SOUTHWEST FLORIDA LANDSCAPE CONSERVATION DESIGN

2017

U.S. FISH & WILDLIFE SERVICE

PENINSULAR FLORIDA LANDSCAPE CONSERVATION COOPERATIVE

NATIONAL Wildlife Refuge ASSOCIATION

Southwest Florida Landscape Conservation Design
December 2017

Prepared by:
National Wildlife Refuge Association
University of Florida Center for Landscape Conservation Planning

Prepared for:
The Peninsular Florida Landscape Conservation Cooperative and US Fish and Wildlife Service
Cover and facing photo credits: Larry Richardson/US Fish and Wildlife Service

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List of Acronyms and Defined Terms

CCP	Comprehensive Conservation Plan, FWS
CERP	Comprehensive Everglades Restoration Plan
CLIP	Critical Lands and Waters Identification Project
DDT	dichlorodiphenyltrichloroethane
DOI	U.S. Department of the Interior
FDOT	Florida Department of Transportation
FGSP	Florida grasshopper sparrow
FWC	Florida Fish and Wildlife Conservation Commission
FWS	U. S. Fish and Wildlife Service, Service
ha	hectares
IWHRS	Integrated Wildlife Habitat Ranking System
LAS	Land Acquisition Strategy, South Florida Ecosystem Restoration
LCC	Landscape Conservation Cooperative, FWS
LCD	Landscape Conservation Design
NAWMP	North American Waterfowl Management Plan
NWR	National Wildlife Refuge, FWS
NRCS	Natural Resource Conservation Service, USDA
PES	Payment for Ecosystem Services
PIF	Partners in Flight
RCW	Red-cockaded woodpecker
Service	U. S. Fish and Wildlife Service, also FWS
SFWMD	South Florida Water Management District
SGCN	Species of Greatest Conservation Need, State of Florida
sp	species
Study Area	The generalized area of interest covered in this Landscape Conservation Design
US	United States
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service, also Service or FWS
WMA	Wildlife Management Area, FWC
WRE	Wetland Reserve Easement, NRCS, USDA


Photo credit: US Fish and Wildlife Service

Introduction

Purpose of a Landscape Conservation Design

Landscape Conservation Designs (LCDs) are cooperative landscape conservation processes that identify ecologically-connected networks of terrestrial, freshwater, coastal, and marine conservation areas and conservation priority areas that are likely to be resilient to climate change and support native biodiversity (and related ecosystem services) under changing conditions. They provide information on where to sustain natural and potentially cultural resources across the region and landscape, what conservation actions are needed, how much and who can contribute to those actions.

An LCD functions as both a product and a process. The products portion includes landscape scale prioritization and strategies across multiple management units and managing organizations. The process portion of an LCD involves the continual collaboration and adaptation based on emerging science, changing climate conditions and capabilities of all partners involved.

An LCD is not a static product. It must be periodically modified by all partners based on the results of their collective implementation, monitoring, and evaluation. This is intended to be an adaptive management process at a regional landscape scale.

The Florida Panther National Wildlife Refuge: Description and Conservation Objectives

The Florida Panther National Wildlife Refuge is characterized by lush tropical vegetation with over 700 species of plants. Cypress strands meander through the refuge. Tropical hardwood hammocks, which are dominated by ancient live oaks, are found along upland ridges. Acres of slash pine and saw palmetto lie adjacent to wet prairies blooming with glades lobelia, tickseed and prairie milkweed. Rare orchids and bromeliads are found throughout this mix of habitats.

The four major vegetative communities that exist on the refuge occur as a result of the complex interrelationship of topography, soil, hydroperiod, and the frequency and intensity of fires. These include: hardwood hammocks; pine forests; cypress, and mixed swamp forests; and prairies, marshes, sloughs and ponds (Duever et al., 1986). Fire either maintains or sets back the successional stage that each vegetative type represents. The hydroperiod controls whether an area will burn or not at a given time of the year, or controls the intensity of a fire by influencing soil moisture, plant growth stage (green or cured), or presence of standing water which may only allow a top burn. In most cases, the type of soil or lack thereof, reflects the prevailing hydroperiod and fire history. The delineation of these communities can be somewhat subtle or abrupt. For example, cypress domes can be relatively small (less than an acre), yet distinctly ringed by a prairie which is further surrounded by pine flatwoods. The hydroperiod, changes in elevation of only a few inches, and soil parameters determine the vegetative divisions. In other areas the vegetative boundaries are blurred; where cypress and pines, seeding from their once distinct habitats, are now found together pioneering among the prairie grasses that once served as the ecotone between pine and cypress. This is likely caused by hydrologic changes over the years. Hammocks are typically found on mounds, only a foot or two above the surrounding habitat, which may be a pine forest or prairie.

Conservation objectives for the Florida Panther National Wildlife Refuge:

- Provide optimum habitat conditions for the Florida panther.
- Restore and conserve the natural diversity, abundance, and ecological function of refuge flora and fauna.
- Conduct research, monitoring and evaluations to improve management of flora and fauna on the refuge and within the south Florida ecosystem.
- Develop appropriate and compatible wildlife-dependent recreation and environmental education programs.
- Promote interagency and private landowner cooperation for the protection and management of natural and cultural resources within southwest Florida.

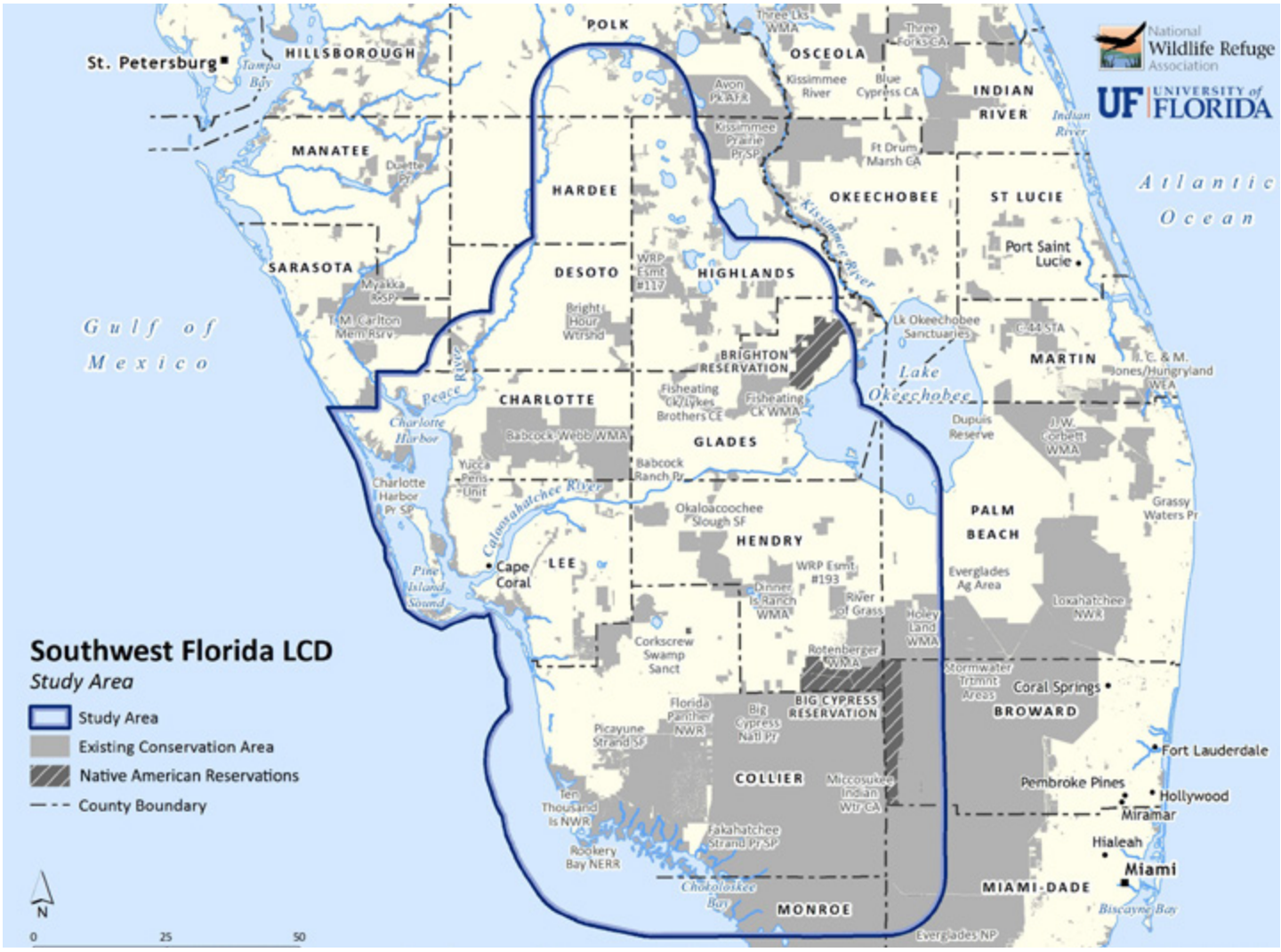


Figure 1. Southwest Florida LCD Study Area.

Study Area

This LCD covers the Florida region including all of Collier, Lee, and Charlotte Counties, most of Hendry County, and portions of Glades, Desoto, Hardee, Highlands, and Polk Counties (**Figure 1**). The study area was selected based on these considerations:

- Panther habitat and corridors
- Critical Linkages in the Florida Ecological Greenways Network
- Caloosahatchee River watershed
- Fisheating Creek watershed
- Areas abutting the southwest boundaries of the Everglades Headwaters National Wildlife Refuge region
- Incorporation of the coastal National Wildlife Refuges from Charlotte Harbor south to the Ten Thousand Islands
- Overlap with FWC's Cooperative Conservation Blueprint Pilot Project study area

The southwest Florida landscape contains a multitude of natural communities including flatwoods, hardwood hammocks, scrub, dry prairie, freshwater marshes and wet prairies, many different freshwater wetland forest natural communities, mangroves, saltmarsh, and extensive estuarine aquatic ecosystems. The geospatial configuration of these native habitats interspersed with agricultural lands provides a high level of biodiversity largely unique to south Florida. The ecosystems are driven by hydrological connections resulting from sheet flow in the Cypress strands, marshes and sloughs, as well as disturbance from fire in natural communities such as pine flatwoods and wet and dry prairie that are maintained through use of prescribed fire.

