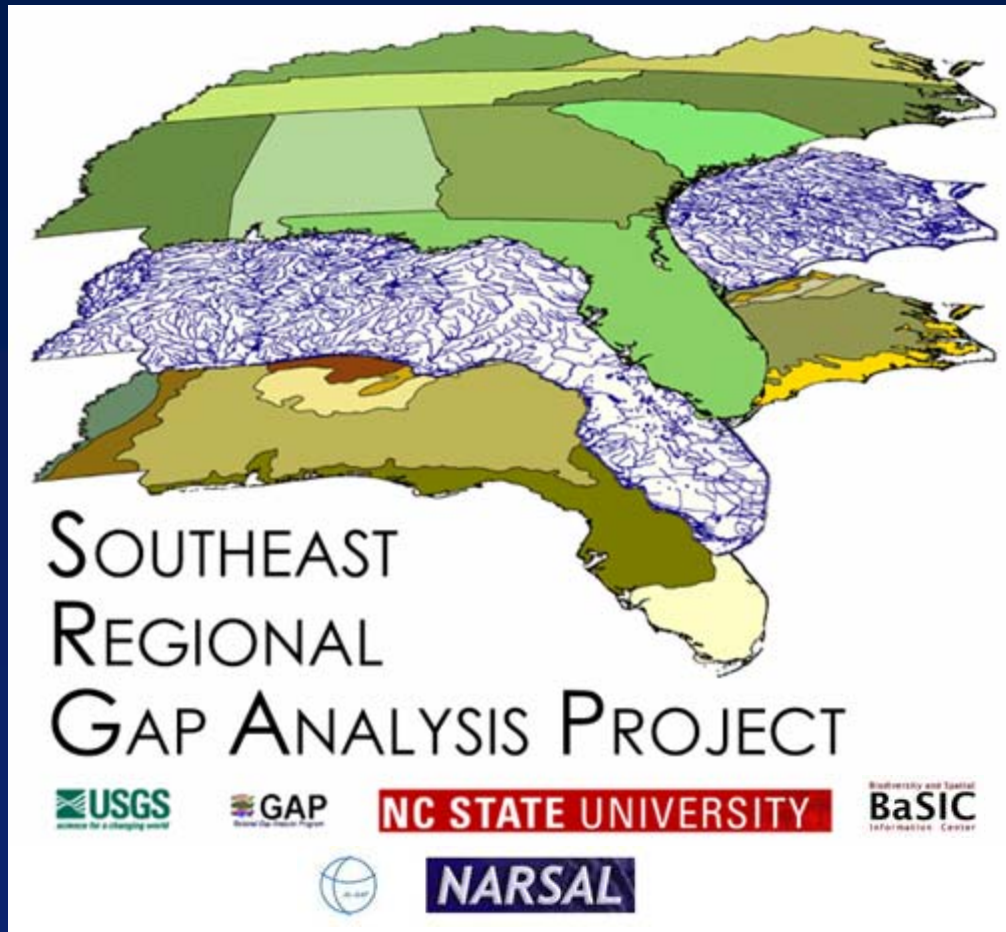


Process & Review: SE-GAP Avian Distribution Models for the Southeast



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²Alabama GAP Project, Auburn University

9 February 2007
SE-PIF Conference
Memphis, TN

Goals of GAP

◆ Primary goals:

- Keep common species common by identifying conservation gaps
- Provide information about conservation gaps and biodiversity to make informed resource management decisions
- Facilitate application of this information to resource management activities

SE Gap Project Goals

- ❖ Create consistent and current land cover products for the Southeast
- ❖ Create consistent presence/absence models for 600+ native terrestrial vertebrates
- ❖ Incorporate GAP data with ongoing conservation planning efforts
 - ✓ North American Bird Conservation Initiative
 - ✓ USFWS Refuges, Ecological Services, and CCP Planning Process
 - ✓ State Comprehensive Wildlife Conservation Plans
 - ✓ More...

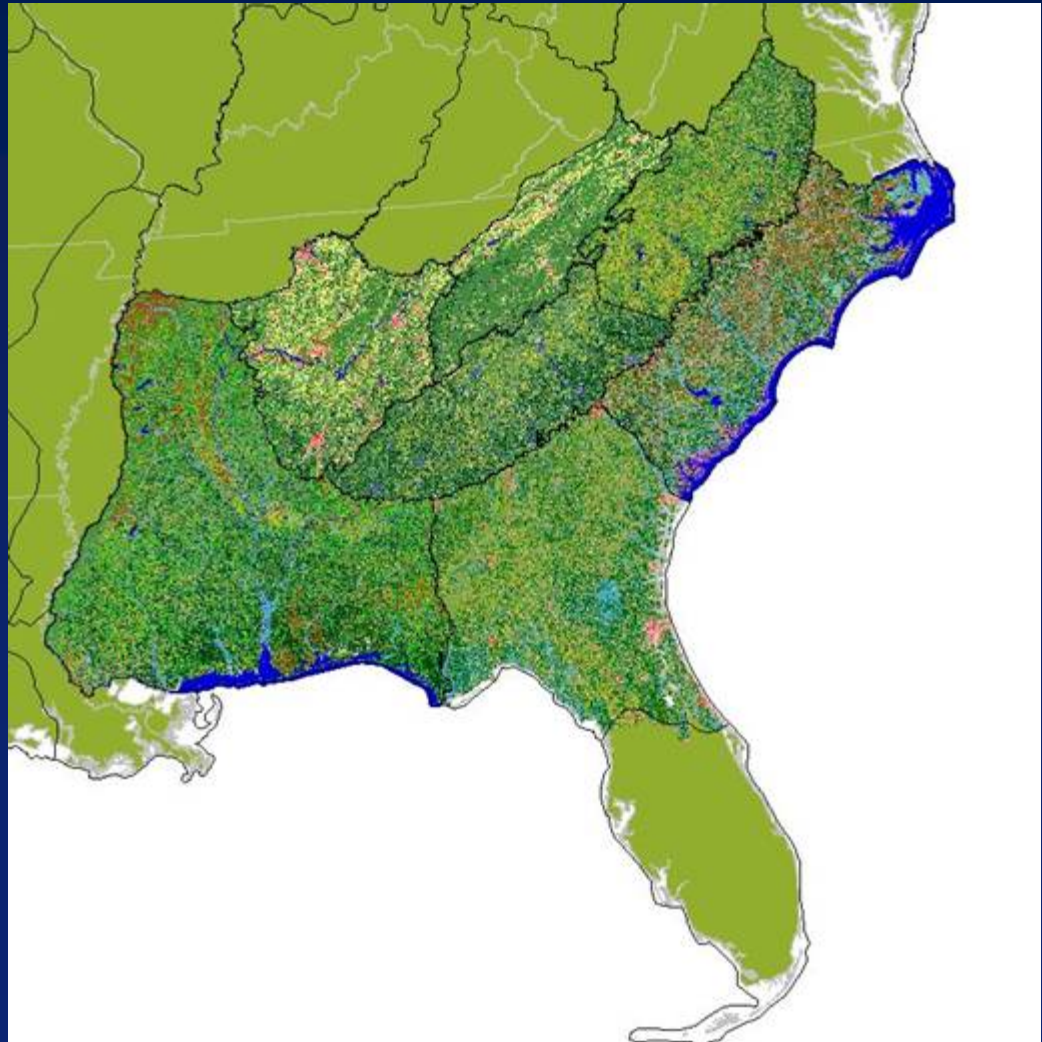
SE-GAP's contribution to the 2001 National Land Cover Dataset

Seven mapping zones

21 Land Cover classes

Impervious Surface
(0 -100%)

Canopy Closure
(0 -100%)



SE-GAP Land Cover Map Units

- ◆ Ecological Systems - NatureServe
 - Matrix, Large Patch, and Linear Types
 - Small patch on a case by case basis
 - ~135 systems to be mapped
- ◆ “Modifiers” to the systems
 - Where phenology or structure vary
- ◆ Additions to the NLCD Classes
 - Where useful for vertebrate modeling

