

APPENDIX 3: ELECTRONIC DOCUMENTS DELIVERED TO USFWS WITH THIS MPA REPORT

MPA Report

The report files can be found in the main directory. The report and appendices are delivered as pdf documents. Recommended print option (black and white or color) is indicated.

- PR-MPA Report.pdf - color
- PR-MPA Appendix1.pdf – b&w
- PR-MPAreport_Appendix2.pdf – color
- PR-MPAreport_Appendix3.pdf – b&w

Literature Review Documents

We collected peer-reviewed and grey literature from diverse sources, focusing on the years since the original Recovery Plan publication (1986 to June 2011). We sought literature helpful to identify and characterize key ecological attributes, direct and indirect threats, and management strategies relevant to manatee recovery in Puerto Rico. The following list includes both literature cited within the report (indicated by *italics*) and those not cited. Those not cited were reviewed prior to the initial workshop, informed development of the revised Recovery Plan, and have potential value as the USFWS moves forward with MPA planning. The file names are provided in the format: AuthorDate_Source_Subject and can be found in the folder labeled “Library”.

Manatee Primary Research within Puerto Rico

- *Alves-Stanley-et al2010_MEPS_ManateeFeedingPrefStableIsotopes.pdf*
- *Freeman&Quintero1990_DistribManateePR.pdf*
- *GarciaRodriguez-et al1998_MolEcol_ManateePhylogeography.pdf*
- *Hunter-et al20XX_DRAFT_PRManateeGenetics&PopStructure.pdf*
- *Lefebvre-et al2000_PacConsBiol_ManateeHabitatFLPR.pdf*
- *MignucciGiannoni&Beck1998_MMS_DietOfManateeInPR.pdf*
- *MignucciGiannoni-et al2000_EnvManag_PRManateeMortality.pdf*
- *MignucciGiannoni-et al2006_EEReport_PRAerialSurveyResults2001-05.pdf*
- *Ortiz-et al1998_PhysZoo_ManateeOsmoregulation.pdf*
- *Rathbun-et al1985_NAVYreport_DistManatees&SeaTurtlesinRR.pdf*
- *Reid2007_USGSabstract_PRManateeTelemetryInThermalLagoon.pdf*
- *Slone-et al2006_USGSreport_PRManateeGPSTracking.pdf*

Manatee Primary Research outside Puerto Rico

- *Bacchus-et al2009_AqMamm_ManateeRestingHolesBelize.pdf*
- *Laist&Shaw2006_MMS_BoatCollisionLegislationEffectivenessFlorida.pdf*
- *Miksis-et al2007_JASA_NoiseImpactsManatees.pdf*
- *Nowacek-et al2004_BiolCons_ManateeResponseToBoats.pdf*

- OliveraGomez&Mellink2005_BiolCons_MexicoManateeHabitat.pdf
- *Powell-etal1981_JMammal_PRManateeStatus.pdf*
- Runge-etal2007_USGSreport_FLQuatitativeManateeThreatsAnalysis.pdf
- Runge-etal2007_USGSreport_FLmanateePopulationModeling.pdf
- *Smith1993_FLreport_HumanThreatsToManateeSeagrass.pdf*
- Sorice-etal2003_CoastManag_ManateeHarrassmentPolicy.pdf

Manatee Knowledge Summaries

(Reviews, Planning Documents, Agency Opinions, Environmental Assessments, etc)

- Auil1998_Report_BelizeManateeRecoveryPlan.pdf
- Bauer-etal2008_NOAAreport_ViequesCharacterizationPart1.pdf
- *Bonde-etal2004_EcoH_ManateesSentinelsOfMarineEcosystemHealth.pdf*
- CERP2006_FLReport_EvergladesManateeConservationGuidelines.pdf
- CFMC2010_NMFSreport_BajoDeSicoFisheriesEnvironmentalAssessment.pdf
- FLFWCC2007_FLreport_FloridaManateeMgmtPlan.pdf
- *GeoMarine2004_NAVYreport_NAPRManateeAssessmentConditionSummary.pdf*
- *Lefebvre-etal2001_Chap22_ManateeChapInBiogeographyWestIndies.pdf*
- MMC2007_AmendedMarineMammalProtectionAct.pdf
- NOAA2003_Report_MPA TechNeedsAssess.pdf
- *PRDNER2010b_PRDNERreport_FinalJobosBayManagementPlan.pdf*
- Quintana-Rizzo&Reynolds2008_CEPreport_RegionalManateeManagmentPlan.pdf
- USACE2001_Letter_BiologicalOpinionWatercraft&Manatee.pdf
- USACE20XX_Report_BiologicalInformationManateeFlorida.pdf
- *USFWS1986_USFWSreport_OrignalManateeRecoveryPlan.pdf*
- USFWS1995_USFWSreport_AntillianManateeStockAsessmentReport.pdf
- *USFWS2009_USFWSreport_AntilleanManateePRStockAssessment.pdf*
- *USFWS2007_USFWSreport_Manatee5YearStatusReview.pdf*
- *USGS2010_USGSreport_ManateeCaptures&HealthAssessment.pdf*
- USFWS2011_USFWSproposal_KingsBayProposedManateeRefuge.pdf
- *USNavy2011_DraftNAVYreport_ManateeImpactsTransfer&DevelopmentNAPR.pdf*