The study area also contains a strategic set of existing conservation lands managed by a diverse set of federal, state, and local governments. Private preserves also exist managed by organizations including Florida Audubon and The Nature Conservancy, along with large private conservation easements protecting water resources, focal species habitat, and agricultural lands.

In addition there are large areas of conservation significance that have been included for future state acquisition and conservation easement projects, such as Florida Forever and the Rural and Family Lands Protection Program (RFLPP) and additional lands identified as high priorities in the Critical Lands and Waters Identification Project database and the Florida Ecological Greenways Network.

The study area region also has a rich history of conservation planning efforts, and an engaged stakeholder community, including landowners, agencies, academia, conservation NGO's and agricultural and real estate interests. Support from the stakeholder community will be crucial to future implementation success.

Southwest Florida LCD Goals and Objectives

1. Maintain a functional ecosystem by maintaining, protecting and restoring habitat connectivity throughout the southwest Florida landscape.
    a. Maintain spatial extent and arrangement of habitats. Areas currently used by species with large home ranges (i.e. Florida panthers and black bear) need habitat connectivity at the landscape scale.
    b. Maintain and restore functional ecological connectivity at a regional landscape scale from the Big Cypress National Preserve and Florida Panther National Wildlife Refuge north to the Everglades Headwaters National Wildlife Refuge.
2. Maintain and restore quality wildlife habitat for all focal species in southwest Florida
3. Protect, restore, and successfully manage mosaics of natural communities with a mosaic of other rural land uses.
4. Coordinate the use of all non-regulatory incentive programs to protect, maintain and restore the quality of wildlife habitats and landscape linkages on private lands.
    a. Keep working agricultural lands working for people, rural communities and wildlife.
    b. Provide lands for compatible and well managed resource-based recreational uses including hunting.
5. Continue to engage stakeholders regarding incentives-based conservation opportunities and agency coordination that facilitates these opportunities working with interested landowners.

Focal Species and Natural Communities

Focal Species

In an online stakeholder workshop coordinated by the Peninsular Florida Landscape Conservation Cooperative (PFLCC), southwest Florida wildlife experts were asked to nominate a broad group of species that would be further refined to a selection of focal species for use in an impact assessment.

Nomination criteria stipulated terrestrial, native, non-invasive, faunal species. Due to the digital nature of the project, obtainable spatial distribution or observation data was necessary for species consideration. Experts were asked to consider species whose existence centered on, or was tied to, the encompassed national wildlife refuges. In the workshop, the participant group was shown a presentation on the scenario-based impact analysis approach, and then asked to nominate a list of potential sensitive species that would be used in the analyses. The participants were asked to suggest any species they felt would be relevant to the goals of the project within the limitations of the nomination criteria. Participants then narrowed the list using voting procedures. The first vote was conducted to rank the original list of species by preference for inclusion on the focal list. The final list of focal species included a range of taxa, habitat types, distribution ranges, and conservation status and needs.

After this discussion, a second vote was taken and the nomination list was subsequently narrowed to 12 individual species and one species group for the purposes of the scenario-based impact assessment on the effects of sea level rise and urbanization. For the purposes of the focal species habitat modeling all 34 species identified in the first vote were used.

These species included the following:

- American crocodile (Crocodylus acutus)
- Eastern diamondback rattlesnake (Crotalus adamanteus)
- Eastern indigo snake (Drymarchon couperi)
- Gopher tortoise (Gopherus polyphemus)
- Ornate diamondback terrapin (Malaclemys terrapin macrospilota)
- Southern chorus frog (Pseudacris nigrita)
- Florida scrub lizard (Sceloporus woodi)
- Florida grasshopper sparrow (Ammodramus savannarum floridanus)
- Mottled duck (Anas fulvigula)
- Florida scrub-jay (Aphelocoma coerulescens)
- Limpkin (Aramus guarauna)
- Florida burrowing owl (Athene cunicularia)
- Short-tailed hawk (Buteo brachyurus)
- Audubon's crested caracara (Polyborus plancus audubonii)
- Piping plover (Charadrius melodus)
- Snowy plover (Charadrius nivosus)
- Mangrove cuckoo (Coccyzus minor)
- Swallow-tailed kite (Elanoides forficatus)
- Southeastern American kestrel (Falco sparverius paulus)
- Florida sandhill crane (Antigone canadensis pratensis)
- Bald eagle (Haliaeetus leucocephalus)
- American oystercatcher (Haematopus palliates)
- Wood stork (Mycteria Americana)
- Red-cockaded woodpecker (Picoides borealis)
- Snail kite (Rostrhamus sociabilis)
- Least tern (Sternula antillarum)
- Black-whiskered vireo (Vireo altiloquus)
- Wading bird guild consisting of roseate spoonbill (Platalea ajaja), little blue heron (Egretta caerulea), reddish egret (Egretta rufescens), snowy egret (Egretta thula), tricolored heron (Egretta tricolor), and white ibis (Eudocimus albus)
- Florida bonneted bat (Eumops floridanus)
- Everglades mink (Neovison vison evergladensis)
- Florida panther (Puma concolor coryi)
- Big Cypress fox squirrel (Sciurus niger avicennia)
- Sherman's fox squirrel (Sciurus niger shermani)
- Florida black bear (Ursus americanus floridanus)

Focal Natural Communities

Focal natural communities were selected based on a multi-criteria approach discussed and developed by the project team. The first step was to develop a natural community classification that best represented natural communities in the study area while providing relevant evaluation criteria and GIS data. For these purposes, we first developed a crosswalk between the Cooperative Land Cover (CLC) version 3.1 and the Florida Natural Areas Inventory's (FNAI) natural community classification. We then analyzed the level of protection for each natural community using a modified version of the CLC data and the existing conservation lands GIS data from FNAI.

All natural communities meeting one of the four following criteria were selected as focal natural communities (**Table 1**):

- Natural communities with less than 80% of their area currently protected, or
- FNAI Critical Lands and Waters (CLIP) rare natural community, or
- FNAI S1 or S2 natural community, or
- FWC State Wildlife Action Plan (SWAP) priority natural community

More information on the species and natural communities in this study is included in **Appendix A**, and information on species habitat models used is included in **Appendix C**.

Table 1. Focal Natural Communities

FOCAL NATURAL COMMUNITIES	% PROTECTED	CLIP RARE NATURAL COMMUNITIES	STATE RANK	FWC PRIORITY
Upland Hardwood/Hammock	25%	yes	3	no
Inland Scrub	40%	yes	2	yes
Coastal Scrub	86%	yes	2	yes
Sandhill	86%	yes	2	yes
Dry Prairie	64%	yes	2	yes
Mesic Flatwood	52%	yes	4	yes
Scrubby Flatwood	52%	yes	2	yes
Coastal Grassland/Shrub	73%	yes	2	yes
Coastal Upland Hammock	89%	yes	2	no
Wet Prairie	29%	no	2	yes
Freshwater Marsh	26%	no	4	yes
Cypress/Pine/Cabbage Palm	46%	no	4	no
Hydric Flatwoods	68%	yes	4	yes
Freshwater Hardwood Wetland	36%	no	4	no
Bay Wetland	76%	no	4	no
Hydric Hammock/Prairie Hammock	73%	no	4	no
Salt Marsh	83%	yes	5	yes
Mangrove Swamp	89%	yes	5	yes

Land Use Planning Foundations

Identification of conservation priority areas based on the best available data and scientific methods has been conducted at a statewide scale and in southwest Florida over the last three decades, with updates and improvements over time. Most recently, the Florida Fish and Wildlife Conservation Commission worked with the University of Florida, contractor Julie Morris, and a number of stakeholders on the Cooperative Conservation Blueprint (the Blueprint) Pilot Project in southwest Florida. The scientific foundation for the Blueprint was the Critical Lands and Waters Identification Project (CLIP), which is a statewide GIS database identifying biodiversity, landscape, water resource, and other conservation priority areas (Oetting et al. 2017). CLIP data were combined with other relevant regional data and analyses to more thoroughly depict the region's conservation priorities. This information was then used as the foundation for the Blueprint's stakeholder process for identifying consensus conservation priorities for protecting focal species and ecosystems in a connected network of existing and potential future conservation lands, as well as potential conservation incentives that would apply to these priorities.

Critical Lands and Waters Identification Project (CLIP)

The Critical Lands and Waters Identification Project (CLIP) is a collection of spatial data that identifies statewide priorities for a broad range of natural resources in Florida. CLIP grew out of a 2006 request by the Century Commission for a Sustainable Florida, for a statewide inventory of natural resource priorities that could inform long range planning decisions. CLIP has been developed through a collaborative effort between the Florida Natural Areas Inventory (FNAI), the University of Florida Center for Landscape Conservation Planning (UF CLCP), and the Florida Fish and Wildlife Conservation Commission (FWC). The CLIP partners have relied upon a team of expert advisors from state and federal agencies, water management districts, NGOs, and the private sector, to provide consensus guidance on data compilation and model construction.