SE-GAP Land Cover Dataset

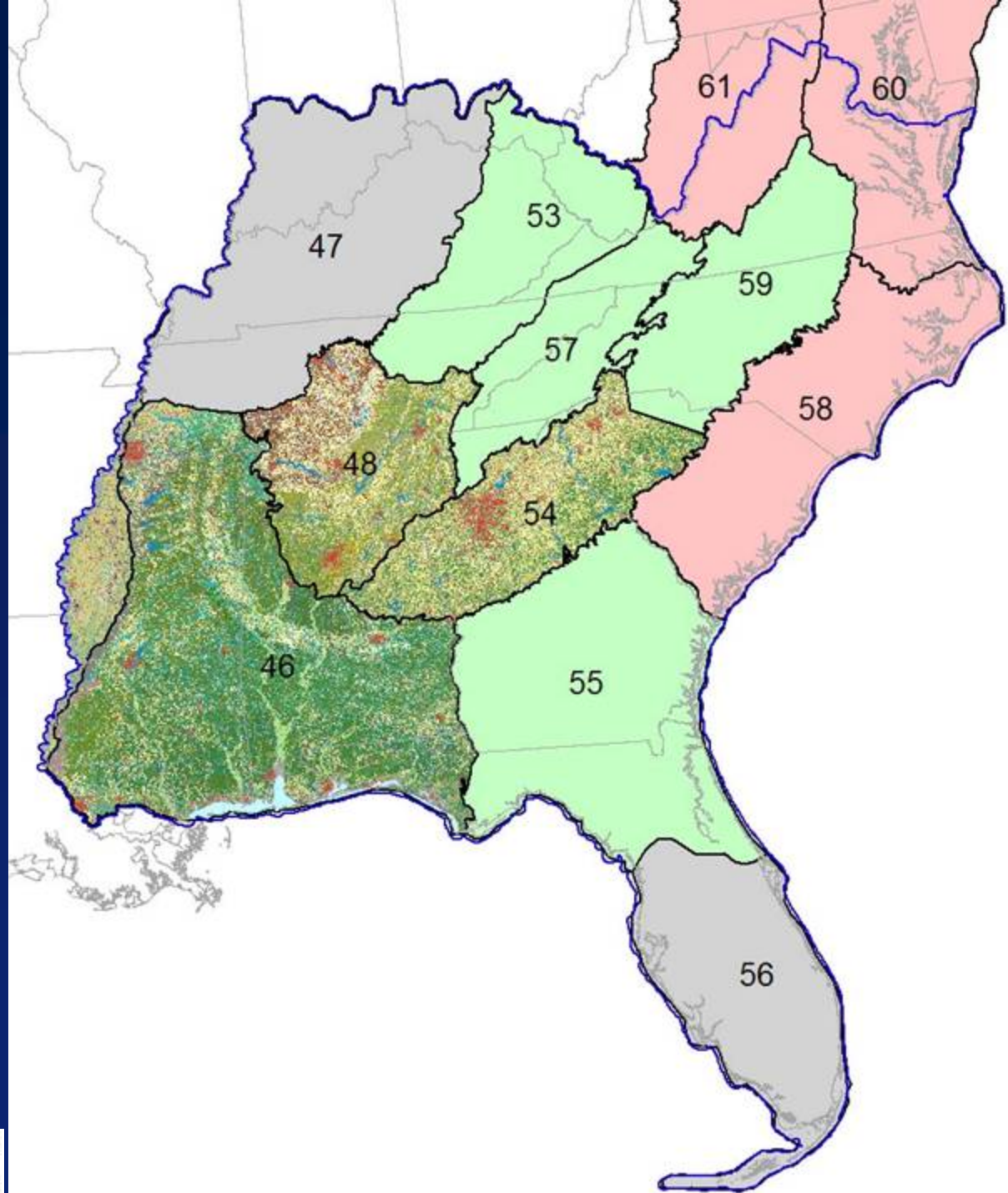
12 Map Zones

3 draft

4 review

3 ongoing

2 pending



Ancillary Data Development

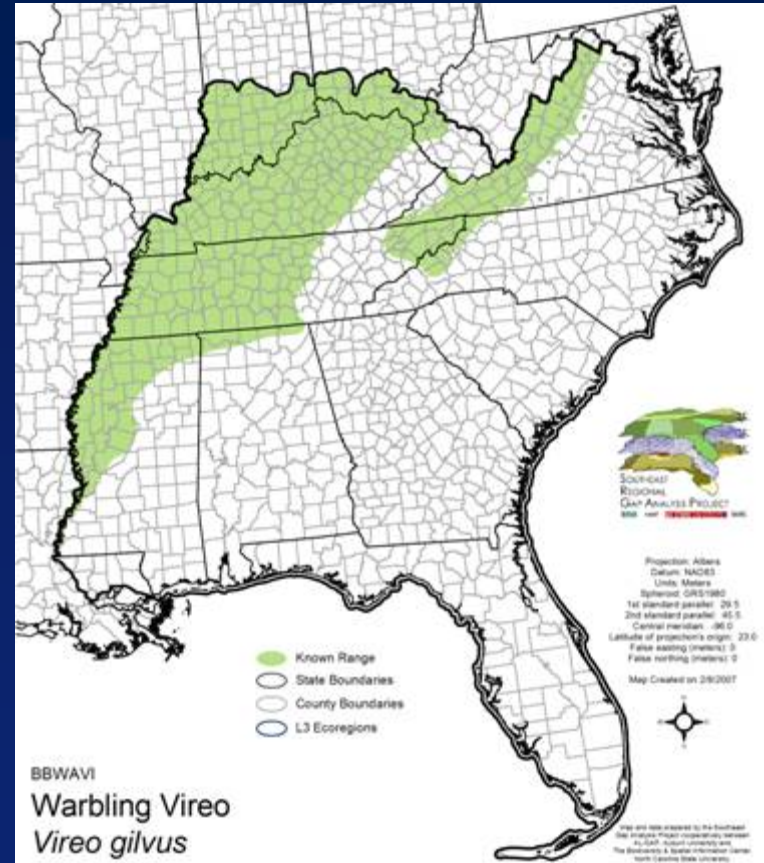
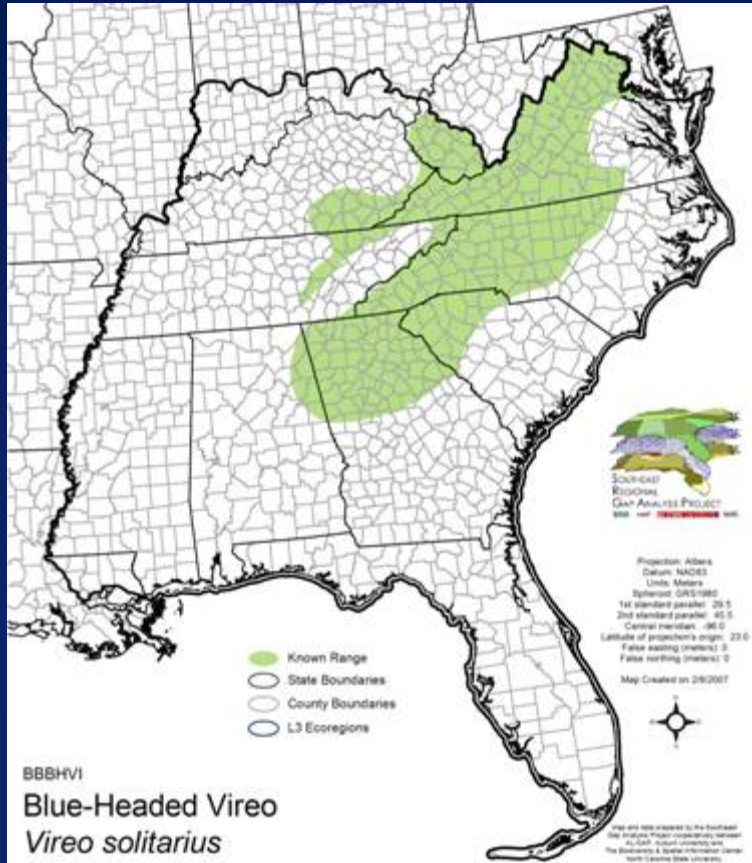
- ◆ Ecological System Range Maps
- ◆ Landform Modeling
- ◆ Refining NHD
- ◆ Aerial Photo Reference Data Collection
- ◆ National Wetland Inventory Data Digitization



