

# South Florida Multi-Species Recovery Plan

Prepared for  
U.S. Fish and Wildlife Service  
Southeast Region  
Atlanta, GA

Approved:     //ss// Sam D. Hamilton    

    Sam D. Hamilton, Regional Director,  
Southeast Region, U.S. Fish and Wildlife Service

Date:     5/18/99





THE SECRETARY OF THE INTERIOR  
WASHINGTON

## South Florida Multi-Species Recovery Plan

I am very pleased to be signing this endorsement for a landmark ecosystem-based recovery plan for the threatened and endangered species of South Florida. This Multi-Species Recovery Plan is one of President Clinton's South Florida Ecosystem Restoration Initiative strategies to recover threatened and endangered species, and to restore and maintain the biodiversity of native plants and animals in South Florida. It was specifically designed to recover the 68 federally listed species through the restoration of the 23 diverse ecological communities in this region. It also includes other species of concern to increase awareness of South Florida's incredible biodiversity.

The Multi-Species Recovery Plan is, by design, a living document. It will be flexible to accommodate the changes identified through ongoing and planned research, and it will be compatible with adaptive management strategies. Multiple stakeholder participation is critical to ensure that this process will continue. I encourage the State and Federal agencies, Tribes, non-governmental organizations, private citizens, and others who are committed to the restoration of the South Florida Ecosystem, to adopt and use this plan.

Now, with its completion, the Service is focused on implementing this large, landscape-level plan. Implementation is an integral component in meeting the Administration's restoration plan for South Florida. It involves prioritizing recovery actions using an ecosystem perspective, and recommending and funding on-the-ground recovery and restoration actions identified in the plan. Implementation, however, will not be possible without engaging the many partners in South Florida, including Federal, State and local governments, Tribal governments, conservation organizations, academia, industry, and private citizens, as part of the overall Ecosystem Restoration Initiative. I look forward to everyone's involvement in effecting the recovery of threatened and endangered species and the restoration of the natural communities in this most unique and diverse region of the United States.

//ss//Bruce Babbitt

Bruce Babbitt

Secretary

U.S. Department of the Interior



<p style="text-align: center;"><b>The Multi-Species Recovery Plan serves as the original or revised recovery plan for the following species:</b></p>		
Species	Original Approved Recovery Plan Date	Former Approved Revision to Original Recovery Plan
Key deer <i>Odocoileus virginianus clavium</i>	6-10-80	6-19-85
Key Largo cotton mouse <i>Peromyscus gossypinus allapaticola</i>		
Lower Keys rabbit <i>Sylvilagus palustris hefneri</i>	1-5-94	
Rice rat (= silver rice rat) <i>Oryzomys palustris natator</i> (= <i>O. argentatus</i> )		
Key Largo woodrat <i>Neotoma floridana smalli</i>		
Audubon's crested caracara <i>Polyborus plancus audubonii</i>	11-14-89	
Everglade snail kite <i>Rostrhamus sociabilis plumbeus</i>	3-11-83	9-9-86
Cape Sable seaside sparrow <i>Ammodramus</i> (= <i>Ammospiza</i> ) <i>maritimus mirabilis</i>	4-6-83	
Florida grasshopper sparrow <i>Ammodramus savannarum floridanus</i>	5-19-88	
American crocodile <i>Crocodylus acutus</i>	2-2-79	2-2-84
Bluetail (blue-tailed) mole skink <i>Eumeces egregius lividus</i>	12-23-93	
Sand skink <i>Neoseps reynoldsi</i>	12-23-93	
Schaus swallowtail butterfly <i>Heraclides</i> (= <i>Papilio</i> ) <i>aristodemus ponceanus</i>	11-17-82	
Stock Island tree snail <i>Orthalicus reses</i> (not incl. <i>nesodryas</i> )	3-9-83	