CLIP is based on a set of core natural resource data layers which are then organized into five Resource Categories: Biodiversity, Landscapes, Surface Water, Groundwater, and Marine. The first three categories are also combined into the Aggregated CLIP model, which identifies five priority levels for natural resource conservation, and has served as a foundation for various conservation planning efforts including the Blueprint and the work of the Peninsular Florida Landscape Conservation Cooperative.

Cooperative Conservation Blueprint (CCB)

The Cooperative Conservation Blueprint serves as the planning and outreach foundation for this LCD.

The Blueprint was initiated in 2006 by the Florida Fish and Wildlife Conservation Commission (FWC) as part of the 2005 State Wildlife Action Plan. The process brought together landowners, businesses, governmental and conservation organizations to collectively build broad agreement on both voluntary and non-regulatory conservation incentives along with a comprehensive vision of ecological priorities to which existing and new incentive ideas can be applied. The overarching goal was a map of statewide conservation priorities developed by stakeholders working together, and voluntary and non-regulatory incentives to implement it.

In 2007 through 2009 FWC and its partners started at a statewide scale, conducted a detailed conservation incentives review and worked with stakeholders to develop new incentives. Extensive outreach was conducted and agency and landowner partnerships were developed.

In 2010 FWC and partners decided to further refine the Blueprint, and focus on a pilot project region. Southwest Florida was chosen as the pilot region

because of its high ecological value, the significant amount of conservation science and planning done in the region, and a very active stakeholder community. The goal of the Southwest Florida Cooperative Conservation Blueprint Pilot Project was to generate broad agreement about a set of priority wildlife corridors that connected existing public conservation lands in the region and to identify private landowner conservation incentives that would help facilitate the protection of those corridors.

Stakeholder committees comprised of local and regional expertise were formed to identify the best connectivity options in the region. CLIP, as well as more localized data served as the scientific basis for corridor development. Through stakeholder committee meetings and individual meetings and planning efforts with landowners, agencies, local governments and development interests, corridors were developed based on the best science, landowner buy-in was discussed, and protection opportunities and obstacles in the region were identified.

The Pilot Project produced a science-based synthesis of state and regional conservation priorities, stakeholder identification of wildlife corridor conservation priorities in southwest Florida, and discussed (and agreed upon) incentives-based conservation tools and strategies. In 2013-2014, Pilot Project work focused on identifying strategic focal areas in the southwest region, developing GIS analysis methodologies to identify appropriate incentive programs and developing detailed protection implementation plans in cooperation with the relevant agencies and landowners. Conservation efforts in these strategic focal areas have been based on these implementation plans. Land protection work in the Everglades Headwaters National Wildlife Refuge has been based on the stakeholder partnerships, incentives and implementation methodologies developed during the Pilot Project, and USFWS is successfully working with partners to leverage funding to maximize land protection in the region.

The Pilot Project region almost completely overlaps the Southwest Florida LCD study area. The Pilot Project process was a massive stakeholder effort; through stakeholder committees and ongoing discussions with agencies, landowners, local and regional governments, and industrial and development interests. The Pilot Project has been based on the premise of using the best available science as a starting point, and then incorporating the on the ground reality -- or human component -- to develop a final conservation plan. The Southwest Florida LCD builds upon the work initiated in the Pilot Project. Through the partnerships developed and lessons learned, we can continue to refine incentive-based conservation in the region.

Stakeholder recommendations from the Southwest Florida Cooperative Conservation Blueprint Pilot Project included:

- Elevate stakeholder-identified priority areas to a high level within agencies with funding programs;
- Get as much landowner buy-in as possible prior to publicizing priority maps;
- Obtain agency agreement to prioritize and have real programs in place prior to publicizing priority maps;
- Engage with landowners throughout the process (process is dynamic).

Implementing meaningful landscape–scale conservation with incentives requires significantly greater coordination and cooperation across agencies, NGOs, and landowners, and all feasible opportunities to effect these changes should be further explored. It is recognized that agency programs often have specific purposes and priorities, but where feasible a common set of strategic focal priorities would be beneficial to both the efficiency and effectiveness of conservation planning and implementation efforts. Agencies should focus on where priority areas overlap, and what flexibility there is within programs to focus on specific areas together. Inter-agency coordination is crucial to integrate existing efforts across relevant federal, state and local programs to facilitate cooperation and maximize available funding/resources. Efforts in the Everglades Headwaters and Conservation Area have been multi-agency and based on such partnerships to maximize funding to mutual priority areas. Agency co-

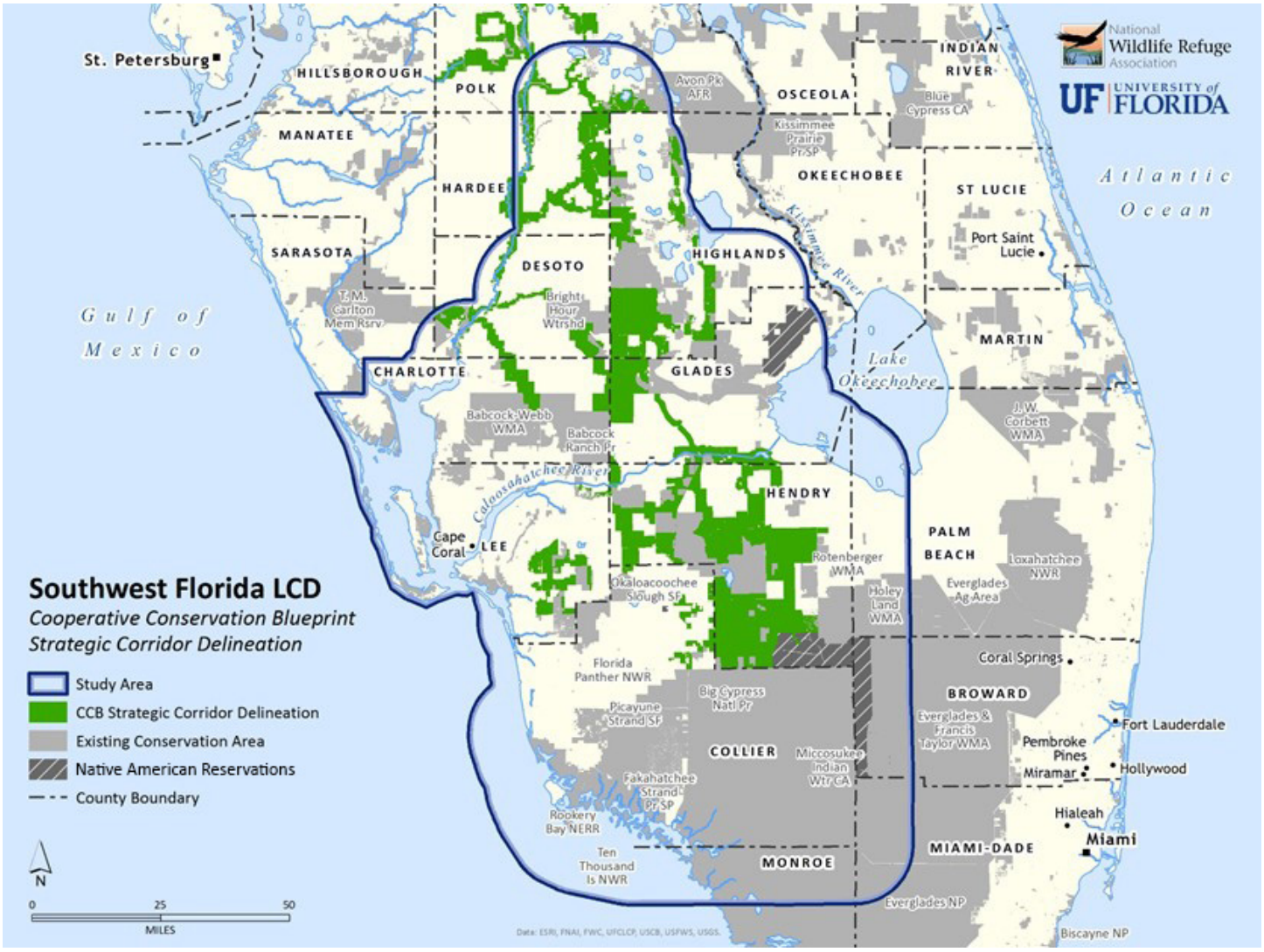


Figure 2. Cooperative Conservation Blueprint Strategic Corridor delineation.

operation to protect the identified priority areas is the primary goal of the Blueprint and our stakeholders.

In 2015 the PFLCC steering committee voted to continue to prioritize and further focus on the Blueprint Pilot Project study area and incorporate and build upon Blueprint products in future work in the region. The Southwest Florida region is considered by the PFLCC to be a priority region for conservation efforts including partnership work between the U.S. Fish and Wildlife Service, the Florida Fish and Wildlife Conservation Commission, the Natural Resources Conservation Service, the Florida Department of Environmental Protection, The Florida Forest Service, and other agencies, organizations, and landowners. In addition, the Blueprint Pilot Project is considered to be a model for other regions in the PFLLC region with a goal of conducting similar efforts. The Southwest Florida LCD has been developed under this PFLCC umbrella with the Blueprint Pilot Project and acceptance of the Pilot Project priorities and recommendations by the PFLCC serving as the foundation for continuing conservation planning and implementation through the LCD and related efforts.

The Cooperative Conservation Blueprint Regional Pilot Project final report can be obtained here. http://myfwc.com/media/2671373/StrategicApproach.pdf

The partners listed on the following page were stakeholders throughout the Blueprint Pilot Project, and we have continued to work with them throughout this planning process. (Note- this is not an inclusive list and new partners have joined these cooperative planning efforts over the past several years).

