic. Other scattered associates include *Sesuvium maritimum*, *Polygonum glaucum*, *Polygonum ramosissimum var. prolificum*, *Suaeda linearis* and *Suaeda maritima*, and *Atriplex cristata* (= *Atriplex pentandra*).

Classification Comments: In Virginia, this system is distributed along the ocean side of the Eastern Shore (Accomack and Northampton counties) and on Cape Henry and False Cape (City of Virginia Beach).

Similar Ecological Systems:

- Central Atlantic Coastal Plain Sandy Beach (CES203.064)--is found to the south.
- Northern Atlantic Coastal Plain Dune and Maritime Grassland (CES203.264)

DESCRIPTION

Environment: This system includes sparsely vegetated ocean beaches that constitute the outermost zone of coastal vegetation ranging from northern North Carolina northward to the terminus of extensive sandy coastlines and the beginning of rocky coasts. Examples generally extend seaward from foredunes but may include flats behind breached foredunes.

Dynamics: Extensive construction of high, artificial dunes along the Atlantic Coast has reduced the extent of these habitats by increasing oceanside beach erosion and eliminating the disturbance regime that creates and maintains overwash flats.

MEMBERSHIP

Associations:

- *Cakile edentula ssp. edentula* - *Chamaesyce polygonifolia* Sparse Vegetation (CEGL004400, G4G5)
- *Sesuvium portulacastrum* - *Atriplex* spp. - *Suaeda* spp. Sparse Vegetation (CEGL004406, G3)

Alliances:

- *Cakile edentula* Sparsely Vegetated Alliance (A.1861)
- *Sesuvium* spp. - *Atriplex* spp. - *Suaeda* spp. Tidal Sparsely Vegetated Alliance (A.1868)

DISTRIBUTION

Range: This system ranges from northern North Carolina northward to the terminus of extensive sandy coastlines and the beginning of rocky coasts in southern Maine.

Divisions: 203:C

Nations: US

Subnations: CT, DE, MA, MD, ME, NC, NH, NJ, NY, RI, VA

Map Zones: 60:C, 65:C, 66:C

TNC Ecoregions: 57:C, 58:C, 62:C

SOURCES

References: Comer et al. 2003, Fleming et al. 2001

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723190#references

Description Author: R. Evans

Version: 12 Oct 2004

Concept Author: R. Evans

Stakeholders: East, Southeast

ClassifResp: East

SOUTH FLORIDA SHELL HASH BEACH (CES411.271)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Beach (Substrate); Graminoid; Coast

National Mapping Codes: ESLF 3138

CONCEPT

Summary: This system represents carbonate sand beaches of the Florida Keys and south Florida mangrove islands (after Johnson and Barbour 1990). The vegetation is poorly known but apparently includes at least one endemic species, *Chamaesyce garberi*. Other diagnostic species may include *Piscidia piscipula* and *Pithecellobium keyense*.

Classification Comments: No associations have currently been described in the NVC for this system. More information is needed.

Related Concepts:

- Unconsolidated Substrate (FNAI 1990) Broader

DISTRIBUTION

Range: The range of this system includes Cape Sable (the southernmost point of mainland Florida), Ten Thousand Islands (Collier County), Florida Keys, and islands in Biscayne Bay (near Miami).

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Johnson and Barbour 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723215#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHEAST FLORIDA BEACH (CES411.272)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)
Land Cover Class: Barren
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Beach (Substrate); Graminoid; Coast
National Mapping Codes: ESLF 3136

CONCEPT

Summary: This beach ecological system is the southernmost of its kind along the mainland coast of North America. Its southerly location distinguishes it from other types along the Atlantic Coast, primarily due to the prevalence of the tropical flora it supports. This type is related to Southwest Florida Beach (CES411.276) but is affected directly by much higher wave energy from the Atlantic. This region has some of the highest wave energy along the entire Atlantic Coastal Plain (Tanner 1960).

Classification Comments: Apparently few, if any, associations have currently been described in the NVC for this system. More information is needed.

Similar Ecological Systems:

- Southwest Florida Beach (CES411.276)

MEMBERSHIP

Associations:

- *Ipomoea pes-caprae* - *Cakile lanceolata* Herbaceous Vegetation (CEGL004403, G3G4)

Alliances:

- *Ipomoea pes-caprae* Herbaceous Alliance (A.1581)

DISTRIBUTION

Divisions: 411:C
Nations: US
Subnations: FL
Map Zones: 56:C
TNC Ecoregions: 54:C

SOURCES

References: Comer et al. 2003, Tanner 1960

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723214#references

Description Author: R. Evans

Version: 23 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN APPALACHIAN GRANITIC DOME (CES202.297)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades

National Mapping Codes: ESLF 3126

CONCEPT

Summary: This system consists of smooth, curved, exfoliated outcrops of massive granite and related rocks in the Southern Blue Ridge and adjacent upper/inner Piedmont. Smooth rock without crevices is the primary factor in the distinctive ecological character of this system. The outcrop surface is largely bare rock but has thin soil mats around the edges and patchily throughout. Mats vary in depth with age and level of development. Resulting vegetation is a complex of small patches of different species and structure on soil mats of different depths, ranging from moss and lichens to herbs to shrubs and trees

Classification Comments: Granitic domes are clearly related to other rock outcrop systems in the southern Appalachians. Most similar in the region are Southern and Central Appalachian Mafic Glade and Barrens (CES202.348), which are distinguished by having more continuous vegetation and only a minority of bare rock, resulting from a more irregular rock surface or less steep slope. Glades and barrens occur on a wider range of rock types, but it is possible that granitic domes develop into glades over long periods of time (probably centuries or longer) if exfoliation ceases to occur. Southern Appalachian Montane Cliff and Talus (CES202.330) and Southern Appalachian Rocky Summit (CES202.327) differ in having more fractured rock, with vegetation dominated by plants rooted in fixed microsites related to crevices, ledges, and other small features. Southern Piedmont Granite Flatrock and Outcrop (CES202.329) is most similar to Southern Appalachian Granitic Dome (CES202.297) in occurring on smooth, exfoliated outcrops and having vegetation driven by soil mat dynamics. Some species are shared, but biogeography and climatic differences make for vegetation that is different.

Deeper soils often have pine-dominated vegetation with dense shrubs, resembling that of Southern Appalachian Montane Pine Forest and Woodland (CES202.331). These communities should be treated as part of this system if they are closely associated with exfoliation outcrops with the more distinctive granitic dome communities. The same is true of closely associated islands and stunted patches of vegetation resembling Southern Appalachian Oak Forest (CES202.886).

Similar Ecological Systems:

- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)

DESCRIPTION

Environment: This system occurs on exfoliated granitic outcrops. In the upper/inner Piedmont, it usually occurs as isolated hills (inselbergs or monadnocks) that stand above the surrounding landscape. In the Blue Ridge, it usually occurs as part of larger mountain ranges but often still as somewhat distinctive knobs. Granite, granitic gneiss, and related rocks without many internal joints tend to fracture in thin sheets parallel to the surface, forming curved outcrops with smooth surfaces largely lacking crevices. Granitic dome outcrops develop on upper to midslopes, and most face south. Most individual outcrops grade from nearly level to very steep. The outcrop surface is largely bare rock but has thin soil mats around the edge and in patches throughout. Mats vary in depth with age and level of development. The smooth rock without crevices is the primary factor in the distinctive ecological character of this system. Distinct microenvironments are created by small irregularities in the rock surface and by areas of seepage at the edge. Elevation is an important factor affecting different associations within the system.