Habitat Quality and Threats to Habitat Research and Knowledge Summaries

- Coffrey-etal2009_PRDNERreport_PRBuoySurveyAssessment.pdf
- Diaz&MassolDeya2003_CarJSci_TraceContaminantsSeagrassPR.pdf
- *Dickson-etal2005_PRDNERreport_PuertoRicoBoatRampsInventory.pdf*
- FWC2010_FWCproposal_ManateeOilSpilleEffectsStudy.pdf
- *Kendall-etal2001_NOAAreport_BenthicHabitatMappingMethods.pdf*
- *Kuniansky&Rodriguez2010_USGSReport_JobosBayAquiferMangroves.pdf*
- Longstaff&Dennison1999_AqBot_SeagrassSurvivalInTurbidWater.pdf
- NMPAC2003_Report_MPACreationLessonsLearned.pdf
- NOAA2004_Report_StandardsToEvaluateBycatch.pdf
- Otero&Carrubba20XX_PRDNERreport_MechanicalDamageToSeagrass&ReefsInPR.pdf
- *PRDENR2010a_PRDNERreport_Reef&SeagrassRecreationalAnchorDamage.pdf*
- *Quinones&Torres2003_DraftPRDNERreport_PRaquifers.pdf*

- Uhrin&Holmquist2003_MEPS_PropScarImpactsSeagrass.pdf

General Conservation Planning and Threats Assessment Literature

- *CMP2007_CMPReport_OpenStandardsVersion2.pdf*
- *FederalRegister 50 CFR 17 103 Subpart J (through 2005).pdf*
- *Gregory&Keeney2002_JAWRA_EnvironmentalDecisionMaking.pdf*
- *Margoluis-et al2009_EvalProgPlan_ConceptualModelsForConservationPlans.pdf*
- *MMC2007_AmendedMarineMammalProtectionAct.pdf*
- *NMPAC2003_Report_MPACreationLessonsLearned.pdf*
- *NOAA2003_Report_MPATechNeedsAssess.pdf*
- *TNC2007_TNCreport_ConservationActionPlanning.pdf*
- *USFWS2006_USFWSreport_StrategicHabitatConservation.pdf*
- *WWF2007_ThreatRankingMethodology.pdf*

Spatial Data Files

The following spatial data can be found in the folder “Library/SpatialData”. All files were created in ArcGIS 9.3 and are in Puerto Rico State Plane (m) projection. File names are given in brackets.

Project Workspaces (ESRI .mxd files)

- Bathymetry (Bathymetry)
- Watercraft Infrastructure, Activity, & Threat (Boats)
- Conservation Areas (Conservation)
- Freshwater Resources (Freshwater)
- Potential MPA Value (MPAvalue)
- Coastal Municipalities (Municipalities)
- 90th, 80th, and 50th Percentile Regions (Percentiles)
- Potential MPA Region 1 (Region1_SantaIsabelWest)
- Potential MPA Region 2 (Region2_BahiaRincon)
- Potential MPA Region 3 (Region3_GuayanillaTallaboa)
- Potential MPA Region 4 (Region4_Mayaguez)
- Potential MPA Region 5 (Region5_BahiaJobos)
- Potential MPA Region 6 (Region6_Fajardo)
- Potential MPA Region 7 (Region7_Boqueron)
- Potential MPA Region 8 (Region8_Guanica)
- Potential MPA Region 9 (Region9_RooseveltRoads)
- Project Scope (Scope)
- Seagrass Resources (Seagrass)
- Shelter Resources (Shelter)
- Manatee Sightings 1984 – 2002 (Sightings8402)
- Manatee First Pass Sightings 2009-2011 (Sightings0911)

Raster Data (ESRI GRID format files)