Agency Partners

- Florida Department of Environmental Protection Florida Forever Program
- Florida Department of Agriculture Rural and Family Lands Protection Program
- Natural Resource Conservation Service Agricultural Land Easement Programs
- Florida Fish and Wildlife Conservation Commission
- South Florida Water Management District
- Southwest Florida Water Management District
- Army Corps of Engineers
- Southwest Florida Regional Planning Council
- Central Florida Regional Planning Council
- Lee County
- Collier County
- Hendry County
- Glades County
- Desoto County
- Hardee County
- Highlands County

NGO Partners

- Conservancy of Southwest Florida
- Defenders of Wildlife
- Florida Wildlife Federation
- Sierra Club of Florida
- Audubon of Florida
- Audubon of Western Everglades
- Save our Creeks
- Archbold Biological Station
- South Florida Wildlands Association

Landowners

- Alico
- King Ranch
- Lykes Brothers
- Rafter T Ranch
- Limestone Ranch
- Peace River Refuge
- Mosaic Company
- Evans Properties
- TRB Groves
- Duda Ranch
- CF Industries
- Tippen Bay Ranch
- McCarlton Partners, Ltd
- Gulf Citrus Growers Association
- Florida Farm Bureau
- Peninsula Properties
- Florida Outdoor Properties
- Grazing Lands Coalition

Other Conservation Planning and Protection Efforts in the Region

Rural Land Stewardship-East Collier Habitat Conservation Plan

The Rural Land Stewardship Area (RLSA) program was established by Collier County's Land Development Code (LDC) in conformity with the Growth Management Plan (GMP). The purpose of the program is to encourage smart growth patterns in rural areas of the county per the GMP, with the objective of creating an incentive based land use overlay system referred to as the Collier County Rural Lands Stewardship Area Overlay Program.

The Stewardship Sending Area (SSA) is used to issue Stewardship Sending Area credits to property owners which may be used to entitle properties in the Stewardship Receiving Area (SRA) in the form of self-contained planned urban developments in the RLSA. The SSA Program within the RLSA establishes a method for protecting and conserving the most valuable environmental land, including large connected wetland systems and significant areas of habitat for listed species.

The landowners within the RLSA have written a Habitat Conservation Plan HCP (currently being reviewed by USFWS) that would allow 45,000 acres of development and protect 109,000 acres in eastern Collier County. This HCP is based on Collier Couny's RLSA. The lands and waters of eastern Collier County that are included in the multispecies HCP are also analyzed in the context of this broader LCD. This LCD depicts the lands that provide the best available habitat for focal species while considering landscape connectivity. Although there are many similarities and some differences in the lands and waters proposed for protection in the draft HCP and the LCD's ecological priorities, further analysis would be needed to determine the impact to any specific threatened or endangered species. Therefore, this LCD should be used for general conservation planning purposes and not for regulatory decisions involving the loss of habitat for a specific threatened or endangered species.

Photo credit: Larry Richardson/US Fish and Wildlife Service

Identifying Ecological Conservation Priorities

The ecological prioritization process was developed by conducting three separate modeling processes with results that were then combined into a final layer of Ecological Priority Tiers. These models were a Florida panther conservation priorities analysis, a focal species habitat priorities overlay model, and a Marxan analysis run with both focal species habitat and focal natural communities land cover data. We have included summaries of the methods and results for these analyses in the main body of the report. A more detailed version of the methods and results is included in **Appendix B**.

Panther Model

The panther prioritization was developed by merging five relevant GIS data layers into one model to identify areas that are the highest priority for conserving panther habitat and corridors within the study area.

Potential panther habitat

A new potential panther habitat model was created using Florida Cooperative Land Cover data version 3.1 and applying a modified set of rules based on the potential panther habitat model developed by Kautz et al. (2006). Larger forest patches surrounded by compatible rural land cover were identified as potential habitat that were also connected to larger landscape patches identified by Thatcher et al. (2006; 2009).

Frakes et al. habitat panther habitat model

This layer was created following the recommendation of Frakes et al. (2015) where all areas with index scores of 0.338 or higher were identified as potential habitat. In addition, since the Frakes et al. model uses a 1 square mile cell size, we also included all areas of potential habitat from the potential panther habitat model within 0.5 miles and connected to Frakes et al. identified habitat.

Florida Panther Subteam Conservation Zones

The Primary Zone, the Dispersal Zone, the Secondary Zone, and the North Focal Area identified in the Florida Panther Subteam Conservation Zones were all combined into one priority.

CLIP 4.0 Landscape Integrity

The CLIP Landscape Integrity layer identifies larger landscapes dominated by natural and semi-natural land cover as having higher landscape integrity and more likely to support functional habitat. The model has index scores ranging from 1-10, and based on CLIP work, we combined areas with index scores from 6-10 as priority areas.

Florida Ecological Greenways Network

All areas within the Florida Ecological Greenways Network were combined as a priority.

These five layers were then simply added together in ArcGIS where the resulting scores ranged from 0 to 5, where 0 would occur in areas where none of the five layers have a value of 1 and areas with a score of 5 have all five layers. Finally, for combining with other layers described below these 5 priority levels were combined as follows (**Figure 3**):

- Values from 3-5 = Tier 1 Priorities
- Values of 2 = Tier 2 Priorities
- Values of 1 = Tier 3 Priorities

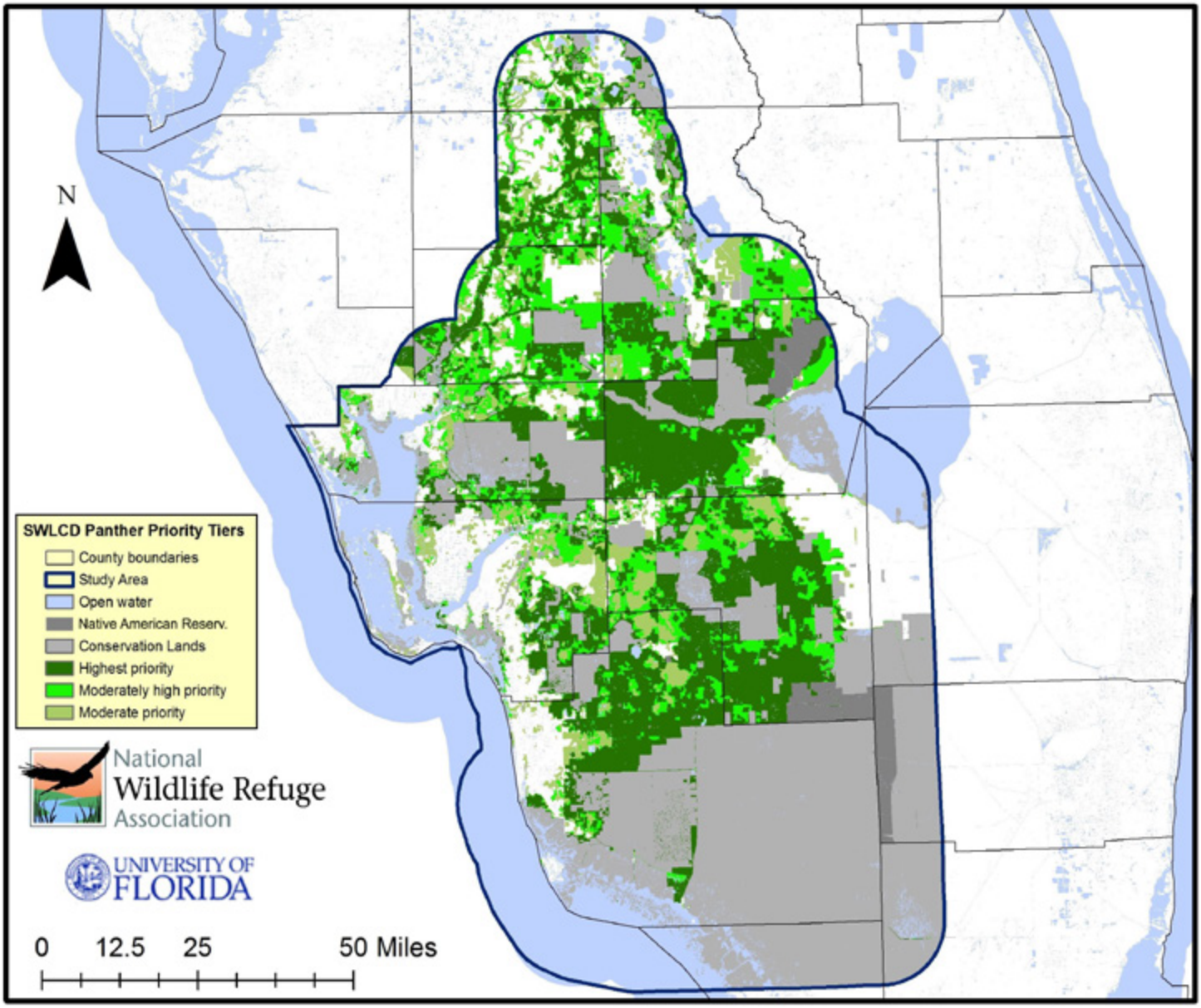


Figure 3. Panther Priority Area Results. On this map Highest priority = Tier 1 Priorities; Moderately high priority = Tier 2 Priorities; Moderate priority = Tier 3 Priorities

Focal Species Overlay Model

The focal species overlay model combines various habitat and landscape factors to identify cumulative focal species priorities using an overlay index approach. The factors were separated into two categories. Each of the individual index layers was created with a rank of 9 to 1 where 9 represents the highest priority and 1 the lowest. The categories and layers were:

Species Habitat Richness and Protection Priorities

a. Species habitat richness: Cells were ranked based on the number of species with potential habitat at each cell location, where more species received higher priority.

b. Species habitat weighted by G rank: Cells were ranked based on species Natural Heritage Global Ranks, where species with G1 ranks received higher priority.

c. Species habitat weighted by federal and state listing status: Cells were ranked based on species federal and state listing status, where cells with species listed as federally endangered received the highest priority.

d. Species habitat ranked by percent and acres protected: Cells were ranked based both on percentage of species habitat protected and the acres of habitat protected, where species with the lowest percentage of habitat protected or lowest amount of acres protected received the highest priority.