Vertebrate Data

- ◆ 608 Species (terrestrial)
 - 253 birds
- ◆ Known Range
- ◆ Predicted Habitat Models
- ◆ Presence/Absence Distribution Maps
- ◆ Knowledge Based Information

SE-GAP Known Range Maps



Habitat Text Review Form

Habitat Modeling Information

BaSIC/NC-GAP

AVIAN

BBDCCO

Phalacrocorax auritus

ABNFD01020

Double-crested Cormorant

Find
Record

Place cursor in field
for selection

Existing State Habitat Notes:

STATE: AL
Breeding:
Wintering:
General:
. Abundant in winter & during migration on the Gulf Coast; occasionally summers there as well. Considered rare inland since 1961. . NEAR SHORE . RIVER, BIG, LOW GRADIENT . DEEP WATER . FORESTED WETLAND, RIPARIAN . CLIFF, BARE ROCK/TALUS/SCREE . . STANDING SNAG/HOLLOW TREE

STATE: NC
Breeding:
Time of nesting varies geographically, with local variations, and among different years a particular colony. Nesting begins in winter in Florida, as late as early June in southern Alaska. Clutch size usually 1-7 (average typically 3 or 4). Incubation 24-33 days (average around 28-30), by both sexes in turn. Hatching success was 54-75% in three studies. Survival from hatching to fledging was 72-95% in two studies. First flight to water at about 35-42 days. Independent at about 9-10 weeks. Usually first breeds at 3 years, sometimes at 2 years, rarely at 1 year. Renesting following loss of clutch is fairly common. Nests mostly in colonies. See Johnsgard (1993) for further information.
Wintering:

Compiled Habitat Notes for the Region:

Scattered breeding colonies exist throughout the region but most often in coastal areas along estuaries, bays, inlets, swamps, lagoons, marine islands etc... Also occurs inland along large reservoir and lake shores and slow-moving rivers. Nests within mats of emergent vegetation as well as in trees in standing water of swamps and lake margins. Forages in shallow waters and roosts and loafes in/on trees, pier pilings, high-tension wires, typically within 30km of nesting sites. M. Rubino, 9nov04.

Please Document Reviewer Name and Date (i.e. Steve Williams, 25feb03)

Edit Species by
Map Units

Edit Ancillary
Spatial

Open Range
Notes

Record: 4 of 106

Select Species Above

Select Lab Below

Record: 2 of 3

Close Form

Map Unit Selection (243 types)

Map Unit Selection

Filter Map Units By:

CLASS only:	SUB CLASS only:	MOISTURE:	LANDFORM:	ELEVATION:	PHYSIOGRAPHY only:	SPECIES COMP only:
BARE ROCK/SAND DECIDUOUS FOREST/WOODLAND DEVELOPED OPEN SPACE ESTUARINE EMERGENT WETLAND ESTUARINE FORESTED WETLAND ESTUARINE SHRUB/SCRUB WETLAND	Anthropogenic Bald Beach Brackish/Salt Brackish/Salt Tidal Coastal Dune	Dry to Dry Mesic Hydric Mesic Mesic to Xeric n/a Xeric	Bald Beach Bottomland Cliff Cove Flatrock	High Elevation Low Elevation Mid Elevation n/a	Appalachian Atlantic Coastal Plain Bluegrass Basin Central Florida Central Int. Highlands Cumberland	Alder-Willow Ash-Hickory Bayberry-Mountain Laurel Beach Grass Beach Birch-Maple

Empidonax virescens

Auxiliary Buffer: Distance:

Sub Functional Group: MU: Aux: Map Unit Name:

MU	Aux	Map Unit Name
<input type="checkbox"/>	<input type="checkbox"/>	Row Crop
<input type="checkbox"/>	<input type="checkbox"/>	Pasture/Hay
<input type="checkbox"/>	<input type="checkbox"/>	Successional Grassland/Herbaceous (Utility Swath)
<input type="checkbox"/>	<input type="checkbox"/>	Successional Grassland/Herbaceous (Other)
<input type="checkbox"/>	<input type="checkbox"/>	Successional Grassland/Herbaceous
<input type="checkbox"/>	<input type="checkbox"/>	Successional Shrub/Scrub (Other)
<input type="checkbox"/>	<input type="checkbox"/>	Successional Shrub/Scrub (Utility Swath)
<input type="checkbox"/>	<input type="checkbox"/>	Successional Shrub/Scrub (Clear Cut)
<input type="checkbox"/>	<input type="checkbox"/>	Developed Open Space
<input type="checkbox"/>	<input type="checkbox"/>	Bare Sand
<input type="checkbox"/>	<input type="checkbox"/>	Bare Soil
<input type="checkbox"/>	<input type="checkbox"/>	Quarry/Strip Mine/Gravel Pit
<input type="checkbox"/>	<input type="checkbox"/>	Evergreen Plantations
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Deciduous Plantations
<input type="checkbox"/>	<input type="checkbox"/>	High Intensity Developed
<input type="checkbox"/>	<input type="checkbox"/>	Medium Intensity Developed
<input type="checkbox"/>	<input type="checkbox"/>	Low Intensity Developed
<input type="checkbox"/>	<input type="checkbox"/>	Central Appalachian Montane Rocky Bald - Herbaceous Modifier
<input type="checkbox"/>	<input type="checkbox"/>	Southern Appalachian Grass and Shrub Bald - Herbaceous Modifier
<input type="checkbox"/>	<input type="checkbox"/>	Southern Appalachian Grass and Shrub Bald - Shrub Modifier
<input type="checkbox"/>	<input type="checkbox"/>	Central Appalachian Montane Rocky Bald - Shrub Modifier
<input type="checkbox"/>	<input type="checkbox"/>	Atlantic Coastal Plain Northern Sandy Beach
<input type="checkbox"/>	<input type="checkbox"/>	Southwest Florida Beach
<input type="checkbox"/>	<input type="checkbox"/>	Southeast Florida Beach
<input type="checkbox"/>	<input type="checkbox"/>	South Florida Shell Hash Beach
<input type="checkbox"/>	<input type="checkbox"/>	Atlantic Coastal Plain Southern Beach

Map Unit Descriptions: FL GA KY MS NC SC TN VA WV

Record: 1 of 243 (Filtered)

Close Form

Map Unit Selection (243 types)

CLASS only:

- BARE ROCK/SAND
- DECIDUOUS FOREST/WOODLAND
- DEVELOPED OPEN SPACE
- ESTUARINE EMERGENT WETLAND
- ESTUARINE FORESTED WETLAND
- ESTUARINE SHRUB/SCRUB WETLAND

SUB CLASS only:

- Anthropogenic
- Bald
- Beach
- Brackish/Salt
- Brackish/Salt Tidal
- Coastal Dune

Filter Map Units By:

MOISTURE: Dry to Dry Mesic, Hydric, Mesic, Mesic to Xeric, n/a, Xeric

LANDFORM:

ELEVATION:

PHYSIOGRAPHY only:

SPECIES COMP only:

Empidonax virescens

Auxiliary Buffer:

Distance:

Sub Functional Group:

MU:	Aux:	Map Unit Name
<input type="checkbox"/>	<input type="checkbox"/>	Row Crop
<input type="checkbox"/>	<input type="checkbox"/>	Pasture/Hay
<input type="checkbox"/>	<input type="checkbox"/>	Successional Gr...