---

Multi-Species Recovery Plan for South Florida

---

Species	Original Approved Recovery Plan Date	Former Approved Revision to Original Recovery Plan
Crenulate lead-plant <i>Amorpha crenulata</i>	10-7-88	
Four-petal pawpaw <i>Asimina tetramera</i>	4-5-88	
Fragrant prickly-apple <i>Cereus eriophorus</i> var. <i>fragrans</i>	8-29-88	
Deltoid spurge <i>Chamaesyce</i> (=Euphorbia) <i>deltoidea</i> spp. <i>deltoidea</i>	10-7-88	
Garber's spurge <i>Chamaesyce</i> (=Euphorbia) <i>garberi</i>	10-7-88	
Pygmy fringe-tree <i>Chionanthus pygmaeus</i>	1-29-90	6-20-96
Florida perforate cladonia <i>Cladonia perforata</i>	6-20-96	
Pigeon wings <i>Clitoria fragrans</i>	6-20-96	
Short-leaved rosemary <i>Conradina brevifolia</i>	6-20-96	
Avon Park harebells <i>Crotalaria avonensis</i>	6-20-96	
Okeechobee gourd <i>Cucurbita okeechobeensis</i> spp. <i>okeechobeensis</i>		
Beautiful pawpaw <i>Deeringothamnus pulchellus</i>	4-5-88	
Garrett's mint <i>Dicerandra christmanii</i>	7-1-87	
Scrub mint <i>Dicerandra frutescens</i>	7-1-87	
Lakela's mint <i>Dicerandra immaculata</i>	7-1-87	

Species	Original Approved Recovery Plan Date	Former Approved Revision to Original Recovery Plan
Small's milkpea <i>Galactia smallii</i>	10-7-88	
Highlands scrub hypericum <i>Hypericum cumulicola</i>	1-29-90	6-20-96
Beach jacquemontia <i>Jacquemontia reclinata</i>	12-1-96	
Scrub blazing star <i>Liatris ohlingerae</i>	1-29-90	6-20-96
Papery whitlow-wort <i>Paronychia chartacea</i> (= <i>Nyachia pulvinata</i> )	1-29-90	6-20-96
Key tree-cactus <i>Pilosocereus</i> (= <i>Cereus</i> ) <i>robinii</i>	9-9-86	
Lewton's polygala <i>Polygala lewtonii</i>	6-20-96	
Tiny polygala <i>Polygala smallii</i>	10-7-88	
Wireweed <i>Polygonella basiramia</i> (= <i>ciliata</i> var. <i>b.</i> )	1-29-90	6-20-96
Sandlace <i>Polygonella myriophylla</i>	6-20-96	
Carter's mustard <i>Warea carteri</i>	1-29-90	6-20-96
Florida ziziphus <i>Ziziphus celata</i>	1-29-90	6-20-96

---

## Disclaimer

Recovery plans delineate reasonable actions that are believed to be required to recover and/or protect listed species. Plans published by the U.S. Fish and Wildlife Service (Service), are sometimes prepared with the assistance of recovery teams, contractors, State agencies, and others. Recovery teams serve as independent advisors to the Service. Plans are reviewed by the public and submitted to additional peer review before they are adopted by the Service. The objectives identified in this recovery plan will only be attained contingent upon appropriations, priorities, and other budgetary constraints. Recovery plans do not necessarily represent the views or the official positions of any individuals or agencies involved in the plan formulation, other than the Service. Recovery plans represent the official position of the Service only after they have been signed by the Regional Director or Director as approved. Approved recovery plans are subject to modification as dictated by new findings, changes in species' status, and the completion of recovery tasks.

By approving this document, the Regional Director certifies that the data used in its development represent the best scientific and commercial data available at the time it was written. Copies of all documents reviewed in development of the plan are available in the administrative record, located at U.S. Fish and Wildlife Service, South Florida Field Office, 1360 U.S. Highway 1, Suite 5, Vero Beach, Florida, 32960.

References to this document should be written as follows:

U.S. Fish and Wildlife Service. 1999. South Florida multi-species recovery plan. Atlanta, Georgia. 2172 pp.

Additional paper and CD-ROM copies may be obtained from:

Fish and Wildlife Reference Service  
5430 Grosvenor Lane, Suite 110  
Bethesda, Maryland 20814  
(301) 492-6403 or (800) 582-3421

A fee will be charged for the paper copy; fees for plans vary depending on the number of pages.

---

# Executive Summary

---

## Current Status

The South Florida Ecosystem encompasses 67,346 square kilometers (26,002 square miles) covering the 19 southernmost counties in Florida. This recovery plan is one of the first specifically designed to recover multiple species through the restoration of ecological communities over a large geographic area. The South Florida region supports an extremely diverse array of flora and fauna. Over 600 species are considered either rare or imperilled in South Florida; 68 of those species are federally listed as threatened or endangered, including 8 mammals, 13 birds, 10 reptiles, 2 invertebrates and 35 plants. The current status of each of these species is provided in Table 1.