Landscape Priorities

a. FEGN prioritization: Focal species habitat within the Florida Ecological Greenways Network (FEGN) received the highest priority and habitat connected to the FEGN received a moderate priority.

b. CLIP Landscape Integrity index prioritization: Habitat was ranked based on its overlap with the CLIP Landscape Integrity index.

c. Distance from conservation lands: Habitat was ranked based on its distance from existing conservation lands with habitat within ¼ mile receiving the highest priority.

d. Connectedness to conservation lands: Habitat in patches connected to existing conservation lands received the highest priority.

These individual layers were then averaged to create the category layers. Then these two category layers were combined through averaging to create the cumulative species prioritization layer (**Figure 4**).

Marxan Analysis

Marxan is a modeling tool frequently used in conservation biology and natural resource management to identify unprotected lands that are most important for attaining conservation goals. It is a form of representation and efficiency analysis, which ensures that all selected focal natural resources are included within a proposed conservation protection plan and that the plan is as efficient regarding cost. Cost is usually represented by total acres of land, so the most efficient plan is the one that achieves the selected conservation goals with the smallest increase in protected lands feasible (Ball et al. 2009).

Marxan requires GIS layers representing focal natural resources and quantitative goals for each of those resources. Although other natural resource features can be included, typically the layers used represent focal species habitat and/or natural communities. For the SWFLCD we used the selected focal species and natural communities discussed above in the *Focal Species and Natural Communities* section.

Marxan also requires the selection of quantitative goals. Goals were discussed among the project team including review of other projects using Marxan. We determined to set goals based on a complimentary set of rules based on listing status (federal and state), Natural Heritage ranking, percent of habitat protected, total acres, and FWC Strategic Habitat Conservation Areas species.

We ran Marxan through various iterations with changes in parameters that seemed to best meet our conservation goals. This included the decision to not run Marxan with a boundary modifier since it seemed to add additional land to the results without appropriately addressing ecological connectivity. After selecting these parameters we ran Marxan through 1000 iterations to determine which additional lands were needed to meet species habitat and natural community protection goals (**Figure 5**).

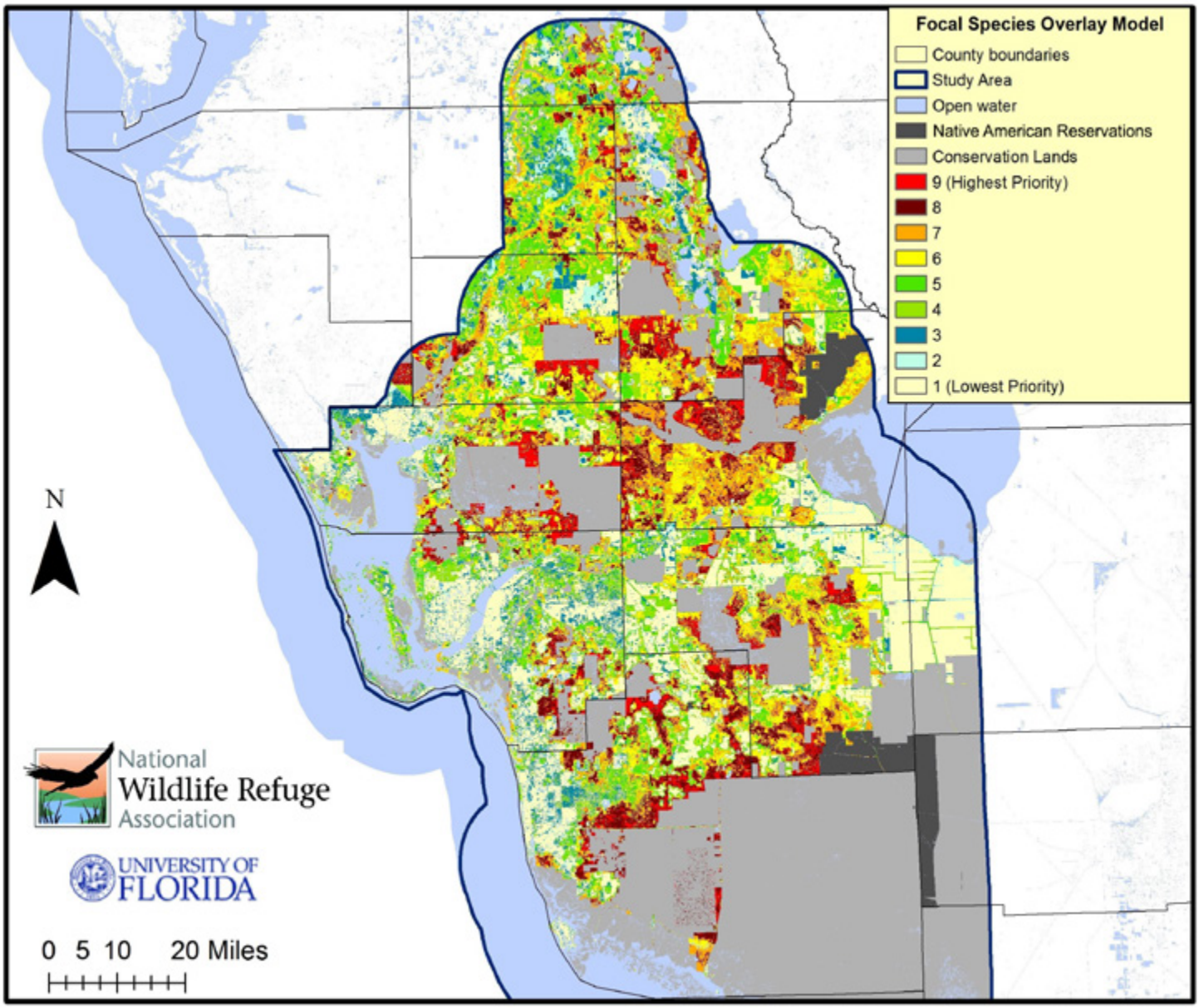


Figure 4. Focal Species Overlay Model.

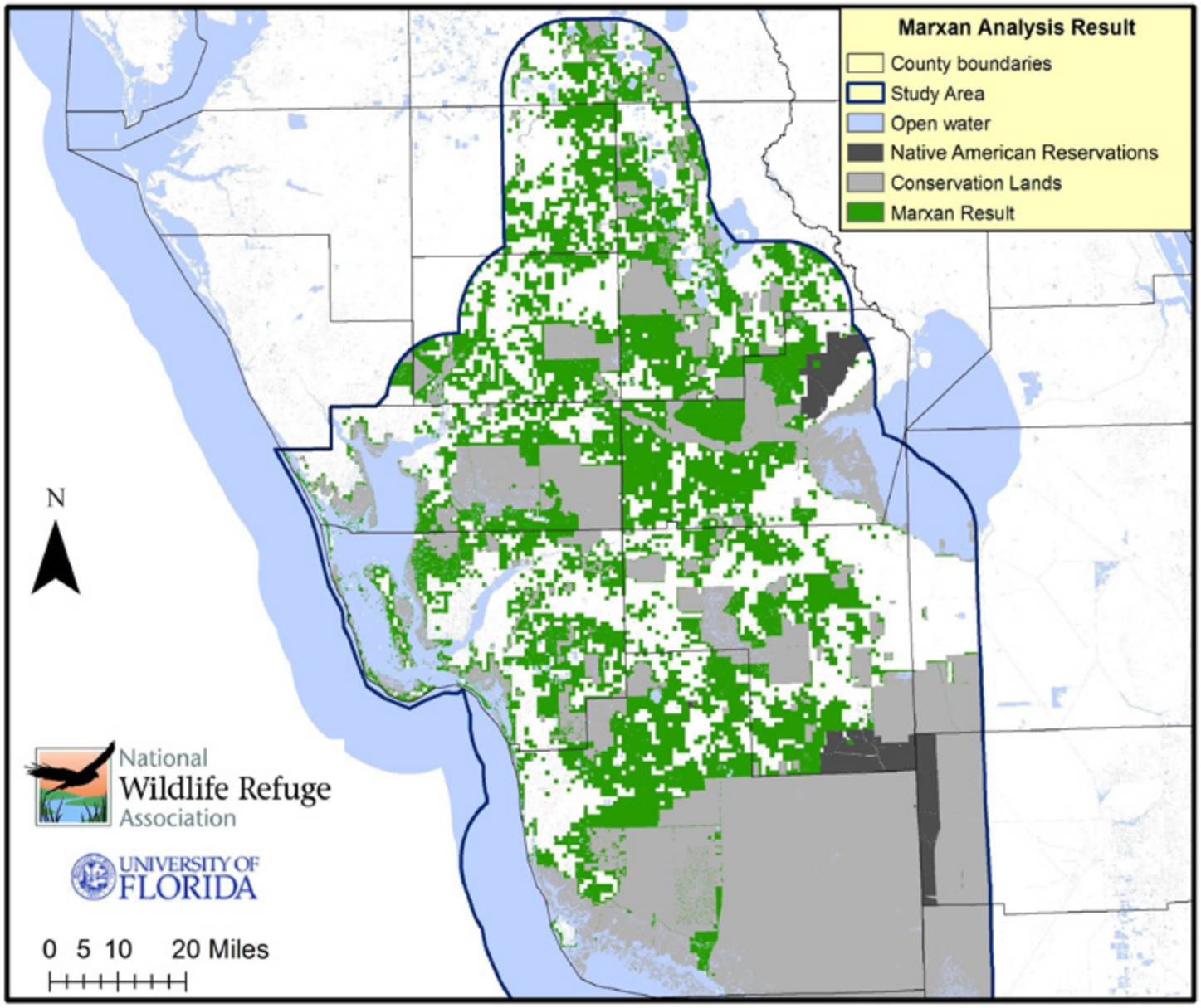


Figure 5. Marxan modeling results showing in green the additional areas needing protection to meet the goals set for focal species and natural communities.