Vegetation: Most of the rock surface is bare or has only crustose or foliose lichen cover. Vegetation occurs as a series of small patches in the thin soil mats, with the kind of vegetation closely related to depth of the mat. Bare rock may have moss patches. The thinnest soils usually have a set of fine forbs, many of them annual. Slightly deeper soils often have grasses dominating. Deeper soils support shrubs or small trees. The flora shares some species with other rock outcrops of similar elevations but has some distinctive species and different dominance of species.

Dynamics: Granitic domes have a distinctive pattern of cyclical primary succession. Soil mats appear and deepen over time in a process that links vegetational and soil development, but are eventually destroyed by wind throw, drought, other natural disturbances, or simply falling off the rock. The result is a pattern with mats of different levels of development at any given time. Mat dynamics are different in different parts of the rock, with older mats and more permanent patterns near the edges, and sparser and younger mats in the interior. The dynamics are further modified by microtopography and the presence of seepage. The overall vegetation patterns likely respond to climatic cycles and natural disturbance events. The thin soils make these communities sensitive to drought, especially the long-lived woody species.

MEMBERSHIP

Associations:

- (*Quercus prinus*) / *Vaccinium pallidum* / *Schizachyrium scoparium* - *Danthonia spicata* / *Cladonia* spp. Herbaceous Vegetation (CEGL004990, G1G2)
- *Carex biltmoreana* - *Pycnanthemum* spp. - *Krigia montana* Herbaceous Vegetation (CEGL004523, G2G3)
- *Lasallia papulosa* - *Umbilicaria caroliniana* Nonvascular Vegetation (CEGL004386, G2?)
- *Quercus rubra* / *Rhododendron catawbiense* - *Rhododendron arborescens* Woodland (CEGL004503, G2)
- *Selaginella rupestris* - *Schizachyrium scoparium* - *Hypericum gentianoides* - *Bulbostylis capillaris* Herbaceous Vegetation (CEGL007690, G2)
- *Selaginella tortipila* - *Krigia montana* - *Houstonia longifolia* Herbaceous Vegetation (CEGL004283, G2G3)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Carex biltmoreana* Herbaceous Alliance (A.1277)
- *Lasallia papulosa* - *Umbilicaria caroliniana* Nonvascular Alliance (A.1826)
- *Quercus rubra* - *Quercus prinus* Woodland Alliance (A.624)
- *Selaginella (tortipila, rupestris)* Herbaceous Alliance (A.1985)

SPATIAL CHARACTERISTICS

Spatial Summary: Large-patch system, most examples covering a few acres.

Size: Most examples naturally cover a few acres, with a few examples up to 10 or more acres. Most examples occur in a few clusters where geology is suitable (e.g., the Blue Ridge escarpment at the South Carolina-North Carolina border and the Brushy Mountains in North Carolina), but most examples in these clusters are probably far enough apart to be considered separate occurrences. Individual knobs may have a cluster of several closely associated outcrops separated by small patches of forest.

Adjacent Ecological Systems:

- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Oak Forest (CES202.886)

Adjacent Ecological System Comments: Surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Appalachian Oak Forest (CES202.886). Patches of oak forests may occur in a mosaic with the granitic domes.

DISTRIBUTION

Range: This system is restricted to the Southern Blue Ridge and adjacent upper/inner Piedmont in the Carolinas and Georgia.

Divisions: 202:C

Nations: US

Subnations: GA?, NC, SC

Map Zones: 57:C, 59:C

TNC Ecoregions: 51:C, 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723194#references

Description Author: M. Schafale and R. Evans

Version: 18 Apr 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN APPALACHIAN MONTANE CLIFF AND TALUS (CES202.330)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Upland

Diagnostic Classifiers: Moss/Lichen (Nonvascular); Cliff (Substrate)

National Mapping Codes: ESLF 3186

CONCEPT

Summary: This system consists of steep to vertical or overhanging rock outcrops (and related steep talus slopes) of the Southern Blue Ridge and adjacent parts of other ecoregions. It occurs on lower slopes, usually in river gorges or bluffs. The sparse vegetation is limited to plants growing on bare rock, small ledges, and crevices. Vegetation is primarily bryophytes, lichens, and herbs, with sparse trees and shrubs rooted in deeper soil pockets and crevices.

Classification Comments: This system is distinguished from other rock outcrops by a combination of low topographic position, vertical orientation, large amount of bare rock, and absence of specialized environments such as exfoliated granite, limestone or dolomite, and spray from waterfalls. In contrast, Southern Appalachian Rocky Summit (CES202.327) occurs in high topographic positions; they have more horizontal rock but may have some substantial vertical surfaces. Southern and Central Appalachian Mafic Glade and Barrens (CES202.348) are more horizontally oriented and have much more vegetation cover. Southern Appalachian Granitic Dome (CES202.297) may have steep portions but has smooth, unfractured rock surfaces with soil largely confined to mats adhering to the rock surface. The division of rock outcrop systems may be too fine and warrant combining some; however, each system has distinctive characteristics of structure and some distinctive flora.

The primary variation within this system, which could be the basis for further subdivision, is the distinction between mafic and felsic rock. The distribution north and west needs review. See also Cumberland Acidic Cliff and Rockhouse (CES202.309).

Similar Ecological Systems:

- Appalachian Shale Barrens (CES202.598)
- Cumberland Acidic Cliff and Rockhouse (CES202.309)
- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Appalachian Spray Cliff (CES202.288)
- Southern Piedmont Cliff (CES202.386)

Related Concepts:

- Dry Sandstone Cliff (Evans 1991) Intersecting
- Moist Sandstone Cliff (Evans 1991) Intersecting

DESCRIPTION

Environment: This system occurs on steep rock outcrops on lower slopes and occasionally higher in topographically sheltered sites. River gorges are probably the most common landforms, with bluffs of more open river valleys or meandering rivers also common. The substrate is mostly bare bedrock, which is steep to vertical or overhanging. Most examples are on felsic metamorphic rock such as gneiss or schist, a smaller number on mafic metamorphic rock or felsic or mafic igneous rock. [Examples may occur on any kind of rock except limestone and dolomite, with felsic metamorphic rock the most common in the Southern Blue Ridge and sandstone the most common in the Cumberland Mountains. Mafic metamorphic rocks form a less common but important fraction of examples, along with some more extreme rocks such as quartzite.] The physical structure of cliffs of metamorphic rock is usually irregular, with some ledges and crevices. [Sedimentary rocks often form more vertical cliffs, but with bedding planes and joints forming deep crevices that provide rooting sites.] Moisture levels vary drastically over short distances. Seepage of groundwater from adjacent soils or through rock fractures often creates permanently or seasonally flooded microsites, while lack of soil makes other portions extremely dry. In less sheltered topography, slope aspect affects overall moisture levels to some degree. Rock or soil chemistry appears to be the most important factor affecting different associations on sites that have the physical structure to belong to this system. Elevation may also be an important factor causing variation, though few examples are known at high elevation.