Twenty-three of the ecological communities found within this region are inhabited by federally listed species, and are the subject of the ecosystem restoration goals in this recovery plan. These communities include: high pine; Florida scrub, including scrubby flatwoods and scrubby high pine; mesic temperate hammock; tropical hardwood hammock; pine rocklands; mesic and hydric pine flatwoods; dry prairie; cutthroat grass communities; freshwater marshes and wet prairies; forested wetlands including flowing water, pond, and seepage swamps; beach dune, coastal strand, and maritime hammock; coastal salt marsh; mangroves; seagrasses; and nearshore and midshelf reefs.

## Habitat Requirements and Limiting Factors

Specific habitat requirements for each of the species are discussed in the individual biological accounts. Limiting factors, however, are similar for all of the species that are habitat-limited. These include upland and wetland habitat loss, fragmentation, and degradation, resulting from urbanization, agriculture or other land-use conversions, wetland drainage and alteration of hydrology, invasion of exotic species, fire suppression, soil subsidence, degradation of water quality, and increased levels of contaminants.

## Recovery Objectives

Recovery objectives for all 68 species included in this plan are provided in Table 1. The Multi-Species Recovery Plan replaces all existing recovery plans for which the South Florida Field Office has official recovery lead. Recovery objectives are stated as “South Florida’s Contribution” for each of the species that occurs in this region, but for which another FWS Field Office has the official recovery lead. This recovery plan does not replace the current, approved recovery plans for those species; however, it does portray South Florida’s contribution toward the rangewide recovery for the species.

Recovery objectives at the community level are termed *restoration* objectives, and include maintaining and enhancing the structure, function, and ecological processes of the community, and in some, increasing the spatial extent of the community in South Florida.

## Recovery Criteria

Recovery criteria for each of the listed species consist of several or all of the following short, narrative statements: (1) a statement that requires amelioration of threats to the species or its habitat, (2) a statement of the probability of persistence for the species (that is, 95 percent probability of persisting for 100 years), (3) the rate of increase ( $r$ ) to measure over a specific period of time, (4) the minimum number of populations (or subpopulations) to establish, (5) a minimum population size, and (6) a habitat condition over a particular geographic area (or areas).

Restoration criteria are also established at the community level. These are more general than quantitative, and include such statements as: (1) prevent further habitat loss or degradation, (2) identify areas to acquire and restore to suitable habitat, (3) protect and manage the community to conserve biodiversity (4) restore ecological linkages at a landscape level, and (5) prepare management plans for long-term perpetuation of the community.

## Actions Needed

Recovery actions at the species level were developed to provide consistency between each of the 68 species' recovery plans. The broad categories for these actions are: (1) determine the distribution of the species in South Florida; (2) protect and enhance populations; (3) conduct research on biology/ecology; (4) monitor populations; and (5) inform and involve stakeholders and the general public in the recovery process .

Habitat-level recovery actions were separated from species-level recovery actions to facilitate the integration of individual species needs at the community level. The habitat-level actions included for each species are: (1) prevent degradation of existing habitat; (2) restore degraded or unsuitable habitat; (3) conduct research to determine the applicability and effectiveness of management techniques; (4) monitor habitat-level responses to management actions; and (5) increase public awareness of the species/habitat relationship.

Recovery actions identified at the community level are referred to as *restoration* actions. This is the ecosystem/community-level term equivalent to *recovery* at the species level. The general template used to develop the restoration actions includes the following: (1) prevent further destruction or degradation of existing communities [=protect]; (2) manage existing natural communities within the context of restoration objectives [=restore existing degraded natural communities]; (3) maintain communities in a natural condition; (4) re-create natural communities where they have been destroyed by human activities [increase spatial extent; reconstruct]; (5) create natural community analogs where communities have been destroyed by human activities to the extent that a legitimate natural community can no longer be restored [=rehabilitate; construct]; (6) connect appropriate habitat; (7) conduct community-level research; (8) monitor community-level processes and effects of land management actions; and (9) increase public awareness at the community level.

### **Total Estimated Cost of Recovery Implementation**

Costs associated with the recovery of the 68 species and with the restoration of the 23 ecological communities discussed in the Multi-Species Recovery Plan are integrally tied to the entire South Florida Ecosystem Restoration Initiative, and are very difficult, if not impossible, to separate at this time. The Central and Southern Florida Restudy portion of the Restoration Initiative is estimated to cost \$7.8 billion over the next 20 years for project implementation. At least 17 of the 68 species included in this recovery plan are dependent upon implementation of the Restudy for survival and recovery, and many others will benefit significantly as a result of this restoration effort. Furthermore, some of these species, such as the Florida panther, red-cockaded woodpecker, West Indian manatee, and wood stork, have existing rangewide recovery plans, and because this recovery plan only provides information and recovery tasks as a contribution to those recovery plans, it is nearly impossible to separate the South Florida recovery costs for those species.