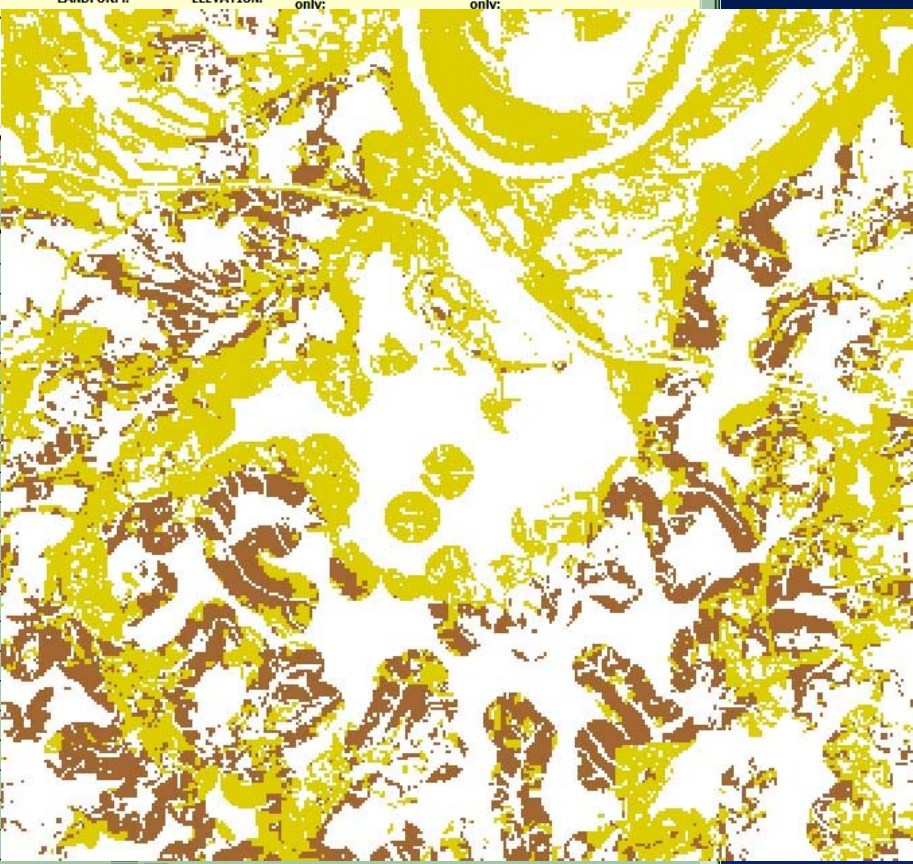
Anthropogenic	Urban
Anthropogenic	Urban
Anthropogenic	Urban
Bald	
Bald	
Bald	
Bald	
Beach	<input type="checkbox"/> <input type="checkbox"/> Atlantic Coastal Plain Northern Sandy Beach
Beach	<input type="checkbox"/> <input type="checkbox"/> Southwest Florida Beach
Beach	<input type="checkbox"/> <input type="checkbox"/> Southeast Florida Beach
Beach	<input type="checkbox"/> <input type="checkbox"/> South Florida Shell Hash Beach
Beach	<input type="checkbox"/> <input type="checkbox"/> Atlantic Coastal Plain Southern Beach

Map Unit Descriptions

Record: 1 of 243 (Filtered)

FL GA KY MS NC SC TN VA WV

Close Form



Map Unit Selection (243 types)

CLASS only:

- BARE ROCK/SAND
- DECIDUOUS FOREST/WOODLAND
- DEVELOPED OPEN SPACE
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- ESTUARINE FORESTED WETLAND
- ESTUARINE SHRUB/SCRUB WETLAND

SUB CLASS only:

- Anthropogenic
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- Beach
- Brackish/Salt
- Brackish/Salt Tidal
- Coastal Dune

Filter Map Units By:

MOISTURE: Dry to Dry Mesic, Hydric, Mesic, Mesic to Xeric, n/a, Xeric

LANDFORM:

ELEVATION:

PHYSIOGRAPHY only:

SPECIES COMP only:

Empidonax virescens

Auxiliary Buffer:

Distance:

Sub Functional Group:

MU:	Aux:	Map Unit Name
<input type="checkbox"/>	<input type="checkbox"/>	Row Crop
<input type="checkbox"/>	<input type="checkbox"/>	Pasture/Hay
<input type="checkbox"/>	<input type="checkbox"/>	Successional Gr


Anthropogenic	Urban
Anthropogenic	Urban
Anthropogenic	Urban
Bald	
Bald	
Bald	
Bald	
Beach	<input type="checkbox"/> <input type="checkbox"/> Atlantic Coastal Plain Northern Sandy Beach
Beach	<input type="checkbox"/> <input type="checkbox"/> Southwest Florida Beach
Beach	<input type="checkbox"/> <input type="checkbox"/> Southeast Florida Beach
Beach	<input type="checkbox"/> <input type="checkbox"/> South Florida Shell Hash Beach
Beach	<input type="checkbox"/> <input type="checkbox"/> Atlantic Coastal Plain Southern Beach

Map Unit Descriptions

Record: 1 of 243 (Filtered)

FL GA KY MS NC SC TN VA WV

Close Form



Ancillary Data Form

Ancillary Data Parameters x

Sistrurus miliarius Pygmy Rattlesnake

Land Cover Derivatives

Patch Size

Contiguous: hectares

Min. Size: hectares

Buffer In: meters

Buffer From: meters

NonContiguous:

% in hectares

Edge

Edge Type:

Buffer Values:

Ecotone Width: meters

Hydrography

Type/Buffer

Type:	Buffer From:	Buffer Into:
<input type="checkbox"/> Flowing Water	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Open/Standing Water	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Wet Vegetation	<input type="text"/>	<input type="text"/>

Salinity

Type:

Stream Flow

Min: Max:

Accumulation:

Velocity:

Road Density/Urban Avoid Mask

Level:

Elevation

Minimum: meters

Maximum: meters

Landforms

<input type="checkbox"/> Cliffs	<input type="checkbox"/> Coves/Draws
<input type="checkbox"/> Steep Slopes	<input type="checkbox"/> Dry Flats
<input type="checkbox"/> Slope Crests	<input type="checkbox"/> Moist Flats
<input type="checkbox"/> Upper Slopes	<input type="checkbox"/> Wet Flats
<input type="checkbox"/> Flat Summits	<input type="checkbox"/> Slope Bottoms
<input type="checkbox"/> Side Slopes	

Modeling Notes:

Check here if this species requires modeling by hand

View State Modeling Criteria

Close Form

Ancillary Data Form

LAND COVER DERIVATIVES

Patch Size

Contiguous:
Size, Buffers

NonContiguous:
% in X area

The image shows a screenshot of a software interface titled "Ancillary Data Parameters" for the species "Sistrurus miliarius" (Pygmy Rattlesnake). The "Land Cover Derivatives" section is highlighted with a red border. This section contains two sub-sections: "Patch Size" and "Edge".

Patch Size

- Contiguous:**
 - Min. Size: [] hectares
 - Buffer In: [] meters
 - Buffer From: [] meters
- NonContiguous:**
 - [] % in [] hectares

Edge

- Edge Type: []
- Buffer Values: []
- Ecotone Width: [] meters

At the bottom of the "Land Cover Derivatives" section, there are two buttons: "View State Modeling Criteria" and "Close Form".