Ecological Priority Tiers

We combined the Panther, Species Overlay, and Marxan model results into one set of priority tiers using the following rules:

- Areas with values 3-5 in the Panther model were identified as most significant for panther conservation and were combined.
- Areas with values of 6-9 from the Species Overlay model were identified as most significant for focal species conservation efforts and were combined.
- All of the Maxent model results were used.

Then the overlap between these three reclassified layers was determined where:

- Areas included in all three models were identified as Tier 1 Ecological Priorities
- Areas included in two of the three models were identified as Tier 2 Ecological Priorities
- Areas in only one of the three models were identified as Tier 3 Ecological Priorities

It should be kept in mind that ALL Tiers are considered to be significant and worthy of conservation protection, however, this overlay method ensures that areas

with the most cumulative conservation value are likely to be in the Tier 1 Ecological Priorities, which makes these areas the primary focus of protection efforts (**Figure 6**). In the final version of the Ecological Priority Tiers, Tier 1 and Tier 2 remained the same, but Tier 3 was revised into a combination of areas in only one of the three models, CCB Strategic Corridor areas, or Panther Review Team (PRT) panther habitat conservation area recommendations (**Figure 7**).

Table 2 shows the land category composition of the three Ecological Priority Tiers. Most existing conservation lands are in Priority Tier 1. There are approximately 900,000 acres of unprotected land in Tier 1 priorities, with over a third of those acres in Florida Forever or Rural and Family Protection Program projects. In addition, we have provided statistics showing how many acres is in each of the Ecological Priority Tiers for each focal species and natural community in **Appendix B**.

Table 2. Ecological Priority Tiers by Major Land and Water Categories

Land Category	Ecological Priority Tier	Acres	Percent
Open Water	Tier 1	49,156	1.1%
Existing Conservation Land	Tier 1	1,830,776	40.8%
Florida Forever or RFLPP	Tier 1	**323,869**	7.2%
Other private wetlands	Tier 1	**231,351**	5.2%
Other private uplands	Tier 1	**336,049**	7.5%
			61.8%
Open Water	Tier 2	71,869	1.6%
Existing Conservation Land	Tier 2	159,081	3.5%
Florida Forever or RFLPP	Tier 2	**72,523**	1.6%
Other private wetlands	Tier 2	**91,255**	2.0%
Other private uplands	Tier 2	**276,500**	6.2%
			15.0%
Open Water	Tier 3	199,440	4.4%
Existing Conservation Land	Tier 3	84,928	1.9%
Florida Forever or RFLPP	Tier 3	**42,171**	0.9%
Other private wetlands	Tier 3	**66,113**	1.5%
Other private uplands	Tier 3	**531,156**	11.8%
			20.6%
		4,366,238	97.3%

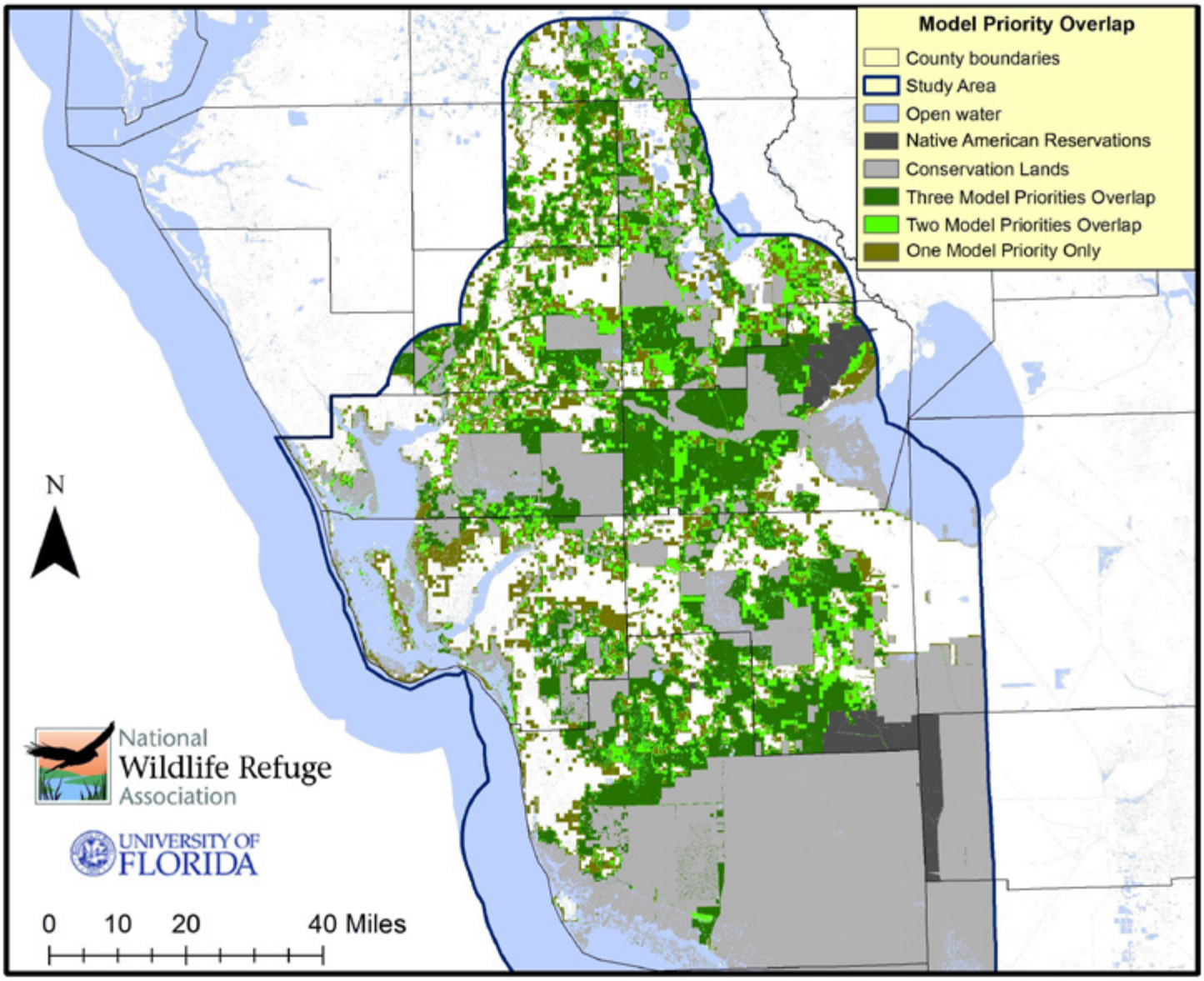


Figure 6. Original Ecological Priority Tiers based on the overlap of high priorities from the Panther, Species Overlay, and Marxan models.

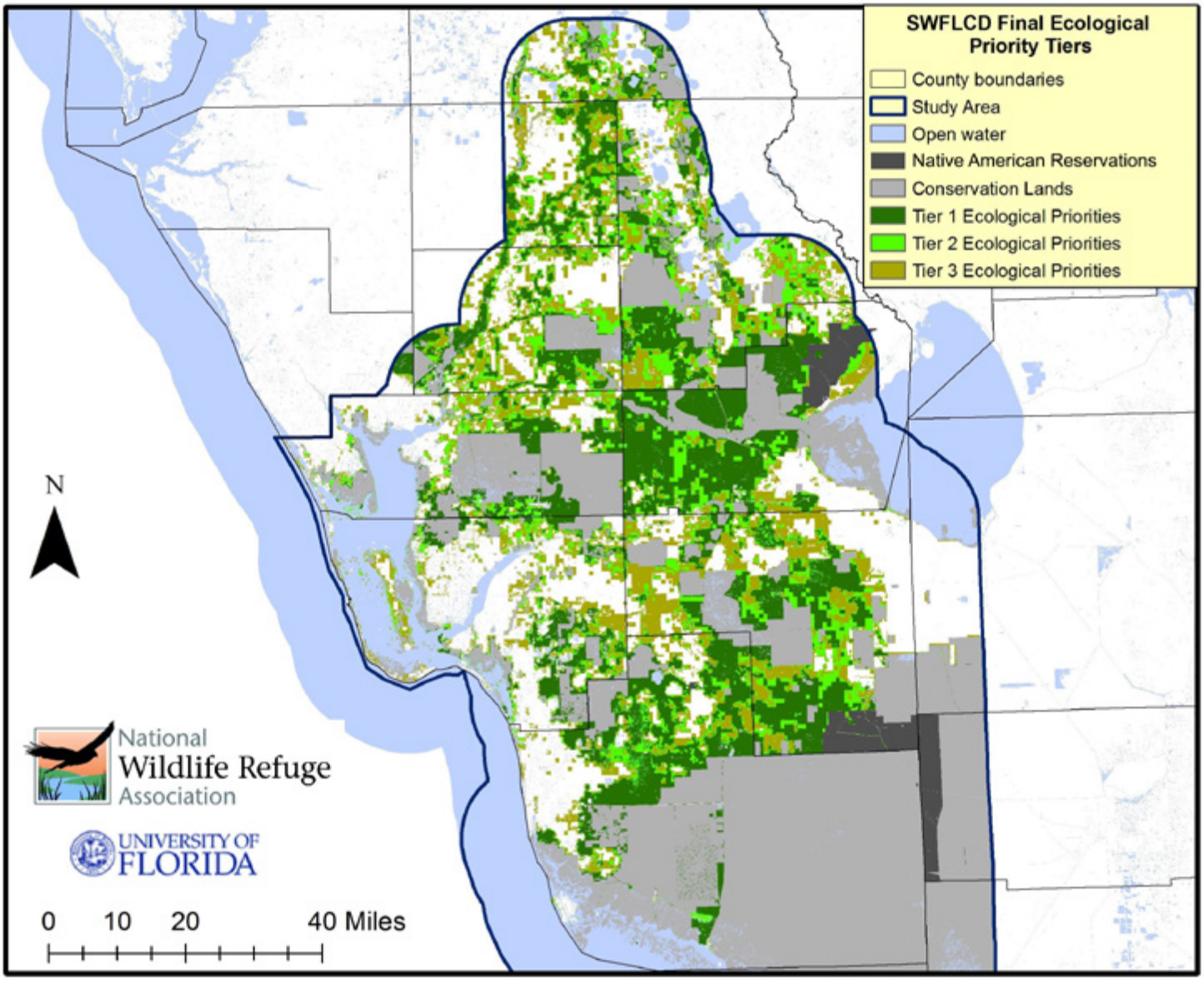


Figure 7. The final Ecological Priority Tiers with the additional panther habitat conservation recommendations and CCB Strategic Corridors added to Tier 3.