The Multi-Species/Ecosystem Recovery Implementation Team will be tasked with updating the costs of recovery implementation for the 42 species assigned as recovery lead to the FWS South Florida Field Office; this will be done as part of the Implementation Plan yet to be developed. The costs will be stepped down from the community to the individual species' level. The Implementation Plan will be distributed as a draft for public review and comment once this process is completed.

### **Date of Recovery**

Because of the complexity of this recovery plan and given the diversity of ecological community types, the numbers of threatened and endangered species, and the connection to ongoing ecosystem restoration efforts, the date of recovery has a very wide range. Species like the American crocodile and some of the scrub-endemic plant species could be considered for reclassified or delisting within the next couple of years. Other species, particularly those dependent upon completion of the Central and Southern Florida Restudy, may require the full 20 years to complete that project and an additional 5 to 10 years for monitoring. A better estimate of the time required for recovery of each of the 42 species for which the South Florida Field Office has recovery lead will be included in the Multi-Species/Ecosystem Recovery Implementation Plan.

**Table 1. Recovery objectives for species included in the Multi-Species Recovery Plan.**

\*The Multi-Species Recovery Plan serves as the original or revised recovery plan for all species *except* those where this document provides a contribution to existing rangewide recovery plans.

Species	Federal Status	Recovery Objective	MSRP Contribution to Rangewide Plan*
Key deer <i>Odocoileus virginianus clavium</i>	Endangered	Reclassify to threatened	
West Indian manatee <i>Trichechus manatus</i>	Endangered	Reclassify to threatened, then delist	Support reclassification to threatened status
Key Largo cotton mouse <i>Peromyscus gossypinus allapaticola</i>	Endangered	Reclassify to threatened	
Southeastern beach mouse <i>Peromyscus polionotus niveiventris</i>	Threatened	Delist	Prevent extirpation and stabilize
Florida panther <i>Puma concolor coryi</i>	Endangered	3 viable populations within historic range	Stabilize in South Florida
Lower Keys rabbit <i>Sylvilagus palustris hefneri</i>	Endangered	Reclassify to threatened	
Rice rat (= silver rice rat) <i>Oryzomys palustris natator</i> (= <i>O. argentatus</i> )	Endangered	Reclassify to threatened	
Key Largo woodrat <i>Neotoma floridana smalli</i>	Endangered	Reclassify to threatened	
Audubon's crested caracara <i>Polyborus plancus audubonii</i>	Threatened	Delist	
Bald eagle <i>Haliaeetus leucocephalus</i>	Threatened	Delist	Support delisting actions
Florida scrub-jay <i>Aphelocoma coerulescens</i>	Threatened	Currently under revision	Stabilize and increase population
Everglade snail kite <i>Rostrhamus sociabilis plumbeus</i>	Endangered	Reclassify to threatened	
Piping plover <i>Charadrius melodus</i>	Threatened	Delist	Maintain wintering habitat
Cape Sable seaside sparrow <i>Ammodramus (=Ammodramus) maritimus mirabilis</i>	Endangered	Reclassify to threatened	

Florida grasshopper sparrow <i>Ammodramus savannarum floridanus</i>	Endangered	Reclassify to threatened	
Wood stork <i>Mycteria americana</i>	Endangered	Reclassify to threatened, then delist	Support reclassification to threatened
Roseate tern <i>Sterna dougallii dougallii</i>	Threatened	Delist	Maintain/increase South Florida population
Bachman's warbler <i>Vermivora bachmanii</i>	Endangered	Not applicable	Conduct surveys
Kirtland's warbler <i>Dendroica kirtlandii</i>	Endangered	Reclassify to threatened	Conduct surveys
Ivory-billed woodpecker <i>Campephilus principalis</i>	Endangered	Not applicable	Conduct surveys
Red-cockaded woodpecker <i>Picoides (= Dendrocopos) borealis</i>	Endangered	Perpetuate viable populations where exists	Establish support populations
American crocodile <i>Crocodylus acutus</i>	Endangered	Reclassify to threatened	
Blue-tail (=blue-tailed) mole skink <i>Eumeces egregius lividus</i>	Threatened	Delist	
Sand skink <i>Neoseps reynoldsi</i>	Threatened	Delist	
Atlantic salt marsh snake <i>Nerodia clarkii (=fasciata) taeniata</i>	Threatened	Delist	Support delisting actions
Eastern indigo snake <i>Drymarchon corais couperi</i>	Threatened	Ensure numerous populations exist and are protected	Stabilize/increase population
Green sea turtle <i>Chelonia mydas</i> (incl. <i>agassizi</i> )	Endangered	Delist	Support delisting actions
Hawksbill sea turtle <i>Eretmochelys imbricata</i>	Endangered	Delist	Support delisting actions
Kemp's (=Atlantic) ridley sea turtle <i>Lepidochelys kempii</i>	Endangered	Delist	Support delisting actions
Leatherback sea turtle <i>Dermochelys coriacea</i>	Endangered	Delist	Support delisting actions