Vegetation: Vegetation is sparse. Bryophytes and lichens may cover portions of the open rock. Vascular plants are limited to sparse rooting sites in soil pockets, ledges, and crevices. Some of these microsites may be deep enough to support shrubs or even stunted trees, while most support only herbs. The woody plants are usually species from surrounding forests, and may be mesophytic or xerophytic. The herbs include a suite of rock outcrop specialists such as *Saxifraga michauxii*, *Hylotelephium telephioides*, *Asplenium montanum*, and *Polypodium* spp. Mafic rock outcrops have an additional suite of specialist herbs, a number of them rare. Herbs from the surrounding forest are often also present and may make up a significant fraction of the flora.

Dynamics: The dynamics of this system have received little study. Most cliff communities are probably stable over long periods of time, with fine-scale disturbances affecting microsites. Rock falls, slides, and other mass movement are rare, but represent catastrophic disturbance to part or all of a cliff, and may be important in the long term for keeping cliffs open. Animal movements may be locally

important. Fire probably has little effect on cliffs, which have too little vegetation to carry fire and which tend to occur in topography that is not conducive to fire spread. Because of the limited natural disturbance and the fragility of soil and vegetation, human disturbance by trampling edges and by climbing may be particularly destructive.

MEMBERSHIP

Associations:

- (*Hydrangea arborescens*) / *Heuchera villosa* - *Asplenium trichomanes* - *Thalictrum clavatum* / *Conocephalum conicum* Shrubland (CEGL008435, G2)
- (*Hydrangea arborescens*) / *Heuchera villosa* - *Dicentra eximia* - *Campanula divaricata* Shrubland (CEGL008546, G2)
- (*Hydrangea arborescens*, *Toxicodendron radicans*) / *Heuchera americana* - (*Dichanthelium depauperatum*, *Woodsia obtusa*) Shrubland (CEGL004395, G3?)
- *Asplenium montanum* - *Heuchera villosa* Felsic Cliff Sparse Vegetation (CEGL004980, G3G4)
- *Carya glabra* - *Fraxinus americana* - *Quercus prinus* / *Ostrya virginiana* / *Philadelphus hirsutus* Woodland (CEGL004995, G2)
- *Parthenocissus quinquefolia* / (*Dicentra eximia*) Sparse Vegetation (CEGL004454, G2G3Q)
- *Physocarpus opulifolius* / *Campanula divaricata* - *Tradescantia subaspera* - (*Packera plattensis*) Sparse Vegetation (CEGL004759, G1?)
- *Umbilicaria mammulata* Nonvascular Vegetation (CEGL004387, G4?)

Alliances:

- (*Hydrangea* spp., *Philadelphus* spp.) / *Heuchera* spp. Shrubland Alliance (A.1905)
- *Asplenium montanum* Sparsely Vegetated Alliance (A.1831)
- *Fraxinus americana* - *Carya glabra* - (*Juniperus virginiana*) Woodland Alliance (A.604)
- Lowland Talus Sparsely Vegetated Alliance (A.1847)
- *Physocarpus opulifolius* Sparsely Vegetated Alliance (A.1837)
- *Umbilicaria mammulata* Nonvascular Alliance (A.1827)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering a few acres. Examples tend to occur as isolated small patches or occasional small clusters.

Size: Most examples naturally cover an acre or less. A few occur as complexes of closely associated patches, but the aggregate size is still small. Size is somewhat ambiguous for this system, in that vertical surfaces may be as extensive as horizontal surfaces.

Adjacent Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)
- Southern Appalachian Low-Elevation Pine Forest (CES202.332)
- Southern Appalachian Montane Pine Forest and Woodland (CES202.331)
- Southern Appalachian Oak Forest (CES202.886)
- Southern Appalachian Spray Cliff (CES202.288)

Adjacent Ecological System Comments: This system is surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern and Central Appalachian Cove Forest (CES202.373), Southern Appalachian Oak Forest (CES202.886), or various floodplain forest systems. Southern Appalachian Low-Elevation Pine Forest (CES202.332) or Southern Appalachian Montane Pine Forest and Woodland (CES202.331) may sometimes adjoin.

DISTRIBUTION

Range: Scattered throughout the Southern Appalachians and incidentally into adjacent ecoregions, from northern Alabama and Georgia through Virginia.

Divisions: 202:C

Nations: US

Subnations: GA, KY, NC, SC, TN, VA

Map Zones: 48:?, 53:P, 54:C, 57:C, 59:C, 61:C

TNC Ecoregions: 50:?, 51:C, 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723173#references

Description Author: M. Schafale and R. Evans

Version: 18 Apr 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN APPALACHIAN ROCKY SUMMIT (CES202.327)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades

National Mapping Codes: ESLF 3178

CONCEPT

Summary: This system represents treeless rock outcrops of the southern Appalachian Mountains, primarily in western North Carolina and eastern Tennessee. Outcrops may be vertical to horizontal, rugged or fractured rock outcrops of peaks, ridgetops, upper slopes, and other topographically exposed locations (Schafale and Weakley 1990). Higher elevation examples occur from 1200 to 2030 m in elevation; other examples may be found at elevations of 305 m (1000 feet) or lower on foothills. These outcrops occur on felsic to mafic rocks and are distinguished from surrounding systems by the prevalence of bare or lichen-encrusted rocks. The vegetation component of this system is generally characterized by a mixture of low-growing lifeforms, especially lichens, mosses, and short-statured forbs. Less commonly, graminoids and low shrubs are encountered. Species common to all outcrop vegetation types include *Carex misera*, *Saxifraga michauxii*, and *Vaccinium corymbosum* (Wiser and White 1999).

Classification Comments: The primary variation within this system, which could be the basis for further subdivision, is the distinction between low and high elevation. High-elevation rocky summits may have a unique biogeographic history of having been adjacent to alpine tundra that existed in the region during the Pleistocene and of now providing a refugium for some of its flora. Their climate is substantially different from the lower elevation examples. However, their structure and the dynamics that results from it are probably similar.

Similar Ecological Systems:

- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Glade and Barrens (CES202.328)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)

Related Concepts:

- High Elevation Rocky Summit (Schafale and Weakley 1990) Finer
- Low Elevation Rocky Summit (Schafale and Weakley 1990) Finer

DESCRIPTION

Environment: This system occurs on rugged rock outcrops on peaks, ridgetops, upper slopes, and other topographically exposed landforms. Elevations may range from nearly the highest in the region (1200-2030 m), down to 305 m (1000 feet) or lower on foothills. The rock outcrops are irregular, with substantial horizontal surfaces, as well as often vertical surfaces, and generally with fractures. This structure allows soil accumulation in local pockets, sometimes to fair depth, even though most of the substrate is bare rock. Bedrock may be a variety of types. Erosion-resistant rocks such as felsic gneisses and schists or quartzite are most common, but mafic rocks such as amphibolite are also important substrates. Granite and granitic gneiss sometimes form rocky summits, but more often form the smoother outcrops that support Southern Appalachian Granitic Dome (CES202.297) or Southern and Central Appalachian Mafic Glade and Barrens (CES202.348). Moisture conditions are generally quite dry due to lack of soil but may be heterogeneous. Local deep crevices may accumulate water funneled from bare rock. Seepage is occasionally present but is usually minor. Climate varies substantially with elevation and has a strong effect on variation within the system. Higher elevation sites have high rainfall and receive substantial additional moisture from fog and rime ice.