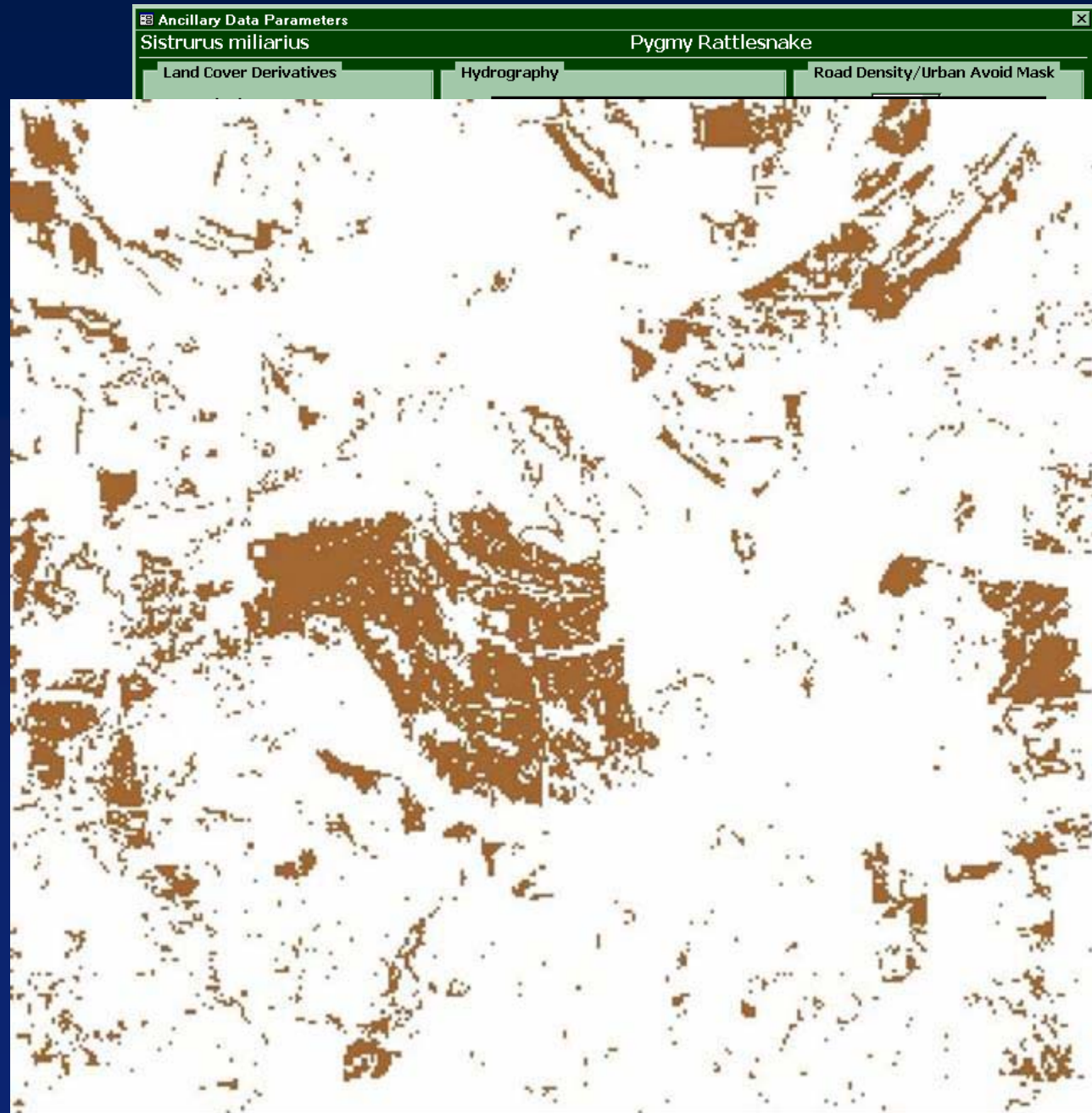
Ancillary Data Form

LAND COVER DERIVATIVES

Patch Size

Contiguous:
Size, Buffers

NonContiguous:
% in X area



50ha minimum contiguous patch

Ancillary Data Form

LAND COVER DERIVATIVES

Patch Size

Contiguous:

Size, Buffers

NonContiguous:

% in X area



50ha minimum contiguous patch

Ancillary Data Form

LAND COVER DERIVATIVES

Patch Size

Contiguous:
Size, Buffers

NonContiguous:
% in X area

Edge

Edge Type:
Forest/Open Ecotone Only
F/O + Shrubland/Woodland

Forest Interior

The image shows a screenshot of a software interface titled "Ancillary Data Parameters" for the species "Sistrurus miliarius" (Pygmy Rattlesnake). The "Land Cover Derivatives" section is highlighted with a red border. This section contains two main sub-sections: "Patch Size" and "Edge".

Patch Size:

- Contiguous:**
 - Min. Size: [] hectares
 - Buffer In: [] meters
 - Buffer From: [] meters
- NonContiguous:**
 - [] % in [] hectares

Edge:

- Edge Type: []
- Buffer Values: []
- Ecotone Width: [] meters

At the bottom of the "Land Cover Derivatives" section, there are two buttons: "View State Modeling Criteria" and "Close Form".

The background shows other tabs in the interface: "Hydrography" and "Road Density/Urban Avoid Mask".

Ancillary Data Form

HYDROGRAPHY

Type/Buffer

Buffer distances:

30, 60, 120, 250, 500,
1000, 2000, 4000, >4k

Salinity

Type:

Freshwater Only

Brackish/Saltwater Only

Stream Flow

Velocity:

Fast Only, Slow Only

The screenshot shows a software window titled "Ancillary Data Parameters" for the species "Sistrurus miliarius" (Pygmy Rattlesnake). The "Hydrography" section is highlighted, showing options for "Type/Buffer" (Flowing Water, Open/Standing Water, Wet Vegetation) with "Buffer From" and "Buffer Into" dropdowns. Other sections include "Land Cover Derivatives" (Patch Size, Edge), "Road Density/Urban Avoid Mask" (Level), "Elevation" (Minimum, Maximum), "Salinity" (Type), and "Stream Flow" (Accumulation, Velocity).

Ancillary Data Form

MODELING NOTES

Ancillary Data Parameters
Bufo americanus American Toad

Land Cover Derivatives

Patch Size

Contiguous:
Min. Size: hectares
Buffer In: meters

NonContiguous:
 % in hectares

Edge

Edge Type:

Buffer Values:
Ecotone Width: meters
From Patch: meters

Forest Canopy Closure

Minimum: percent
Maximum: percent

Hydrography

Type/Buffer

Type:	Buffer From:	Buffer Into:
<input type="checkbox"/> Flowing Water	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Open/Standing Water	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Wet Vegetation	<input type="text"/>	<input type="text"/>

Salinity

Type:

Stream Flow

Accumulation: Min: Max:
Velocity:

Road Density/Urban Avoid Mask

Level:

Elevation

Minimum: meters
Maximum: meters

Landforms

<input type="checkbox"/> Cliffs	<input type="checkbox"/> Coves/Draws
<input type="checkbox"/> Steep Slopes	<input type="checkbox"/> Dry Flats
<input type="checkbox"/> Slope Crests	<input type="checkbox"/> Moist Flats
<input type="checkbox"/> Upper Slopes	<input type="checkbox"/> Wet Flats
<input type="checkbox"/> Flat Summits	<input type="checkbox"/> Slope Bottoms
<input type="checkbox"/> Side Slopes	

Modeling Notes:

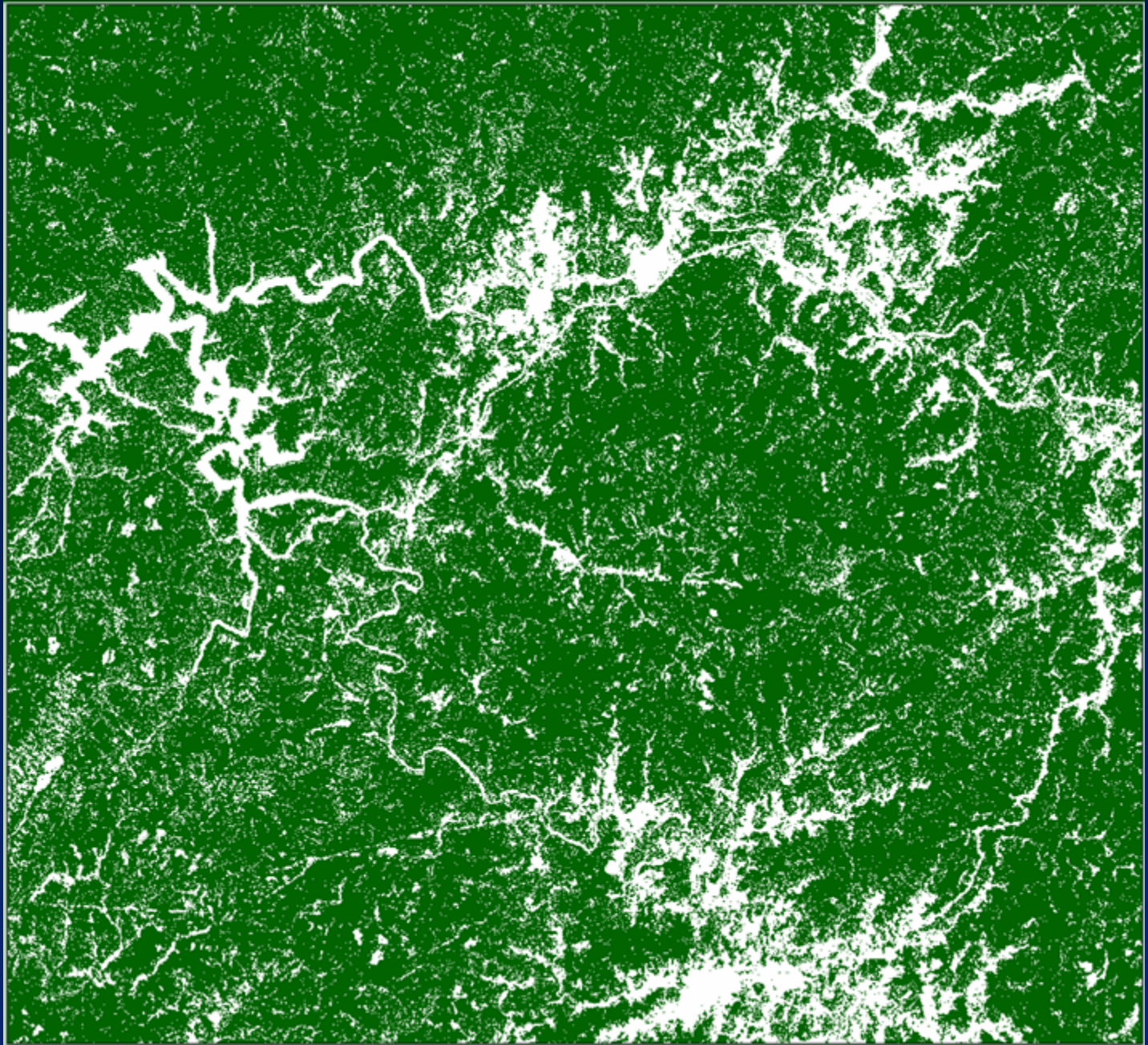
Check here if this species requires modeling by hand