Loggerhead sea turtle <i>Caretta caretta</i>	Threatened	Delist	Support delisting actions
Schaus swallowtail butterfly <i>Heraclides (= Papilio) aristodemus ponceanus</i>	Endangered	Reclassify to threatened, then delist	
Stock Island tree snail <i>Orthalicus reses</i> (not incl. <i>nesodryas</i> )	Threatened	Delist	
Crenulate lead-plant <i>Amorpha crenulata</i>	Endangered	Prevent extinction, then stabilize	
Four-petal pawpaw <i>Asimina tetramera</i>	Endangered	Reclassify to threatened	
Florida bonamia <i>Bonamia grandiflora</i>	Threatened	Delist	Stabilize and increase population
Fragrant prickly-apple <i>Cereus eriophorus</i> var. <i>fragrans</i>	Endangered	Prevent extinction, then stabilize	
Deltoid spurge <i>Chamaesyce (=Euphorbia) deltoidea</i> spp. <i>deltoidea</i>	Endangered	Stabilize, then reclassify	
Garber's spurge <i>Chamaesyce (=Euphorbia) garberi</i>	Threatened	Stabilize, then delist	
Pygmy fringe-tree <i>Chionanthus pygmaeus</i>	Endangered	Stabilize, then reclassify to threatened	
Florida golden aster <i>Chrysopsis (=Heterotheca) floridana</i>	Endangered	Reclassify to threatened	Conduct surveys
Florida perforate cladonia <i>Cladonia perforata</i>	Endangered	Reclassify to threatened	
Pigeon wings <i>Clitoria fragrans</i>	Threatened	Delist	
Short-leaved rosemary <i>Conradina brevifolia</i>	Endangered	Stabilize, then reclassify to threatened	
Avon Park harebells <i>Crotalaria avonensis</i>	Endangered	Prevent extinction	

Okeechobee gourd <i>Cucurbita okeechobeensis</i> spp. <i>okeechobeensis</i>	Endangered	Reclassify to threatened	
Beautiful pawpaw <i>Deeringothamnus pulchellus</i>	Endangered	Reclassify to threatened	
Garrett's mint <i>Dicerandra christmanii</i>	Endangered	Stabilize, then reclassify to threatened	
Scrub mint <i>Dicerandra frutescens</i>	Endangered	Stabilize, then reclassify to threatened	
Lakela's mint <i>Dicerandra immaculata</i>	Endangered	Prevent extinction, then stabilize	
Scrub buckwheat <i>Eriogonum longifolium</i> var. <i>gnaphalifolium</i>	Threatened	Delist	Stabilize and increase population
Snakeroot <i>Eryngium cuneifolium</i>	Endangered	Reclassify to threatened	
Small's milkpea <i>Galactia smallii</i>	Endangered	Prevent extinction, then stabilize	
Highlands scrub hypericum <i>Hypericum cumulicola</i>	Endangered	Stabilize, then reclassify to threatened	
Beach jacquemontia <i>Jacquemontia reclinata</i>	Endangered	Reclassify, then delist	
Scrub blazing star <i>Liatris ohlingerae</i>	Endangered	Reclassify to threatened	
Scrub lupine <i>Lupinus aridorum</i>	Endangered	Prevent extinction, then stabilize	Prevent extinction, then stabilize
Britton's beargrass <i>Nolina brittoniana</i>	Endangered	Delist	Stabilize and increase population
Papery whitlow-wort <i>Paronychia chartacea</i> (= <i>Nyachia pulvinata</i> )	Threatened	Delist	
Key tree-cactus <i>Pilosocereus</i> (= <i>Cereus</i> ) <i>robinii</i>	Endangered	Reclassify to threatened	
Lewton's polygala <i>Polygala lewtonii</i>	Endangered	Reclassify to threatened	
Tiny polygala <i>Polygala smallii</i>	Endangered	Prevent extinction, then stabilize	