Vegetation: Vegetation is sparse or patchy, with substantial expanses of lichen-covered or bare rock. Vegetation cover may be >25% (i.e., not technically "sparse") in local areas (including some plots), but the overall effect is of sparse vegetation. Mosses are usually present but often do not have substantial cover. A suite of typical rock outcrop herbs, including *Saxifraga michauxii*, *Carex misera*, *Paronychia argyrocoma*, *Heuchera villosa*, *Krigia montana*, and *Hylotelephium telephioides* (= *Sedum telephioides*), is usually present, along with more widespread herbs of open areas such as *Danthonia spicata*, *Danthonia compressa*, *Schizachyrium scoparium*, *Potentilla canadensis*, and *Houstonia caerulea*. High-elevation examples have an additional suite of herbs, which include some northern disjunct species such as *Minuartia groenlandica*, *Sibbaldiopsis tridentata*, *Trichophorum caespitosum*, and *Huperzia selago*. A suite of narrow endemic herbs is also characteristic of many high-elevation examples. Herbs of the adjacent forests may be present in small numbers. Shrubs and stunted trees are usually present in patches, where crevices or deeper soil accumulations are present. A few shrubs, such as *Leiophyllum buxifolium*, are largely limited to this system, but most are widespread species of dry forests and woodlands. Shrubs in the Ericaceae family are particularly prominent. Wiser and White (1999) found that in high-elevation rocky summits, less than a third of the flora was limited to rock outcrop sites.

Dynamics: The dynamics of this system have received little study. Most rocky summit sites are probably stable over long periods of

time, but variations in the always stressful environment may disturb and change vegetation. The role of crevices and soil in depressions as the primary rooting site makes for a relatively stable pattern of plant distribution and potentially long-lived individuals. This is in contrast to the shallow soil mats predominating in granitic domes. Between disturbances, accumulation of soil and succession of vegetation to greater woody abundance may occur. Fire may naturally be uncommon or fairly common. The topographically high location of this system would make it likely that fires would spread into it, though the sparse fuels would allow only patchy burning. Fires have been indicated to be important in preventing dense woody growth from encroaching on open outcrops in at least some instances. Rock falls or other mass movement are rare, but may be important in creating rock outcrops and keeping them open in the long term. Periodic drought is probably a significant disturbance. Animals and freeze-thaw action may be important disturbances at a local scale. Because of the fragility of soil and vegetation, human disturbance by trampling edges and by climbing may be particularly destructive.

MEMBERSHIP

Associations:

- *Hudsonia montana* - *Leiophyllum buxifolium* Dwarf-shrubland (CEGL003948, GH)
- *Saxifraga michauxii* - *Carex misera* - *Calamagrostis cainii* Herbaceous Vegetation (CEGL004278, G1)
- *Saxifraga michauxii* - *Carex misera* - *Danthonia spicata* - *Krigia montana* Herbaceous Vegetation (CEGL004279, G2)
- *Saxifraga michauxii* - *Carex misera* - *Oclemena acuminata* - *Solidago glomerata* Herbaceous Vegetation (CEGL004277, G1)
- *Saxifraga michauxii* - *Cheilanthes lanosa* - *Hylotelephium telephioides* Herbaceous Vegetation (CEGL004989, G1)
- *Saxifraga michauxii* Herbaceous Vegetation (CEGL004524, G3?)
- *Schizachyrium scoparium* - *Saxifraga michauxii* - *Coreopsis major* Herbaceous Vegetation (CEGL004074, G1)

Alliances:

- *Leiophyllum buxifolium* Dwarf-shrubland Alliance (A.1063)
- *Saxifraga michauxii* Herbaceous Alliance (A.1621)

SPATIAL CHARACTERISTICS

Adjacent Ecological Systems:

- Central and Southern Appalachian Spruce-Fir Forest (CES202.028)
- Southern and Central Appalachian Mafic Glade and Barrens (CES202.348)
- Southern Appalachian Grass and Shrub Bald (CES202.294)
- Southern Appalachian Northern Hardwood Forest (CES202.029)

DISTRIBUTION

Range: This system is found at a variety of elevations in the southern Appalachian Mountains, primarily in western North Carolina and eastern Tennessee.

Divisions: 202:C

Nations: US

Subnations: GA, NC, SC, TN

Map Zones: 57:C

TNC Ecoregions: 51:C

SOURCES

References: Comer et al. 2003, Schafale and Weakley 1990, Wisser and White 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723176#references

Description Author: M. Schafale, mod. M. Pyne

Version: 18 Apr 2006

Concept Author: M. Schafale

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN APPALACHIAN SPRAY CLIFF (CES202.288)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate)

National Mapping Codes: ESLF 3145

CONCEPT

Summary: This system consists of rock outcrops that are kept wet by spray from waterfalls, primarily in the Southern Blue Ridge, and possibly elsewhere in the southern Appalachians region. The rocks are often densely or moderately covered with bryophytes or algae. The sparse vascular vegetation is limited to plants growing on bare rock, small ledges and crevices.

Classification Comments: This system is distinguished from all others in its range by its being kept wet by spray. Other outcrop systems, especially Southern Appalachian Montane Cliff and Talus (CES202.330), may have local wet areas created by seepage but will be dominated by dry microsites. Other interpretations of this system are that it could be combined with other cliff systems of the Appalachians.

Similar Ecological Systems:

- Southern Appalachian Montane Cliff and Talus (CES202.330)

Related Concepts:

- Moist Sandstone Cliff (Evans 1991) Broader

DESCRIPTION

Environment: Occurs on rock outcrops adjacent to waterfalls, where spray from the falls keeps the rock wet for long periods. Outcrops are usually near vertical, but horizontal surfaces at the base, boulder piles, and grottos are also common. The rock may be of any type, and the substrate may occasionally be saprolite rather than hard rock. Soil is limited to accumulations in crevices and on ledges. The rock may be permanently wet or may be wet seasonally when stream flow is high. Wetness is constant enough that this system may be considered a wetland, though some of the impacts of soil saturation do not occur. Seepage often makes portions of the rock wetter than areas covered just by spray. The typical topographic setting, in narrow gorges or enclosed valleys, makes for high local humidity and moderated temperature fluctuations.

Vegetation: Vegetation is usually a mix of growth forms and may be very patchy. Bryophytes, both mosses and liverworts, are often dense. Vascular vegetation may be sparse, but some examples are dense. Characteristic rock outcrop herbs such as *Saxifraga michauxii*, *Asplenium montanum*, and *Heuchera* spp. are usually present, along with some herbs of moist forests and seeps, such as *Galax urceolata*, *Thalictrum clavatum*, *Houstonia serpyllifolia*, *Circaea alpina*, and *Impatiens capensis*. A few examples are grassy. Examples on basic rock or with basic seepage have additional calciphilic herbs. A number of rare species, especially mosses, liverworts, and ferns but also including some forbs, grasses, and sedges, may be present. Shrubs and trees are usually present, at least on edges and often also rooted in crevices and ledges. *Rhododendron maximum*, *Kalmia latifolia*, and *Tsuga canadensis* are among the most frequent. Woody vines may also be prominent.