Modeling Notes:

Check here if this species requires modeling by hand

Acadian
Flycatcher
*Epidonax
virescens*

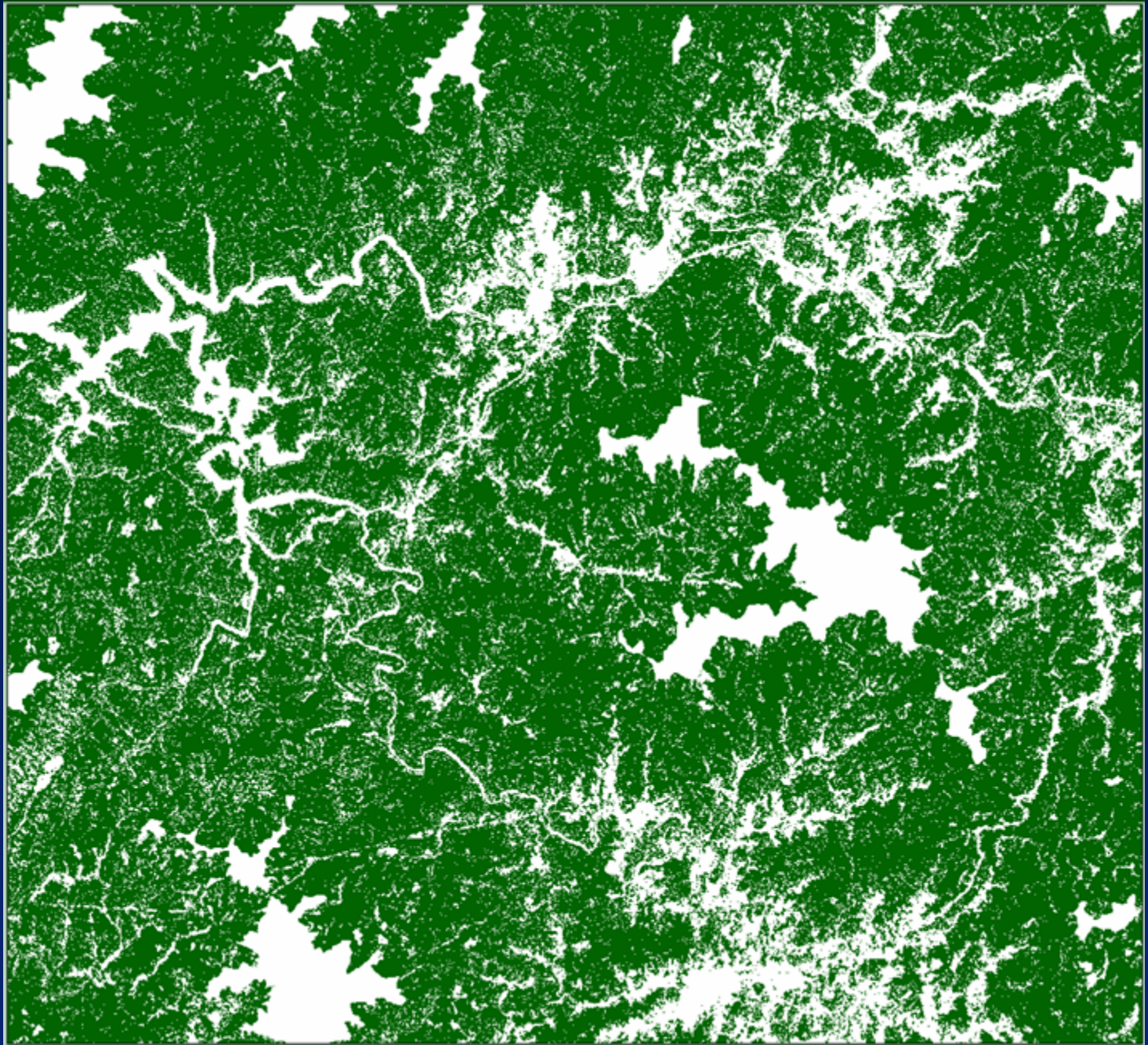
Appropriate
Vegetation
(forested map
units)



Acadian
Flycatcher
*Epidonax
virescens*

Appropriate
Vegetation
(forested map
units)

Elevation
Mask
($< 4000'$)