Wireweed <i>Polygonella basiramia</i> (= <i>ciliata</i> var. <i>b.</i> )	Endangered	Reclassify to threatened	
Sandlace <i>Polygonella myriophylla</i>	Endangered	Reclassify to threatened, then delist	
Scrub plum <i>Prunus geniculata</i>	Endangered	Reclassify to threatened, then delist	Stabilize and support reclassification to threatened
Wide-leaf warea <i>Warea amplexifolia</i>	Endangered	Protect populations; create new populations	Prevent extinction, then stabilize
Carter's mustard <i>Warea carteri</i>	Endangered	Reclassify to threatened	
Florida ziziphus <i>Ziziphus celata</i>	Endangered	Prevent extinction, then stabilize	

---

## Acknowledgements

The Multi-Species Recovery Plan is the result of extensive effort and support by many individuals throughout the country (refer to list of names in Appendices A and B). Mr. George Frampton (former Assistant Secretary of the Department of the Interior for Fish and Wildlife and Parks) and the late Ms. Mollie H. Beattie (former Director, FWS) are due special acknowledgement because this plan is a result of their vision.

Without the help of Don Chase (U.S. Department of the Interior Natural Resources Library), Fred Lohrer (Archbold Biological Station), and Violet Catrow, Joyce Mann, and Lora McKenzie (USGS, BRD, Leetown Science Center), the recovery team would not have been able to assemble the information that went into this document.

Appreciation is due to Ms. Patricia Beneke (Assistant Secretary, Water and Science), William Leary (Special Assistant to the Deputy Assistant Secretary for Fish and Wildlife and Parks), Jamie Rappaport Clark (Director, FWS), Terrence H. Salt (Executive Director, South Florida Ecosystem Restoration Task Force), Samuel Hamilton (FWS, Southeast Regional Director), Noreen Clough (former FWS Southeast Regional Director), Gloria Bell and Kelly Bibb (FWS, Atlanta Regional Office), and Stephen Forsythe (FWS, Florida State Supervisor's Office).

Special recognition is due to the FWS South Florida Field Office for completing the preparation of this recovery plan: James Slack (Field Office Supervisor), Dawn Jennings (Recovery Team Leader), Kalani Cairns, Charleen Looney, Brian Luprek, and Grant Webber. Additional staff who contributed technical and clerical support are included in Appendix B.

Appreciation is also due to Mark Landry, DigitalInk, for the layout of the document, to Kathryn Ziewitz for providing the final technical editing, to Sudden Images Beachside for scanning the photographs, to Lauren Kerstetter, SFWMD, for creating the cover, and to Barbara Orisich, FWS, for making the recovery plan available on the Internet.

---

**List of Acronyms**

ACSC	Areas of Critical State Concern
AFR	Air Force Range
BLM	U.S. Bureau of Land Management
CARL	Conservation and Recreation Lands
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COE	U.S. Army Corps of Engineers
CREW	Corkscrew Regional Ecosystem Watershed
C&SF	Central and Southern Florida Project
DCA	Florida Department of Community Affairs
DEP	Florida Department of Environmental Protection
DERM	Department of Environmental Resources Management
DOT	Florida Department of Transportation
EAA	Everglades Agricultural Area
EPA	U.S. Environmental Protection Agency
EPPC	Florida Exotic Pest Plant Council
ESA	Endangered Species Act (also referred to as the Act)
FCREPA	Florida Committee on Rare and Endangered Plants and Animals
FDACS	Florida Department of Agriculture and Consumer Services
FEMA	Federal Emergency Management Agency
FKNMS	Florida Keys National Marine Sanctuary
FLUCCS	Florida Land Use, Cover and Forms Classification System
FNAI	Florida Natural Areas Inventory
FWS	U. S. Fish and Wildlife Service
GIS	Geographic Information System
GPS	Global Positioning System
GFC	Florida Game and Fresh Water Fish Commission
IUCN	International Union for the Conservation of Nature and Natural Resources