Photo credit: Larry Richardson/US Fish and Wildlife Service

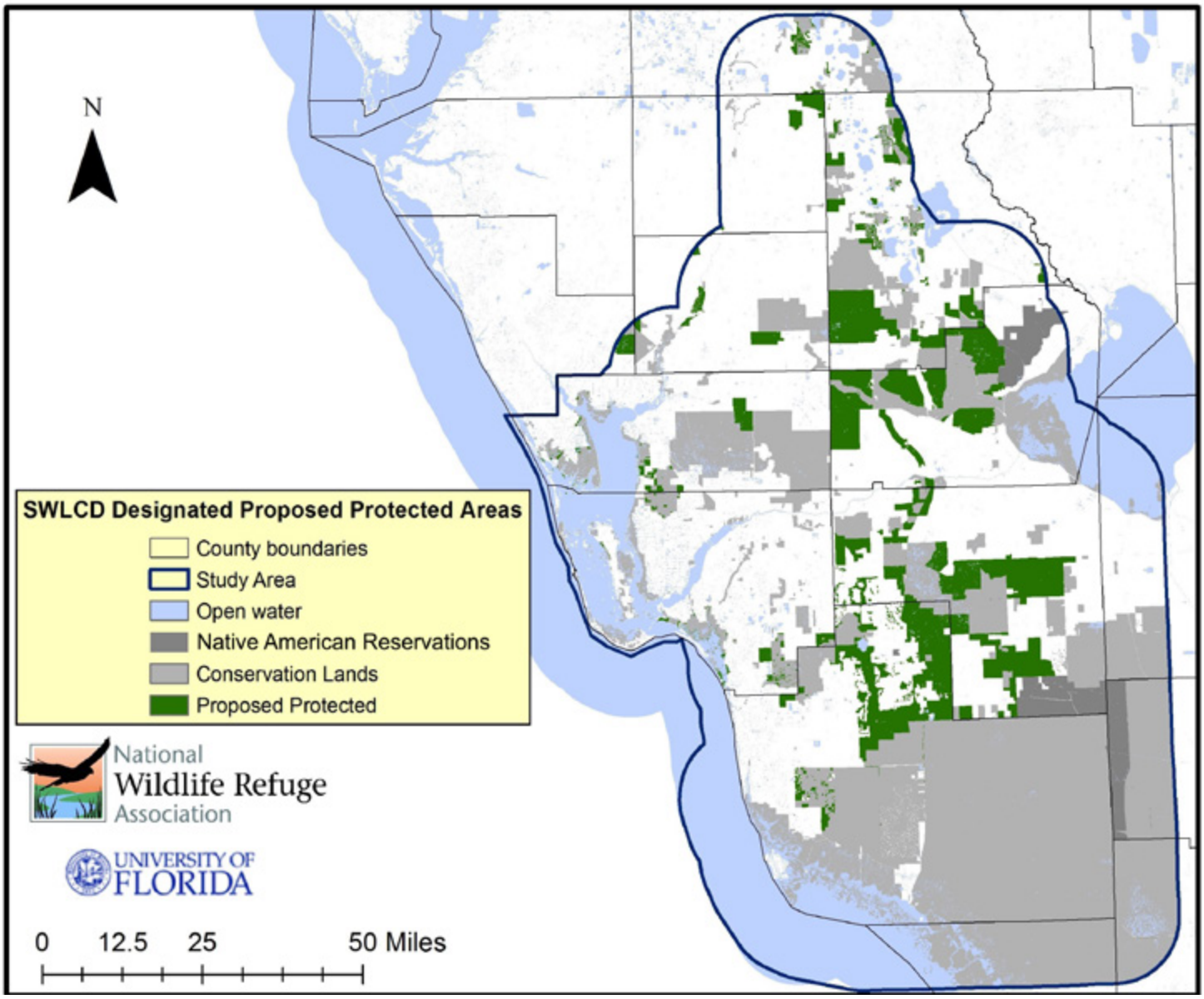


Figure 8. All designated proposed conservation lands.

Identifying Protection Opportunities

We identified potential protection opportunities based on the concept of protection feasibility regarding existing programs that provide funds for conservation easements and fee simple acquisition. The goal was to provide GIS data that could be used to determine the potential feasibility of protecting areas within the identified Ecological Priority Tiers. More detail on the methods for identifying protection opportunities is provided in **Appendix B**.

Designated Proposed Protected Areas

Designated proposed protected areas included all Florida Forever projects, all Tier 1 Rural and Family Lands Protection Program projects, all proposed protected land in the Collier County RLSA, the proposed Florida Panther HCP protected lands, and any approved Sector Plan proposed protected lands (**Figure 8**).

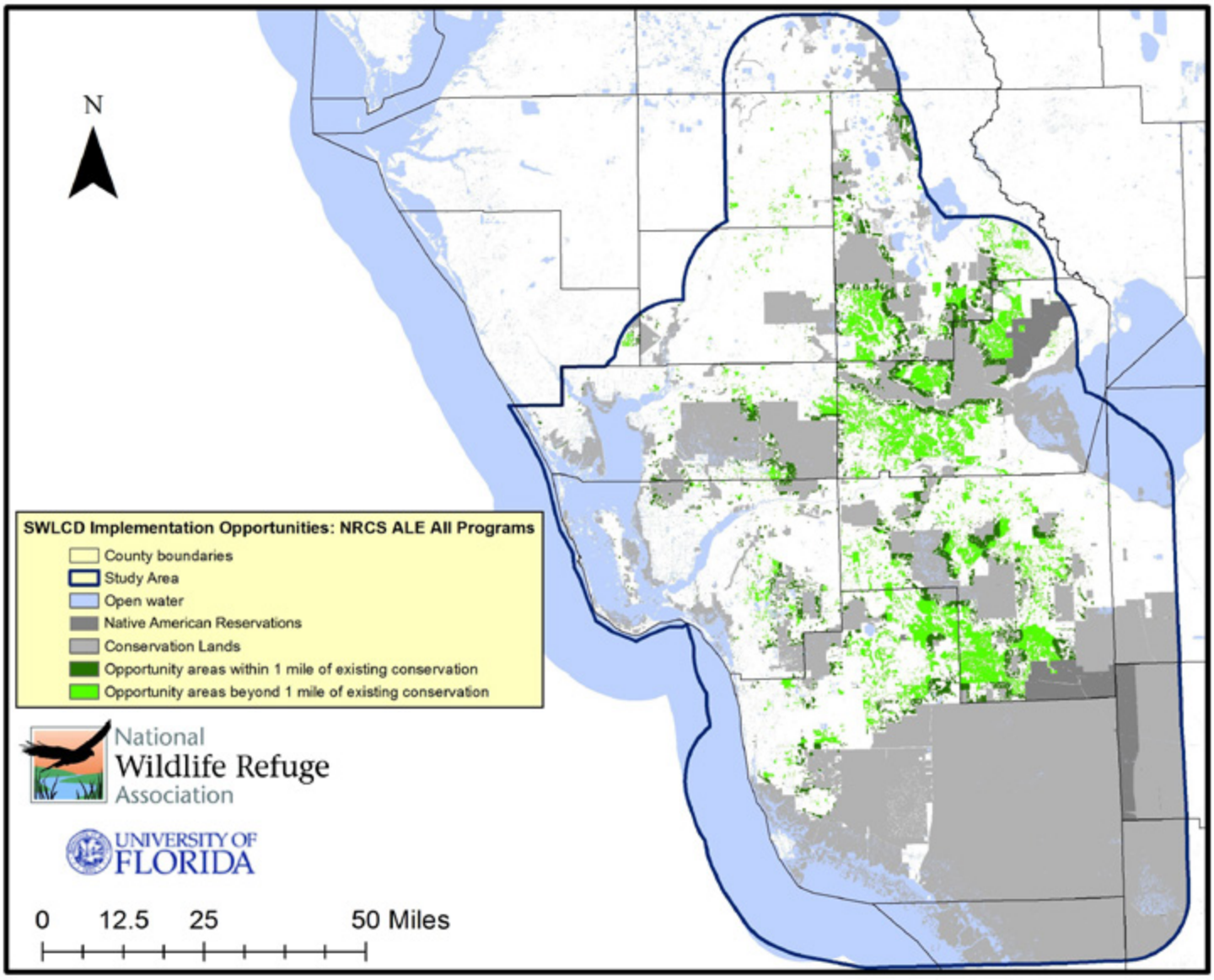


Figure 9. Potential candidate areas for all NRCS ALE programs combined.