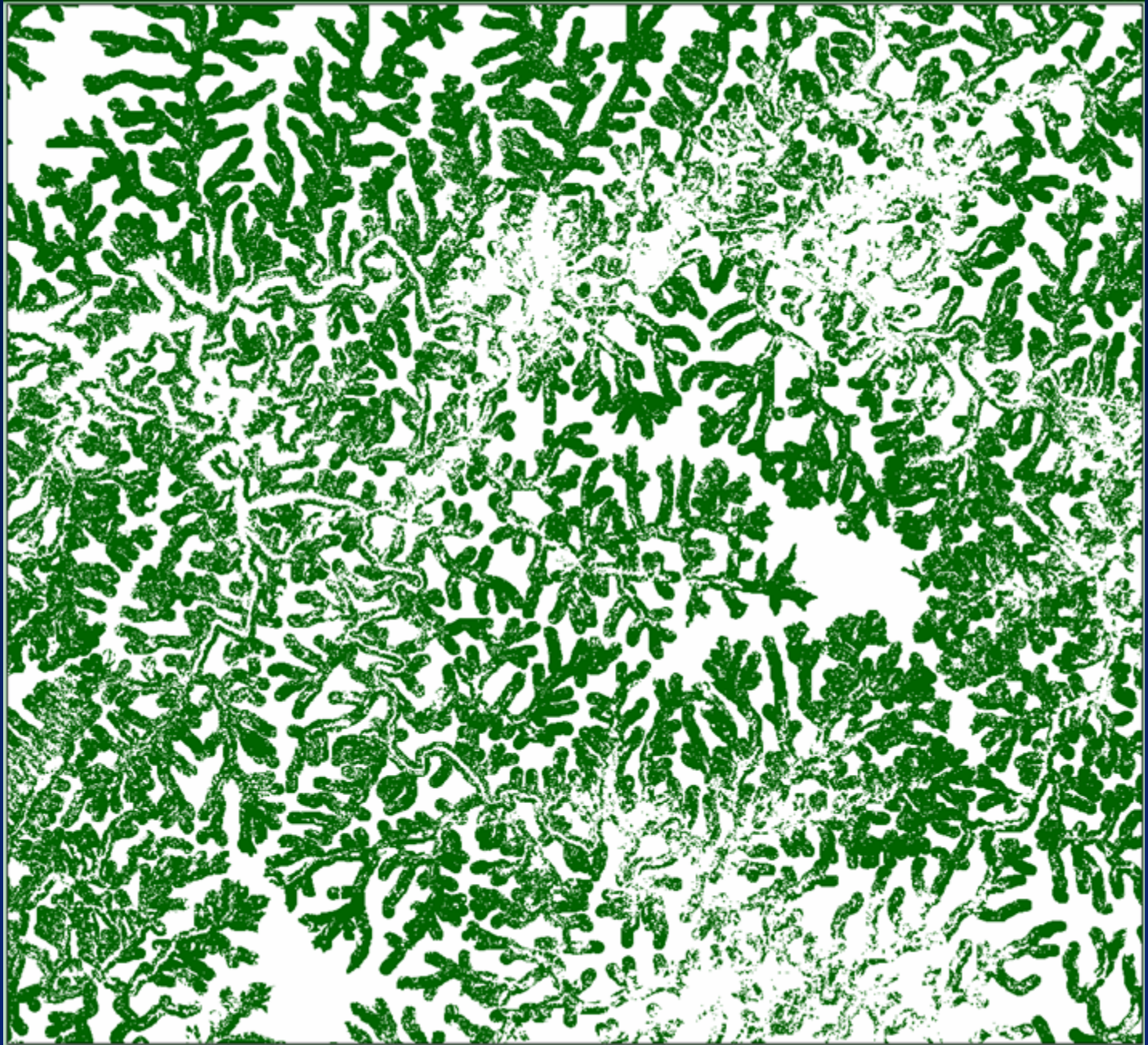


Acadian
Flycatcher
*Epidonax
virescens*

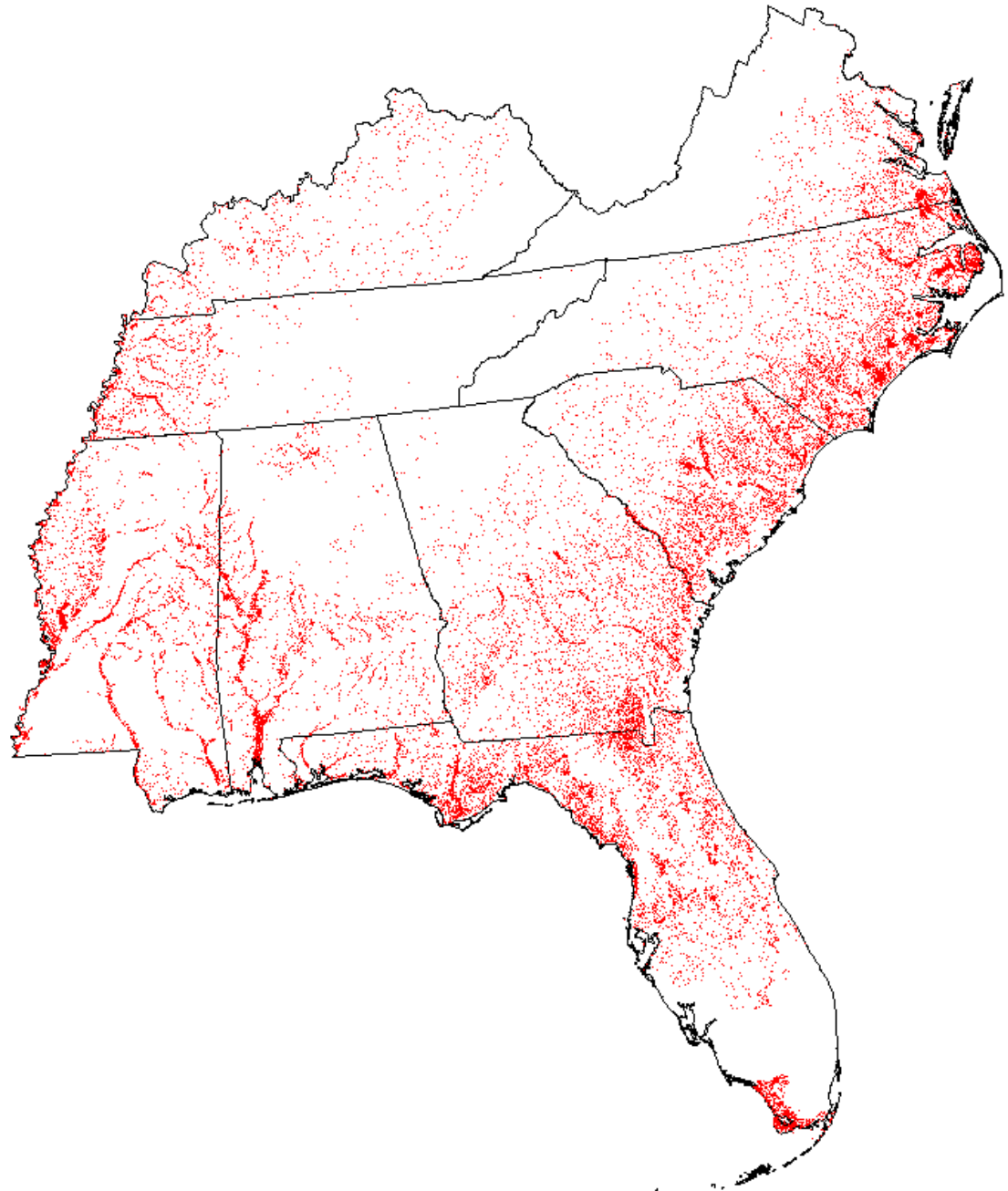
Appropriate
Vegetation
(forested map
units)

Elevation
Mask
($\leq 4000'$)

Proximity to
Water
Mask
($\leq 200m$)



SE-GAP Pres./Abs. Distribution Model



Prothonotary Warbler
Protonotaria citrea

SE-GAP Deliverables

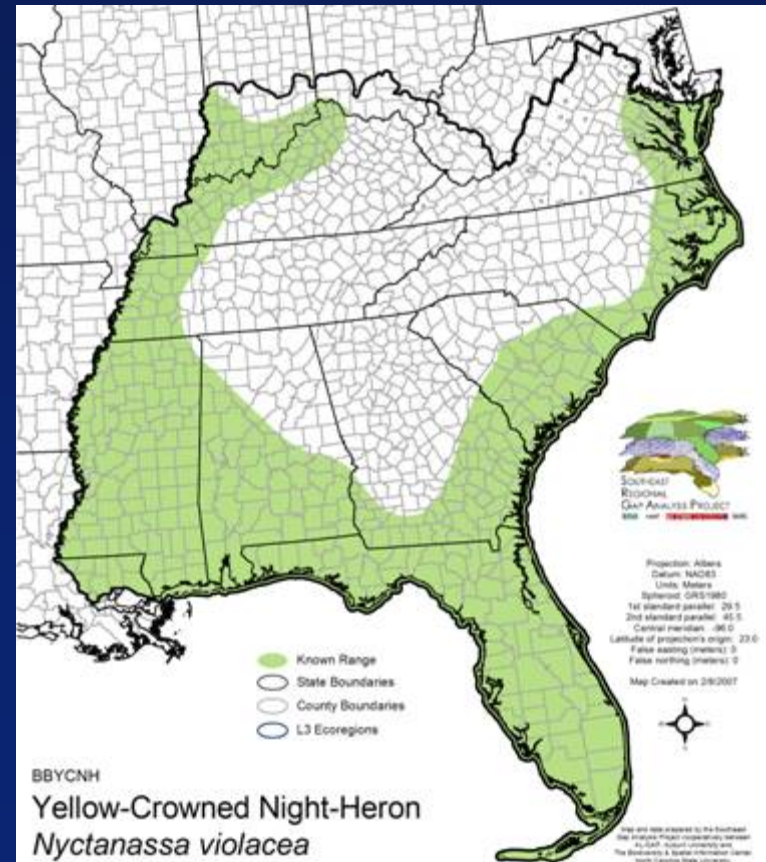
- ◆ 2001 NLCD level land cover (20 classes)
- ◆ 2001 GAP level land cover based on NatureServe Systems (135+ classes)
- ◆ Digital photo library (30,000+)
- ◆ Ancillary data sets (NHD, NED, NWI, landform) used in spatial modeling
- ◆ Vertebrate database
 - ✓ Taxonomic information
 - ✓ Protection status
 - ✓ Habitat relationships
 - ✓ Textual descriptions of habitat
 - ✓ Spatial modeling criteria
 - ✓ Citations
- ◆ 600+ vertebrate species known range maps and distribution models (presence/absence)

Model Assessment

- ◆ Assessment of modeling done with comparing species lists of management areas with model output to produce Omission and Commission rates.
- ◆ Reviewer Agreement with model.
 - Need to keep it relatively simple and concise.
 - Assess major components models and overall model performance.