MSRP	South Florida Multi-Species Recovery Plan
NAS	National Audubon Society
NEP	National Estuary Program
NF	National Forest
NM	National Monument
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NP	National Park
NPS	National Park Service
NRCS	National Resources Conservation Service
NWR	National Wildlife Refuge
PVA	Population Viability Analysis
SF	State Forest
SFWMD	South Florida Water Management District
SJWMD	St. Johns Water Management District
SOR	Save Our Rivers
SP	State Park
SRA	State Recreation Area
STA	Stormwater Treatment Area
SWFWMD	Southwest Florida Water Management District
USDA	U.S. Department of Agriculture
USGS, BRD	U.S. Geological Survey, Biological Resources Division
WCA	Water Conservation Area
WMA	Wildlife Management Area
USFS	U.S. Forest Service

## **Conversions**

<b>To convert</b>		<b>Multiply by</b>	<b>To obtain</b>	
centigrade	(°C)	$(^{\circ}\text{C} \times 5/9) + 32$	fahrenheit	(°F)
centimeters	(cm)	0.3937	inches	(in.)
grams	(g)	0.002205	pounds	(lb.)
hectares	(ha)	2.471	acres	(ac)
kilograms	(kg)	2.2046	pounds	(lb.)
kilometers	(km)	0.6214	miles	(mi.)
sq. kilometers	(km <sup>2</sup> )	247.1	acres	(ac)
meters	(m)	0.0006214	miles	(mi.)

---

# Table of Contents

---

<b>Executive Summary</b>	<b>ix to xvi</b>
<b>Introduction</b>	<b>1-1 to 1-20</b>
<b>The South Florida Ecosystem</b>	<b>2-1 to 2-84</b>
<b>The Ecological Communities</b>	<b>3-1 to 3-642</b>
High Pine	3-3
Florida Scrub/Scrubby Flatwoods/Scrubby High Pine	3-31
Beach Dune/Coastal Strand/Maritime Hammock	3-69
Mesic Temperate Hammock	3-95
Tropical Hardwood Hammock	3-121
Pine Rocklands	3-161
Pine Flatwoods	
Mesic Pine Flatwoods	3-195
Hydric Pine Flatwoods	3-231
Dry Prairie	3-279
Cutthroat Grass Communities	3-347
Freshwater Marshes/Wet Prairies	3-399
Forested Wetlands	
Flowing Water Swamps	3-455
Pond Swamps	3-479
Seepage Swamps	3-499
Mangroves	3-519
Coastal Salt Marsh	3-553
Seagrasses	3-597
Nearshore and Midshelf Reefs	3-623
<b>The Species</b>	<b>4-1 to 4-1226</b>
<b>The Mammals</b>	
Key deer, <i>Odocoileus virginianus clavium</i>	4-3
West Indian manatee, <i>Trichechus manatus</i>	4-25
Key Largo cotton mouse, <i>Peromyscus gossypinus allapaticola</i>	4-79
Southeastern beach mouse, <i>Peromyscus polionotus niveiventris</i>	4-97
Florida panther, <i>Puma concolor coryi</i>	4-117
Lower Keys rabbit, <i>Sylvilagus palustris hefneri</i>	4-151
Rice rat, <i>Oryzomys palustris natator</i>	4-173
Key Largo woodrat, <i>Neotoma floridana smalli</i>	4-195

---

# Table of Contents

## continued

---

### The Birds

Audubon's crested caracara, <i>Polyborus plancus audubonii</i>	4-219
Bald eagle, <i>Haliaeetus leucocephalus</i>	4-237
Florida scrub-jay, <i>Aphelocoma coerulescens</i>	4-261
Everglade snail kite, <i>Rostrhamus sociabilis plumbeus</i>	4-291
Piping plover, <i>Charadrius melodus</i>	4-325
Cape Sable seaside sparrow, <i>Ammodramus maritimus mirabilis</i>	4-345
Florida grasshopper sparrow, <i>Ammodramus savannarum floridanus</i>	4-371
Wood stork, <i>Mycteria americana</i>	4-393
Roseate tern, <i>Sterna dougallii dougallii</i>	4-429
Bachman's warbler, <i>Vermivora bachmanii</i>	4-445
Kirtland's warbler, <i>Dendroica kirtlandii</i>	4-455
Ivory-billed woodpecker, <i>Campephilus principalis</i>	4-465
Red-cockaded woodpecker, <i>Picoides borealis</i>	4-473