Dynamics: The dynamics of this system have received little study. The spray cliff environment is probably unusually stable, with its sheltered topographic position limiting wind influence, dryness, and extreme temperatures. Most individual plants are probably long-lived. The presence of tropical disjunct bryophytes and ferns at some spray cliffs supports the idea of a very stable, moderate environment. Droughts affect streamflow and must affect moisture levels, but most streams large enough to support spray cliffs will probably never dry up. Occasional rock falls and scouring related to flash floods represent catastrophic disturbances to all or part of occurrences. Because of the fragility of the vegetation and soil, along with the attractiveness of waterfalls, human disturbance can be very significant.

MEMBERSHIP

Associations:

- *Vittaria appalachiana* - *Heuchera parviflora* var. *parviflora* - *Houstonia serpyllifolia* / *Plagiochila* spp. Herbaceous Vegetation (CEGL004302, G2)

Alliances:

- *Vittaria appalachiana* - *Heuchera parviflora* Saturated Herbaceous Alliance (A.1696)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering less than one acre. Examples tend to occur as isolated small patches.

Size: Most examples naturally cover well less than one acre, and well-developed and diverse examples may be as small as 100 square meters. Complexes of multiple patches are almost never found. Size is somewhat ambiguous for this system, in that vertical surfaces may be as extensive as horizontal surfaces.

Adjacent Ecological Systems:

- Southern and Central Appalachian Cove Forest (CES202.373)

- Southern Appalachian Montane Cliff and Talus (CES202.330)

Adjacent Ecological System Comments: This system is usually surrounded by mesic forest systems, including Southern and Central Appalachian Cove Forest (CES202.373). Some may be associated with Southern Appalachian Montane Cliff and Talus (CES202.330) on drier rock exposures.

DISTRIBUTION

Range: This system occurs scattered throughout the southern Appalachians and incidentally into adjacent ecoregions, from northern Alabama and Georgia through Virginia.

Divisions: 202:C

Nations: US

Subnations: AL, GA, KY, NC, SC, TN, VA, WV?

Map Zones: 48:?, 53:C, 57:C, 61:C

TNC Ecoregions: 50:?, 51:C, 52:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUId=ELEMENT_GLOBAL.2.723200#references

Description Author: M. Schafale and R. Evans

Version: 12 Oct 2004

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN ATLANTIC COASTAL PLAIN BEACH (CES203.535)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Linear

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

National Mapping Codes: ESLF 3181

CONCEPT

Summary: This beach system is found along the Atlantic Coast from the St. Johns River in northeastern Florida to approximately Cape Canaveral. Unlike Atlantic Coastal Plain Sea Island Beach (CES203.383) north of the St. Johns River, this system is subject to higher wave energy and a greater component of sand. Vegetation of this area is distinct from that farther south along the coast of Florida, lacking the tropical element found south of Cape Canaveral (Johnson and Muller 1993a).

Classification Comments: Apparently few, if any, associations have currently been described in the NVC for this system. More information is needed.

Similar Ecological Systems:

- Atlantic Coastal Plain Sea Island Beach (CES203.383)--dovetails this system to the north.

Related Concepts:

- Unconsolidated Substrate (FNAI 1990) Broader

MEMBERSHIP

Associations:

- *Cakile edentula* ssp. *harperi* Sparse Vegetation (CEGL004401, G3)

Alliances:

- *Cakile edentula* Sparsely Vegetated Alliance (A.1861)

DISTRIBUTION

Range: This system is found along the Atlantic Coast from the St. Johns River in northeastern Florida to approximately Cape Canaveral.

Divisions: 203:C

Nations: US

Subnations: FL

Map Zones: 55:C, 56:C

TNC Ecoregions: 55:C, 56:C

SOURCES

References: Comer et al. 2003, Johnson and Muller 1993a, Southeastern Ecology Working Group n.d.

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723067#references

Description Author: R. Evans, mod. C.W. Nordman

Version: 02 Feb 2007

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN COASTAL PLAIN SINKHOLE (CES203.495)

CLASSIFIERS

Classification Status: Standard

Primary Division: Gulf and Atlantic Coastal Plain (203)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades

Non-Diagnostic Classifiers: Depressional; Isolated Wetland [Partially Isolated]

National Mapping Codes: ESLF 3184

CONCEPT

Summary: This system consists of deep sinkhole depressions with steep vertical walls of exposed limestone in the Gulf Coastal Plain of Florida and Georgia (other depressions formed in karstic regions that are shallow and lacking in steep vertical walls with exposed rock are accommodated by other systems). These cylindrical- or conical-shaped depressions form in karstic environments where cavities have been eroded in underlying limestone. As cavities enlarge, cavern roofs eventually collapse forming these steep-sided depressions. Some examples drain readily and contain standing water for short periods of time, while others contain permanent lakes. The steep-sided limestone walls are typically sparsely vegetated with mosses, liverworts, and ferns, with occasional herbs and shrubs in crevices where organic soils have developed (FNAI 1990). The steepness and depth of these depressions help create a generally moist microclimate which is often enhanced by seepage from surrounding uplands, and the presence of standing water.

Classification Comments: Excluded from this system are sinkholes of extreme southern Florida and the Mid-Atlantic Coastal Plain of the Carolinas which do not develop such extreme depth and microclimatic features.

Similar Ecological Systems:

- East Gulf Coastal Plain Depression Pondshore (CES203.558)
- East Gulf Coastal Plain Sandhill Lakeshore Depression (CES203.292)

Related Concepts:

- Sinkhole (FNAI 1990) Equivalent

MEMBERSHIP

Associations:

- *Adiantum capillus-veneris* - *Thelypteris kunthii* / *Dumortiera hirsuta* Herbaceous Vegetation (CEGL004717, G3?)
- *Adiantum tenerum* - *Parietaria praetermissa* - *Arenaria lanuginosa* Herbaceous Vegetation (CEGL004469, G2?)

Alliances:

- *Adiantum capillus-veneris* Saturated Herbaceous Alliance (A.1683)
- *Adiantum tenerum* Herbaceous Alliance (A.1613)

DISTRIBUTION

Range: Gulf Coastal Plain of Florida and Georgia.

Divisions: 203:C

Nations: US

Subnations: AL, FL, GA

Map Zones: 55:C, 56:C, 99:C

TNC Ecoregions: 53:C, 55:C

SOURCES

References: Comer et al. 2003, FNAI 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723091#references

Description Author: R. Evans

Version: 14 Dec 2004

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN INTERIOR CALCAREOUS CLIFF (CES202.356)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate)

National Mapping Codes: ESLF 3185

CONCEPT

Summary: This system encompasses calcareous cliffs of the Southern Ridge and Valley and adjacent areas of the Cumberland Plateau with a few disjunct localities in the southern Appalachians. This system includes vertical to near-vertical rock faces of limestone and dolomite. These cliffs are typically dry but may contain relatively small embedded seepage patches. Both wet and, more commonly, dry expressions are included. Due to harsh edaphic conditions, including verticality, these cliffs are nearly unvegetated, however, *Asplenium ruta-muraria* and *Pellaea atropurpurea* may be characteristic plants. Some cliffs have scattered *Thuja occidentalis* trees which may be very old (>800 years) and genetically diverse. This system also covers a narrow zone of vegetation, often herbaceous, at the horizontal clifftop where growing conditions are harsh and often gladelike.