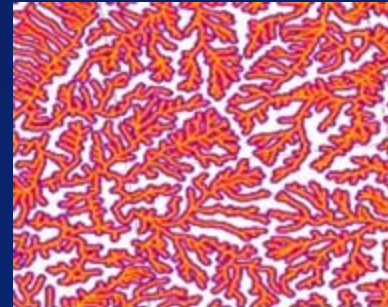
Reviewer Agreement with Model

1. The light green shaded area is an accurate representation of the known range extent of this species.



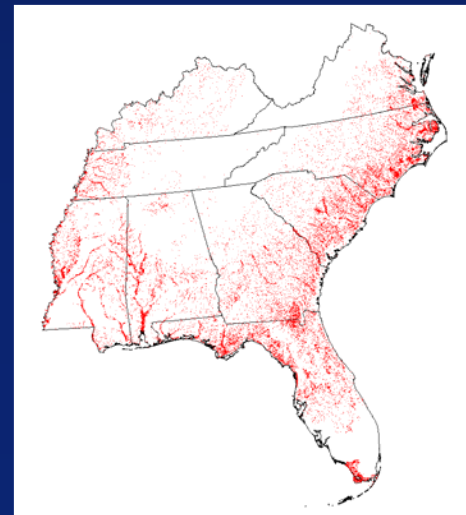
Reviewer Agreement with Model

1. The light green shaded area is an accurate representation of the known range extent of this species.
2. The parameters used to model the predicted distribution of this species accurately represent its habitat requirements in the southeastern United States.
3. The spatial data adequately represent the species' habitat requirements.



Reviewer Agreement with Model

1. The light green shaded area is an accurate representation of the known range extent of this species.
2. The parameters used to model the predicted distribution of this species accurately represent its habitat requirements in the southeastern United States.
3. The spatial data adequately represent the species' habitat requirements.
4. The red pixels on the map adequately represent the distribution of this species' habitat within the identified range extent.



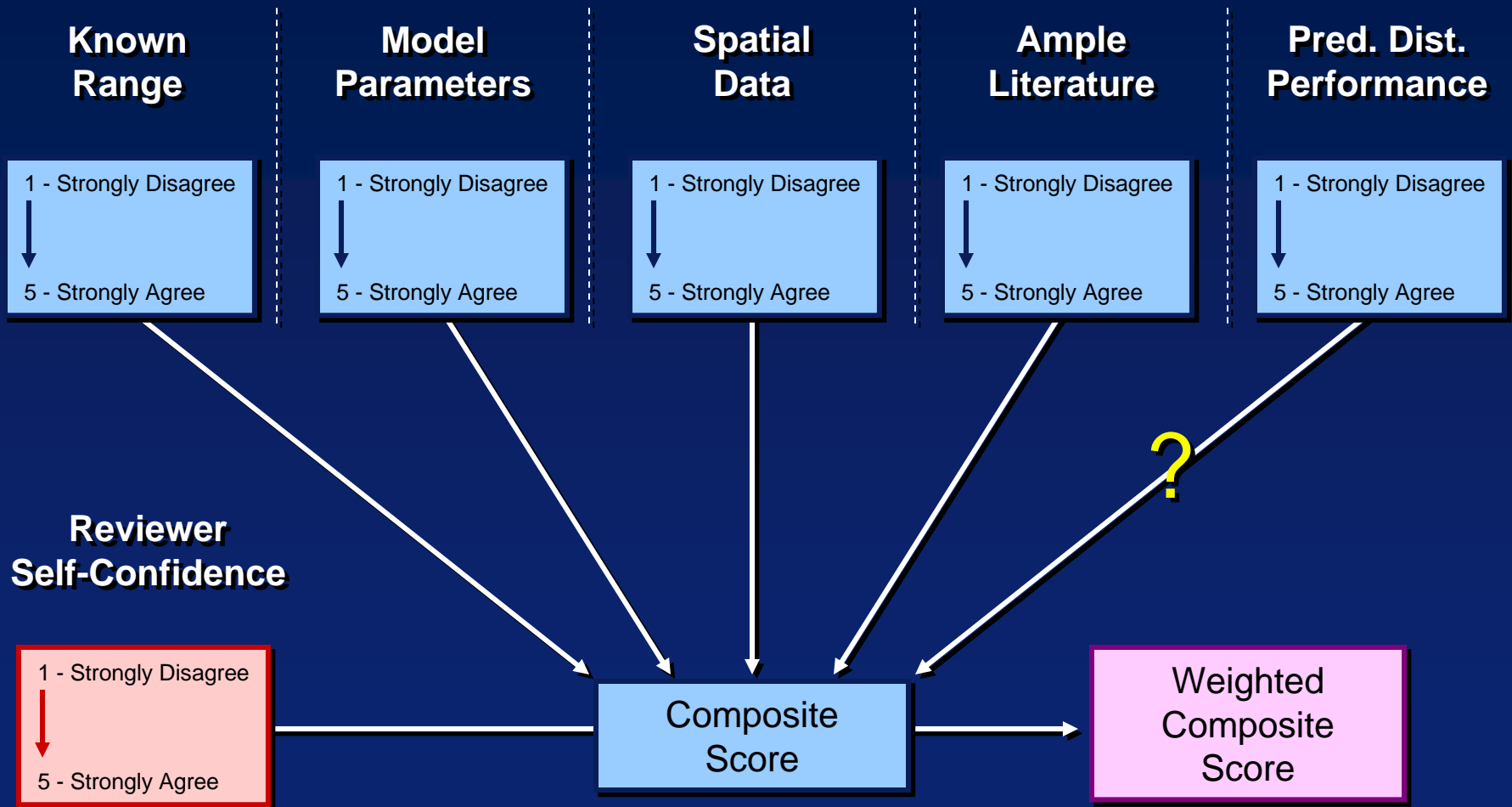
Reviewer Agreement with Model

1. The light green shaded area is an accurate representation of the known range extent of this species.
2. The parameters used to model the predicted distribution of this species accurately represent its habitat requirements in the southeastern United States.
3. The spatial data adequately represent the species' habitat requirements.
4. The red pixels on the map adequately represent the distribution of this species' habitat within the identified range extent.
5. The published literature adequately documents the breeding habitat requirements for this species in the southeastern United States.

Reviewer Agreement with Model

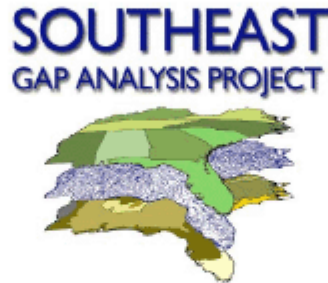
1. The light green shaded area is an accurate representation of the known range extent of this species.
2. The parameters used to model the predicted distribution of this species accurately represent its habitat requirements in the southeastern United States.
3. The spatial data adequately represent the species' habitat requirements.
4. The red pixels on the map adequately represent the distribution of this species' habitat within the identified range extent.
5. The published literature adequately documents the breeding habitat requirements for this species in the southeastern United States.
6. I am an expert in the natural history of this species.

Baysian Belief Network



National Gap Analysis Conference 2007

*Featuring the Southeast Regional Gap Analysis Project
(Kentucky, Tennessee, Alabama, Georgia, Florida, South Carolina,
North Carolina, and Virginia)*



<http://gapanalysis.nbii.gov>

Call for Special Sessions, Papers and Posters

Abstracts due: March 1st

September 10 – 13, 2007

Renaissance Asheville Hotel

Asheville, North Carolina