### The Reptiles

American crocodile, <i>Crocodylus acutus</i>	4-505
Bluetail mole skink, <i>Eumeces egregius lividus</i>	4-529
Sand skink, <i>Neoseps reynoldsi</i>	4-541
Atlantic salt marsh snake, <i>Nerodia clarkii taeniata</i>	4-553
Eastern indigo snake, <i>Drymarchon corais couperi</i>	4-567
Green sea turtle, <i>Chelonia mydas</i>	4-583
Hawksbill sea turtle, <i>Eretmochelys imbricata</i>	4-615
Kemp's ridley sea turtle, <i>Lepidochelys kempii</i>	4-649
Leatherback sea turtle, <i>Dermochelys coriacea</i>	4-665
Loggerhead sea turtle, <i>Caretta caretta</i>	4-705

### The Invertebrates

Schaus swallowtail butterfly, <i>Heraclides aristodemus ponceanus</i>	4-743
Stock Island tree snail, <i>Orthalicus reses</i>	4-767

### The Plants

Crenulate lead-plant, <i>Amorpha crenulata</i>	4-789
Four-petal pawpaw, <i>Asimina tetramera</i>	4-801
Florida bonamia, <i>Bonamia grandiflora</i>	4-813
Fragrant prickly-apple, <i>Cereus eriophorus</i> var. <i>fragrans</i>	4-825
Deltoid spurge, <i>Chamaesyce deltoidea</i> spp. <i>deltoidea</i>	4-839
Garber's spurge, <i>Chamaesyce garberi</i>	4-851
Pygmy fringe-tree, <i>Chionanthus pygmaeus</i>	4-863
Florida golden aster, <i>Chrysopsis floridana</i>	4-875
Florida perforate cladonia, <i>Cladonia perforata</i>	4-887
Pigeon wings, <i>Clitoria fragrans</i>	4-901
Short-leaved rosemary, <i>Conradina brevifolia</i>	4-911
Avon Park harebells, <i>Crotalaria avonensis</i>	4-923
Okeechobee gourd, <i>Cucurbita okeechobeensis</i> ssp. <i>okeechobeensis</i>	4-933
Beautiful pawpaw, <i>Deeringothamnus pulchellus</i>	4-951
Garrett's mint, <i>Dicerandra christmanii</i>	4-965

# Table of Contents

## continued

Scrub mint, <i>Dicerandra frutescens</i>	4-977
Lakela's mint, <i>Dicerandra immaculata</i>	4-989
Scrub buckwheat, <i>Eriogonum longifolium</i> var. <i>gnaphalifolium</i>	4-1001
Snakeroot, <i>Eryngium cuneifolium</i>	4-1013
Small's milkpea, <i>Galactia smallii</i>	4-1023
Highlands scrub hypericum, <i>Hypericum cumulicola</i>	4-1035
Beach jacquemontia, <i>Jacquemontia reclinata</i>	4-1049
Scrub blazing star, <i>Liatris ohlingerae</i>	4-1063
Scrub lupine, <i>Lupinus aridorum</i>	4-1077
Britton's beargrass, <i>Nolina brittoniana</i>	4-1089
Papery whitlow-wort, <i>Paronychia chartacea</i>	4-1101
Key tree-cactus, <i>Pilosocereus robinii</i>	4-1111
Lewton's polygala, <i>Polygala lewtonii</i>	4-1125
Tiny polygala, <i>Polygala smallii</i>	4-1135
Wireweed, <i>Polygonella basiramia</i>	4-1149
Sandlace, <i>Polygonella myriophylla</i>	4-1163
Scrub plum, <i>Prunus geniculata</i>	4-1173
Wide-leaf warea, <i>Warea amplexifolia</i>	4-1185
Carter's mustard, <i>Warea carteri</i>	4-1199
Florida ziziphus, <i>Ziziphus celata</i>	4-1213

### Implementation

5-1 to 5-8

### Appendices

A 1-1 to H 1-12

Appendix A: Recovery Team Members	A 1-14
Appendix B: Other Contributors and Reviewers	B 1-8
Appendix C: Species of Concern and their Respective Community Types in South Florida	C 1-66
Appendix D: Migratory Birds Occurring in South Florida	D 1-8
Appendix E: Exotic Plant Species Reported from the South Florida Ecosystem	E 1-44
Appendix F: Federal, State and Private Conservation Lands	F 1-6
Appendix G: Federal and State Agencies with Management and Restoration Responsibilities in South Florida	G 1-12
Appendix H: Glossary	H 1-12