Similar Ecological Systems:

- Central Interior Calcareous Cliff and Talus (CES202.690)
- North-Central Appalachian Circumneutral Cliff and Talus (CES202.603)

Related Concepts:

- Dry Limestone Cliff (Evans 1991) Intersecting
- Moist Limestone Cliff (Evans 1991) Intersecting

DESCRIPTION

Environment: This system includes vertical to near-vertical rock faces of limestone and dolomite. These cliffs are typically dry but may contain relatively small embedded seepage patches. Both wet and, more commonly, dry expressions are included. Disjunct examples in the southern Appalachians attributed to this system include Hot Springs and Linville Caverns area. It presumably includes both the Bull Cave and Calf Cave area in the Smokies.

Vegetation: Due to harsh edaphic conditions, including verticality, these cliffs are nearly unvegetated, however, *Asplenium ruta-muraria* and *Pellaea atropurpurea* may be characteristic plants. Some cliffs have scattered *Thuja occidentalis* trees which may be very old (>800 years) and genetically diverse. This system also covers a narrow zone of vegetation, often herbaceous, at the horizontal clifftop where growing conditions are harsh and often gladelike.

MEMBERSHIP

Associations:

- *Asplenium ruta-muraria* - *Pellaea atropurpurea* Sparse Vegetation (CEGL004476, G3G4)
- *Rhus aromatica* - *Celtis tenuifolia* / *Carex eburnea* Shrubland (CEGL004393, G3)
- *Schizachyrium scoparium* - *Sporobolus compositus* var. *compositus* - *Rudbeckia fulgida* var. *fulgida* Wooded Herbaceous Vegetation (CEGL004078, G2)
- *Thuja occidentalis* / *Carex eburnea* - *Pellaea atropurpurea* Woodland (CEGL002596, G2G3)
- *Thuja occidentalis* Limestone Seepage Woodland (CEGL003675, G2G3Q)

Alliances:

- (*Juniperus virginiana*) / *Schizachyrium scoparium* - (*Bouteloua curtipendula*) Wooded Herbaceous Alliance (A.1919)
- *Asplenium ruta-muraria* - *Pellaea atropurpurea* Sparsely Vegetated Alliance (A.1832)
- *Juniperus virginiana* - *Rhus aromatica* Shrubland Alliance (A.1049)
- *Thuja occidentalis* Saturated Woodland Alliance (A.583)
- *Thuja occidentalis* Woodland Alliance (A.544)

DISTRIBUTION

Range: This system is found in the Southern Ridge and Valley and adjacent areas of the Cumberland Plateau with a few disjunct localities in the southern Appalachians.

Divisions: 202:C

Nations: US

Subnations: AL, KY, NC, TN, VA

Map Zones: 48:C, 53:C, 57:C

TNC Ecoregions: 50:C, 51:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723156#references

Description Author: R. Evans, C. Nordman, M. Pyne

Version: 18 Apr 2006

Concept Author: R. Evans, C. Nordman, M. Pyne

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN INTERIOR SINKHOLE WALL (CES202.357)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate); Alkaline Soil

National Mapping Codes: ESLF 3163

CONCEPT

Summary: This system represents vertical shaft sinkholes and the characteristic vegetation associated with their steep walls in the southern Ridge and Valley and adjacent Interior Low Plateau regions of the southeastern United States. Related examples in the Southern Blue Ridge are also covered here. Examples are normally dominated by *Cystopteris bulbifera* and *Asplenium rhizophyllum* or the liverwort *Dumortiera hirsuta*.

Similar Ecological Systems:

- Central Interior Calcareous Cliff and Talus (CES202.690)--may be in effect a subset of CES202.690.

Related Concepts:

- Moist Limestone Cliff (Evans 1991) Broader

MEMBERSHIP

Associations:

- *Cystopteris bulbifera* - (*Asplenium rhizophyllum*) Sparse Vegetation (CEGL004394, G3G4)
- *Cystopteris bulbifera* / *Dumortiera hirsuta* Sinkhole Wall Sparse Vegetation (CEGL004988, G1)

Alliances:

- *Cystopteris bulbifera* - *Asplenium rhizophyllum* Sparsely Vegetated Alliance (A.1834)

DISTRIBUTION

Range: This system is found in the Southern Ridge and Valley and adjacent Interior Low Plateau regions of the southeastern United States and the Southern Blue Ridge, with rare and limited occurrences in the Upper East Gulf Coastal Plain.

Divisions: 202:C

Nations: US

Subnations: AL, KY, MS, NC, TN

Map Zones: 46:P, 47:C, 48:C, 53:C, 57:C

TNC Ecoregions: 43:C, 44:C, 50:C, 51:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723155#references

Description Author: R. Evans and C. Nordman

Version: 13 Dec 2002

Concept Author: R. Evans and C. Nordman

Stakeholders: Southeast

ClassifResp: Southeast

SOUTHERN PIEDMONT CLIFF (CES202.386)

CLASSIFIERS

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland

Diagnostic Classifiers: Cliff (Substrate)

National Mapping Codes: ESLF 3156

CONCEPT

Summary: This system consists of steep to vertical or overhanging rock outcrops in the Piedmont, with occasional examples in the Coastal Plain. They occur on lower to mid slopes, usually in river gorges or bluffs. The sparse vegetation is limited to plants growing on bare rock, small ledges, and crevices. Vegetation is primarily bryophytes, lichens, and herbs, with sparse trees and shrubs rooted in deeper soil pockets and crevices.

Classification Comments: More information is needed on the associations that belong to this system.

This system is distinguished from other rock outcrops by a combination of low topographic position, vertical orientation, large amount of bare rock, and absence of specialized environments such as exfoliated granite, limestone or dolomite, and spray from waterfalls. In contrast, Southern Appalachian Rocky Summit (CES202.327) occurs in high topographic positions; they have more horizontal rock but may have some substantial vertical surfaces. Southern Piedmont Glade and Barrens (CES202.328) is more horizontally oriented and have much more vegetation cover. The division of rock outcrop systems may be too fine and warrant combining some; however, each system has distinctive characteristics of structure and some distinctive flora.

This system is distinguished from Southern Appalachian Montane Cliff and Talus (CES202.330) by floristic differences. Southern Appalachian Montane Cliff and Talus (CES202.330) has a number of species absent or scarce in the Piedmont, differences that may be related to elevation, regional climate, or to biogeography. However, upper Piedmont cliffs that have Appalachian flora are included in that system (CES202.330).

The primary variation within this system, which could be the basis for further subdivision, is the distinction between mafic and felsic rock, with the rare sedimentary rock examples a third category. Sedimentary rock examples in the Piedmont and Coastal Plain resemble other Piedmont Cliffs more than they resemble cliffs of sedimentary rocks in the interior ecoregions.

Similar Ecological Systems:

- Southern Appalachian Montane Cliff and Talus (CES202.330)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Glade and Barrens (CES202.328)
- Southern Piedmont Granite Flatrock and Outcrop (CES202.329)

DESCRIPTION

Environment: Occurs on steep rock outcrops on lower slopes, occasionally higher in topographically sheltered sites. River bluffs are the primary setting. Cliffs may have any aspect, but north-facing cliffs seem to be more common. The substrate is mostly bare bedrock, which is steep to vertical or overhanging. Most examples are on felsic metamorphic rock such as gneiss or schist, a smaller number on mafic metamorphic rock, felsic or mafic igneous rock, or sedimentary rock. The physical structure of most cliffs in the Piedmont is irregular, with some ledges and crevices, and with steep, vertical, and even overhanging portions intermixed. Moisture levels vary drastically over short distances. Seepage of ground water from adjacent soils or through rock fractures often creates permanently or seasonally flooded microsites, while lack of soil makes other portions extremely dry. In less sheltered topography, slope aspect affects overall moisture levels to some degree. Rock or soil chemistry appears to be the most important factor affecting different associations on sites that have the physical structure to belong to this system.