- Bathymetry (bathymetry)
- Shallow Water, < 13 m (bathy_value)
- Rescaled Value of Freshwater Resources (fw_value)
- Puerto Rico land masses (land)
- Sum of First Pass Sightings 2009-2011 (obs0911_sum)
- Sum of Sightings 1984-2002 (obs8402_sum)
- Project Scope (scope)
- All Seagrass Habitat (seagrass)
- Seagrass Habitat in Water < 13m depth (sg_available)
- Seagrass Presence/Absence (sg_presabs)
- Rescaled Value of Seagrass Resources (sg_value)
- Rescaled Value of Shelter Resources (sh_value)
- Shelter Resources (shelter)
- Rescaled Value of Watercraft Threat (wc_value)

Vector Data (ESRI Shapefiles)

- 50th Percentile Potential MPA Regions (50p_polygons)
- 5 km Radius from 80th Percentile Regions' Centers (80p_5k_limit)
- 80th Percentile Potential MPA Regions (80p_polygons)
- 90th Percentile Potential MPA Regions (90p_polygons)
- Benthic Habitats (benthichabitat)
- Conservation Areas, data from PRDRNA (designated)
- Freshwater Resources (freshwater)
- Coastal Municipalities (municipalities)
- Sightings 1984-2002 (obs8402)
- 50th Percentile Regions for Sightings 1984-2002 (obs8402_50percentile)
- 80th Percentile Regions for Sightings 1984-2002 (obs8402_80percentile)
- First Pass Sightings 2009 (obs09_firstpass)
- First Pass Sightings 2010 (obs10_firstpass)
- First Pass Sightings 2011 (obs11_firstpass)
- 80th Percentile Potential MPA Regions (potentialMPAs)
- NHD Perennial Stream Outlets (streams_perennial)
- NHD Artificial Stream Outlets (streams_artificial)
- Watercraft Infrastructure and Activity (watercraft)

Image Files

To facilitate reproduction and sharing of figures and tables, these are provided as high resolution .tif image files. These files can be found in the folder “Images”.

- PR-MPA_Fig1_Workflow.tif
- PR-MPA_Fig2_Scope.tif
- PR-MPA_Fig3a_ConceptualDiagramLeft.tif
- PR-MPA_Fig3a_ConceptualDiagramRight.tif
- PR-MPA_Fig4_Bathymetry.tif
- PR-MPA_Fig5_Seagrass.tif
- PR-MPA_Fig6_Municipalities.tif
- PR-MPA_Fig7_Freshwater.tif
- PR-MPA_Fig8_WindStations.tif
- PR-MPA_Fig9_Shelter.tif
- PR-MPA_Fig10_Watercraft.tif
- PR-MPA_Fig11_PotentialMPAvalue.tif
- PR-MPA_Fig12_ValueHistogram.tif
- PR-MPA_Fig13_90&80PercentileRegions.tif
- PR-MPA_Fig14_AerialSurveys94-02.tif
- PR-MPA_Fig15_AerialSurveys09-11.tif
- PR-MPA_Fig16_MortalityEvents.tif
- PR-MPA_Fig17_Reg1_SantaIsabelWest.tif
- PR-MPA_Fig18_Reg2_BahiaRincon.tif
- PR-MPA_Fig19_Reg3_GuayanillaTallaboa.tif
- PR-MPA_Fig20_Reg4_Mayaguez.tif
- PR-MPA_Fig21_Reg5_BahiaJobos.tif
- PR-MPA_Fig22_Reg6_Fajardo.tif
- PR-MPA_Fig23_Reg7_Boqueron.tif
- PR-MPA_Fig24_Reg8_Guanica.tif
- PR-MPA_Fig25_Reg9_RooseveltRoads.tif
- PR-MPA_Tab1_Definitions.tif
- PR-MPA_Tab2_Vision&Scope.tif
- PR-MPA_Tab3_KEAs.tif
- PR-MPA_Tab4_ThreatRanks.tif
- PR-MPA_Tab5a_ThreatImpacts.tif
- PR-MPA_Tab5b_ThreatImpacts.tif
- PR-MPA_Tab5c_ThreatImpacts.tif
- PR-MPA_Tab6_90PercentileRegions.tif
- PR-MPA_Tab7a_80PercentileRegions.tif
- PR-MPA_Tab7b_80PercentileRegions.tif
- PR-MPA_Tab8_ThreatMitigation.tif

MPA Communication

The methods and results of this Manatee Protected Area design project were presented at several conferences. We provide these communication materials in the folder “Presentations”.

- **PR-MPA_Poster.pptx:** Poster presented by L. Alexander at the 2nd International Conference on Marine Mammal Protected Areas, Martinique, November 2011
- **PR-MPA_Oral.pptx:** Talk presented by C.A. Drew at the International Sirenian Symposium, Tampa, Florida, November 2011