Vegetation: No plant associations have yet been defined for this system. Vegetation is sparse. Bryophytes and lichens may cover portions of the open rock. Vascular plants are limited to sparse rooting sites in soil pockets, ledges, and crevices. Some of these microsites may be deep enough to support shrubs or even trees, while most support only herbs. The woody plants are usually species from surrounding forests, and may be mesophytic or xerophytic. The herbs include a variety of species of open dry habitats, such as *Schizachyrium scoparium*, *Danthonia spicata*, *Houstonia purpurea*, and *Coreopsis major*, along with a few rock outcrop specialists such as *Polypodium virginianum*, *Saxifraga virginianensis*, and *Heuchera* spp. A number of bryophyte species may be present. Mafic rock outcrops have an additional suite of specialist herbs, including *Aquilegia canadensis*, *Arabis lyrata*, *Anemone berlandieri*, and *Sedum glaucophyllum*. Herbs from the surrounding forest are often also present and may make up a significant fraction of the flora.

Dynamics: The dynamics of this system have received little study. Most cliff communities are probably stable over long periods of time, with fine-scale disturbances affecting microsites. Rock falls, slides, and other mass movement are rare, but represent catastrophic disturbance to part or all of a cliff, and may be important in the long term for keeping cliffs open. Animal movements may be locally important. Fire probably has little effect on cliffs, which have too little vegetation to carry fire and which tend to occur in topography that is not conducive to fire spread. Because of the limited natural disturbance and the fragility of soil and vegetation, human disturbance by trampling edges and by climbing may be particularly destructive.

MEMBERSHIP

Associations:

- *Cystopteris bulbifera* - (*Asplenium rhizophyllum*) Sparse Vegetation (CEGL004394, G3G4)
- *Lasallia papulosa* - *Lasallia pensylvanica* Nonvascular Vegetation (CEGL004385, G2?)
- Piedmont Acidic Cliff Sparse Vegetation (CEGL003979, G2?)

Alliances:

- *Cystopteris bulbifera* - *Asplenium rhizophyllum* Sparsely Vegetated Alliance (A.1834)
- *Lasallia (papulosa, pensylvanica)* Nonvascular Alliance (A.1824)
- Open Cliff Sparsely Vegetated Alliance (A.1836)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering less than one acre. Examples tend to occur as isolated small patches, occasionally as small clusters.

Size: Most examples naturally cover an acre or less. A few occur as complexes of closely associated patches, but the aggregate size is still small. Size is somewhat ambiguous for this system, in that vertical surfaces may be as extensive as horizontal surfaces.

Adjacent Ecological Systems:

- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)
- Southern Piedmont Large Floodplain Forest (CES202.324)
- Southern Piedmont Mesic Forest (CES202.342)
- Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)

Adjacent Ecological System Comments: Surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Piedmont Dry Oak-(Pine) Forest (CES202.339) above and Southern Piedmont Large Floodplain Forest (CES202.324) or Southern Piedmont Small Floodplain and Riparian Forest (CES202.323) below.

DISTRIBUTION

Range: Scattered throughout the Piedmont and incidentally into the Coastal Plain, from northern Alabama and Georgia north into Virginia.

Divisions: 202:C; 203:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 58:C, 59:C, 61:C

TNC Ecoregions: 52:C, 57:C

SOURCES

References: Comer et al. 2003

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723130#references

Description Author: M. Schafale

Version: 08 Jan 2003

Concept Author: M. Schafale

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHERN PIEDMONT GRANITE FLATROCK AND OUTCROP (CES202.329)

CLASSIFIERS

Conf.: 1 - Strong

Classification Status: Standard

Primary Division: Central Interior and Appalachian (202)

Land Cover Class: Barren

Spatial Scale & Pattern: Small patch

Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland; Wetland

Diagnostic Classifiers: Rock Outcrops/Barrens/Glades

Non-Diagnostic Classifiers: Seepage-Fed Sloping; Isolated Wetland [Strictly Isolated]

National Mapping Codes: ESLF 3175

CONCEPT

Summary: This system consists of smooth, exfoliated outcrops of massive granite and related rocks in the eastern and central Piedmont of the southeastern United States, and rarely in the adjacent Atlantic Coastal Plain (confined to the fall-line where erosion has exposed underlying rocks). Examples occur from Virginia south to Alabama but are found most abundant in the upper Piedmont of Georgia. Some noteworthy examples in central Georgia include Stone Mountain, Panola Mountain, and Arabia Mountain in DeKalb, Henry, and Rockdale counties. Depending upon the location, examples may rise above the surrounding landscape by as much as 200 m, or lie flush with the surrounding land surface. The vegetation is a complex of small-patch communities of different species and structure occupying different microhabitats present on the outcrops, ranging from moss and lichens to herbs to shrubs and trees. In some areas, these microhabitats include solution pits or depressions that retain water and form a distinctive wetland community. This outcrop system supports a relatively high degree of endemic plants.

Classification Comments: Granitic domes are clearly related to other rock outcrop systems in the Piedmont but are distinct in their flora and vegetation mat succession. The smooth rock surface is crucial to their development. More fractured granitic rocks do not form this distinct system. In contrast, Southern Piedmont Cliff (CES202.386) has vertically oriented rock outcrops that tend to have fractures and ledges. Southern Piedmont Glade and Barrens (CES202.328) is similarly horizontally oriented but has denser vegetation and rather different flora. Southern Appalachian Rocky Summit (CES202.327), which barely overlaps the range of this system, has fractured rock and occurs in topographically high settings in rugged topography.

This system is closely related to Southern Appalachian Granitic Dome (CES202.297), with which it shares the distinctive structure and vegetation mat dynamics of exfoliated outcrops. The flat orientation of the flatrocks makes pools more important in them. Climatic and biogeographic differences lead to floristic differences between the two systems. The massive Piedmont outcrops in the Atlanta vicinity (Wharton 1978) are included here, the distinction between "dome" (CES202.297) and "flatrock" (CES202.329) perhaps being an overly specific use of vague and conceptual terminology.

Similar Ecological Systems:

- Southern Appalachian Granitic Dome (CES202.297)
- Southern Appalachian Rocky Summit (CES202.327)
- Southern Piedmont Cliff (CES202.386)
- Southern Piedmont Glade and Barrens (CES202.328)

Related Concepts:

- Rock Outcrops (Wharton 1978) Broader

DESCRIPTION

Environment: This system occurs on exfoliated granitic outcrops; these are Precambrian metamorphic rocks generally found in the Piedmont Plateau (McVaugh 1943). Outcrops are level or gently sloped, occurring as low domes up to 200 m above the surrounding landscape or as flatrocks varying considerably in size (Shure 1999). Smooth rock without crevices is the primary factor in the distinctive ecological character of this system. Granite, granitic gneiss, and related rocks without many internal joints tend to fracture into thin sheets parallel to the surface, forming outcrops with smooth surfaces largely lacking crevices. The outcrop surface is largely bare rock but has thin soil mats around the edges and in patches throughout. Mats vary in depth with age and level of development. Distinct microenvironments are created by small irregularities in the rock surface and by areas of seepage at the edge. Some examples (e.g., in central Georgia) may have prominent seepage-related features, where areas of perennial herbaceous vegetation are very wet in the winter and spring. In these cases, the only vegetated areas on the granite outcrop are seepage-related. One possible substrate is the Lilesville granite.

Vegetation: Most of the rock surface is bare or has only crustose or foliose lichen cover. Vegetation occurs as a series of small patches in the thin soil mats, or seasonal pools, with the community type dependent on the nature of the depression and depth of the soil mat (if any). Bare rock may have moss patches. The thinnest soils usually have a set of fine forbs, many of them annual. Slightly deeper soils often have grasses dominating. Deeper soils support shrubs or small trees. A distinctive woodland of pines or pines and oaks occurs on the continuous shallow soils surrounding the outcrop. The flora shares some species with other rock outcrops of the Piedmont, but has some distinctive species and different dominance of species.

Dynamics: Large numbers of soil island depression may be scattered across the surface of granite outcrops and occasional pools of shallow water may stand in certain depressions which trap rainfall (McVaugh 1943, Shure 1999). Where soil accumulates in depressions formed by exfoliating surface rock, a distinctive and fairly predictable pattern of successional changes occurs [see

references in Shure (1999)]. Soil mats appear and deepen over time in a process that links vegetational and soil development, but are eventually destroyed by wind throw, drought, other natural disturbances. The result is a mosaic with mats of different levels of development at any given time. Mat dynamics are different in different parts of the rock, with older mats and more permanent patterns near the edges and sparser and younger mats in the interior. The dynamics are further modified by microtopography and the presence of seepage. The larger vegetation patterns such the relative amount of different stages likely respond to climatic cycles and natural disturbance events. The thin soils make these communities sensitive to drought, especially the long-lived woody species. Fire is probably rare in the interior, given the sparse fuel, but may be important in determining the size of the open area and may affect the dynamics of the bordering woodlands.

MEMBERSHIP

Associations:

- *Amphianthus pusillus* - *Isoetes melanospora* - *Isoetes tegetiformans* Herbaceous Vegetation (CEGL004342, G1)
- *Diamorpha smallii* - *Minuartia glabra* - *Minuartia uniflora* - *Cyperus granitophilus* Herbaceous Vegetation (CEGL004344, G3)
- *Packera tomentosa* - *Croton willdenowii* - *Schizachyrium scoparium* - (*Selaginella rupestris*) Herbaceous Vegetation (CEGL004298, G3)
- *Talinum teretifolium* - *Minuartia glabra* - *Diodia teres* - *Croton willdenowii* Herbaceous Vegetation (CEGL003857, G2G3)

Alliances:

- (*Quercus stellata*, *Quercus marilandica*) / *Schizachyrium scoparium* Wooded Herbaceous Alliance (A.1920)
- *Amphianthus pusillus* - *Isoetes* spp. Seasonally Flooded Herbaceous Alliance (A.1817)
- *Minuartia glabra* - *Talinum* spp. - *Diamorpha smallii* Saturated Herbaceous Alliance (A.1819)

SPATIAL CHARACTERISTICS

Spatial Summary: Small-patch system, most examples covering one to a relatively few acres.

Size: Most examples naturally cover one to a few acres, some less than one acre. A few examples exceed 10 acres. Most examples occur in a few clusters where geology is particularly suitable, such as central Georgia and northeastern North Carolina. A few examples are more isolated. Individual flatrocks may occur in complexes, separated by small patches of forest.

Adjacent Ecological Systems:

- Southern Piedmont Dry Oak-(Pine) Forest (CES202.339)

Adjacent Ecological System Comments: Surrounded by forest systems on deeper soils less influenced by bedrock, most typically Southern Piedmont Dry Oak-(Pine) Forest (CES202.339).

DISTRIBUTION

Range: This system is found scattered in the eastern and central Piedmont, from Alabama to Virginia. Rare examples occur in the upper Piedmont. A few, occurring surrounded by Tertiary sediments in the Fall Zone, may be considered to be in the Coastal Plain.

Divisions: 202:C

Nations: US

Subnations: AL, GA, NC, SC, VA

Map Zones: 54:C, 59:C, 61:C

TNC Ecoregions: 52:C, 57:P

SOURCES

References: Baker 1956, Coffey 1964, Comer et al. 2003, McVaugh 1943, Nelson 1986, Quarterman et al. 1993, Shure 1999

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723174#references

Description Author: M. Schafale and R. Evans, mod. M. Pyne

Version: 18 Apr 2006

Concept Author: M. Schafale and R. Evans

Stakeholders: East, Southeast

ClassifResp: Southeast

SOUTHWEST FLORIDA BEACH (CES411.276)

CLASSIFIERS

Classification Status: Standard

Primary Division: Caribbean (411)
Land Cover Class: Barren
Spatial Scale & Pattern: Small patch
Required Classifiers: Natural/Semi-natural; Unvegetated (<10% vasc.); Upland
Diagnostic Classifiers: Beach (Substrate); Coast
Non-Diagnostic Classifiers: Graminoid
National Mapping Codes: ESLF 3151

CONCEPT

Summary: This system ranges from Anclote Key southward to Cape Romano (Johnson and Barbour 1990). Within the northern Gulf region these beaches are distinguished by the highest species richness, greatest cover of succulents, and high cover of *Iva imbricata* and several tropical species (Barbour et al. 1987). Sands are relatively coarse and, unlike other beach systems of the northern Gulf of Mexico, are extremely rich in calcium from an abundance of calcareous shell fragments.

Classification Comments: Apparently, few associations have currently been described in the NVC for this system. More information is needed.

Similar Ecological Systems:

- Southeast Florida Beach (CES411.272)

Related Concepts:

- Beach Dune (FNAI 1990) Broader
- Unconsolidated Substrate (FNAI 1990) Broader

DESCRIPTION

Vegetation: These beaches are dominated by *Uniola*, but less so than other beach systems of the northern Gulf of Mexico. Other important species are *Iva imbricata*, *Oenothera humifusa*, *Scaevola plumieri*, and *Sesuvium portulacastrum*.

MEMBERSHIP

Associations:

- *Ipomoea pes-caprae* - *Cakile lanceolata* Herbaceous Vegetation (CEGL004403, G3G4)
- *Scaevola plumieri* / *Uniola paniculata* - *Iva imbricata* - *Cenchrus spinifex* Herbaceous Vegetation (CEGL003897, G3?)

Alliances:

- *Ipomoea pes-caprae* Herbaceous Alliance (A.1581)
- *Uniola paniculata* Subtropical Herbaceous Alliance (A.1153)

DISTRIBUTION

Range: This system ranges from Anclote Key (border of Pasco and Pinellas counties) southward to Cape Romano, Florida (Collier County).

Divisions: 411:C

Nations: US

Subnations: FL

Map Zones: 56:C

TNC Ecoregions: 54:C

SOURCES

References: Barbour et al. 1987, Comer et al. 2003, Johnson and Barbour 1990

Full References:

See www.natureserve.org/explorer/servlet/NatureServe?searchSystemUid=ELEMENT_GLOBAL.2.723210#references

Description Author: R. Evans

Version: 24 Sep 2002

Concept Author: R. Evans

Stakeholders: Southeast

ClassifResp: Southeast