NRCS ALE Easement Program

We used high point criteria used in both the ALE and ALE-Grassland easement programs evaluation process that could be mapped in GIS to identify areas that are potentially better candidates for these programs. The criteria included counties in the NRCS Gulf or Everglades priority regions, prime farmland soils, CLIP 4.0 Biodiversity Resource Category Priority 1 and Priority 2, and parcels at least 40 acres or larger. Areas meeting these criteria were then split into two tiers, with areas within 1 mile of existing public or private conservation lands identified as Tier 1 and other areas meeting all other criteria but beyond 1 mile from existing conservation lands identified as Tier 2.

The criteria for the ALE-Grassland program were priority natural communities from the Cooperative Land Cover version 3.1 dataset (dry prairie, wet prairie, scrub, scrubby flatwoods, sandhill, upland pine, marl prairie, freshwater marsh, wet flatwoods, mesic flatwoods), prime farmland soils (state and Collier County), and parcels 40 acres or larger. Areas meeting these criteria were then split into two tiers, with areas within 1 mile of existing public or private conservation lands identified as Tier 1 and other areas meeting all other criteria but beyond 1 mile from existing conservation lands identified as Tier 2.

These two maps were then combined into a final NRCS ALE program opportunities map (**Figure 9**).

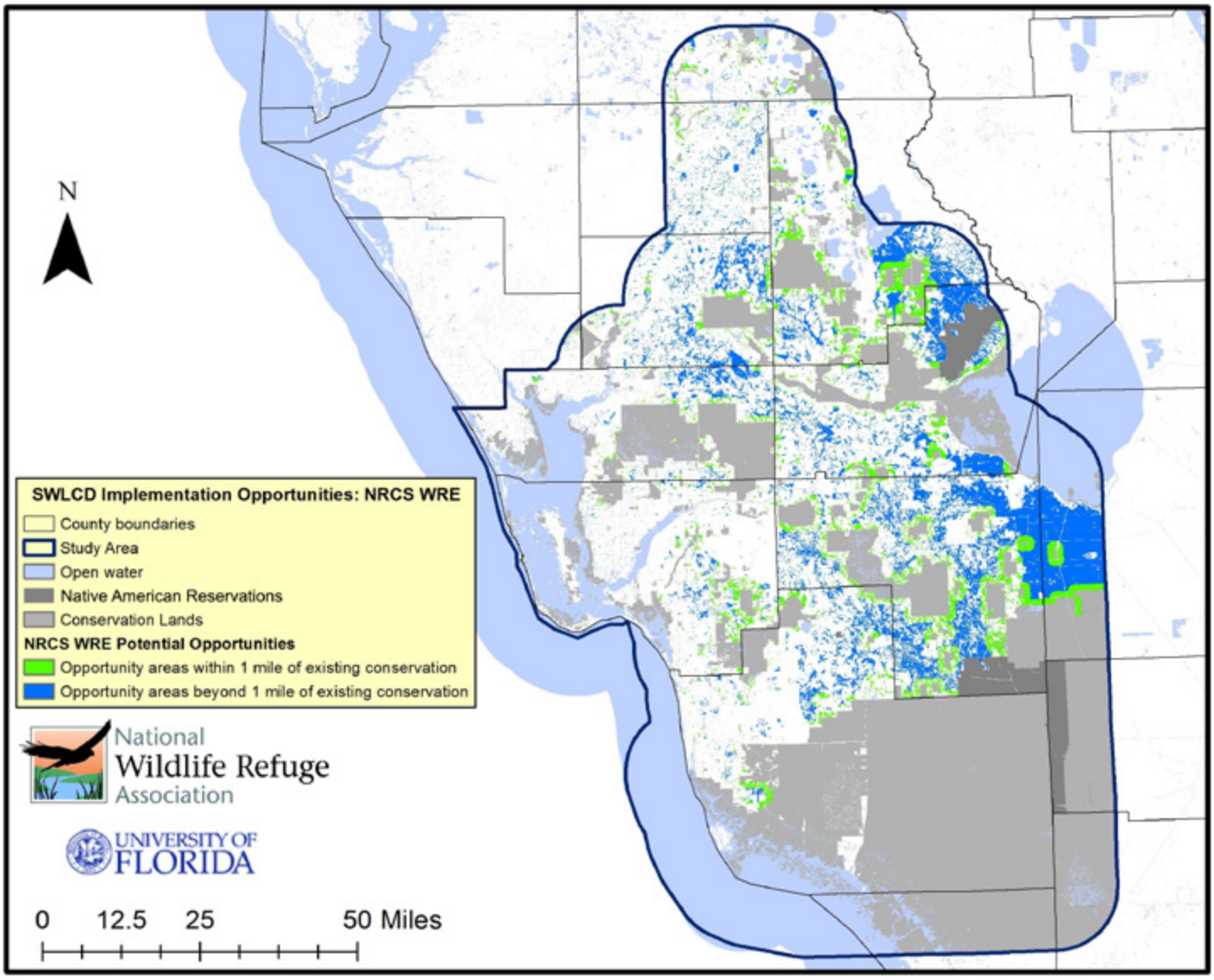


Figure 10. Potential candidate areas for the NRCS WRE program.

NRCS Wetland Reserve Easements

We used high point criteria used in the WRE program evaluation process that could be mapped in GIS to identify areas that are potentially better candidates for this program.

The criteria used were potential former wetlands that are still potentially restorable and parcels 40 acres or larger. Areas meeting these criteria were then split into two tiers, with areas within 1 mile of existing public or private conservation lands identified as Tier 1 and other areas meeting all other criteria but beyond 1 mile from existing conservation lands identified as Tier 2 (**Figure 10**).

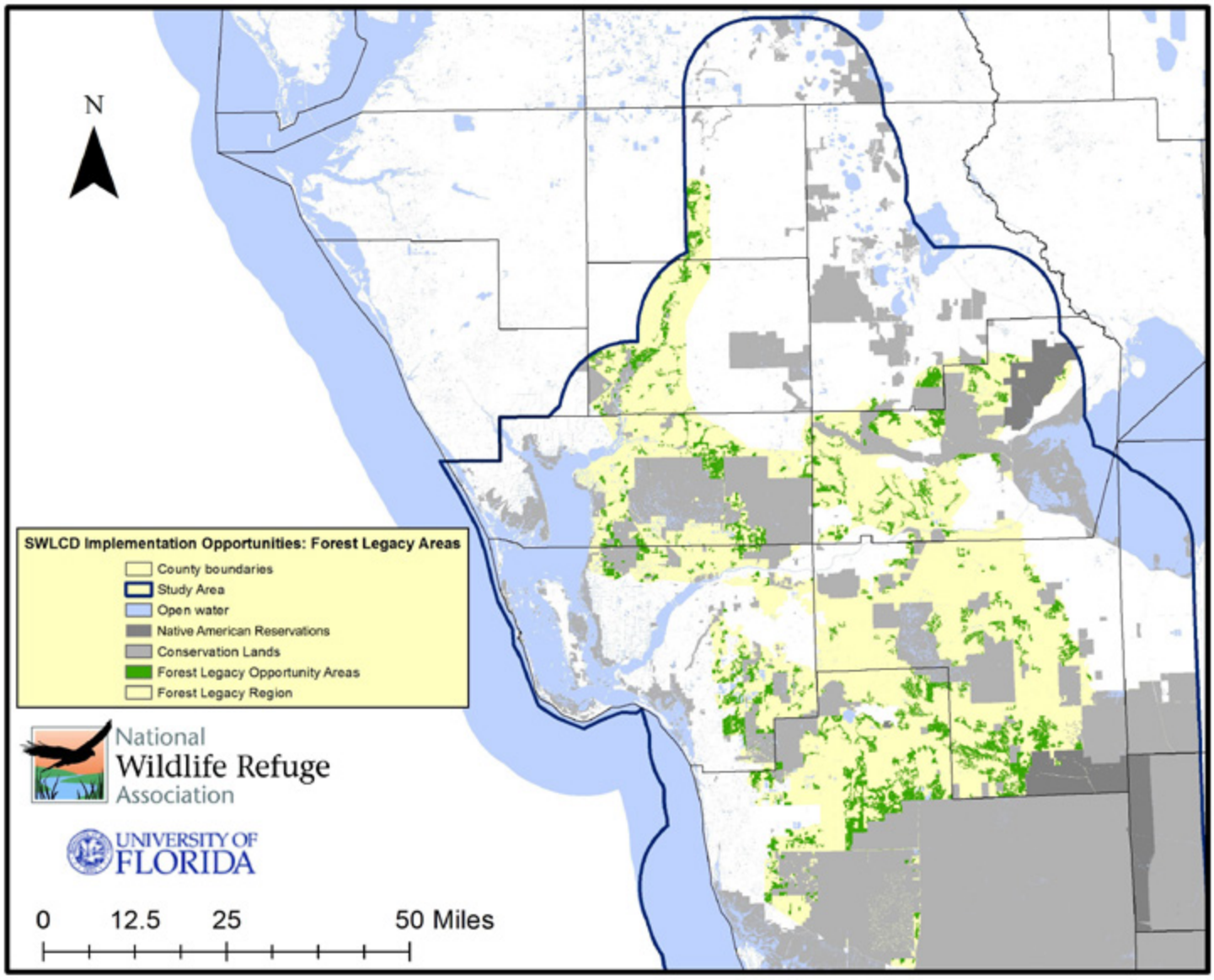


Figure 11. Potential candidate areas for the Forest Legacy program.

Forest Legacy

We used criteria from the Forest Legacy evaluation process that could be mapped in GIS to identify areas that are potentially better candidates for this program. The criteria used for the Forest Legacy program were lands within Forest Legacy program opportunity areas identified by the Florida Department of Agriculture and Consumer Services, all natural forest types in patches 100 acres or larger, and parcels 40 acres or larger (**Figure 11**).

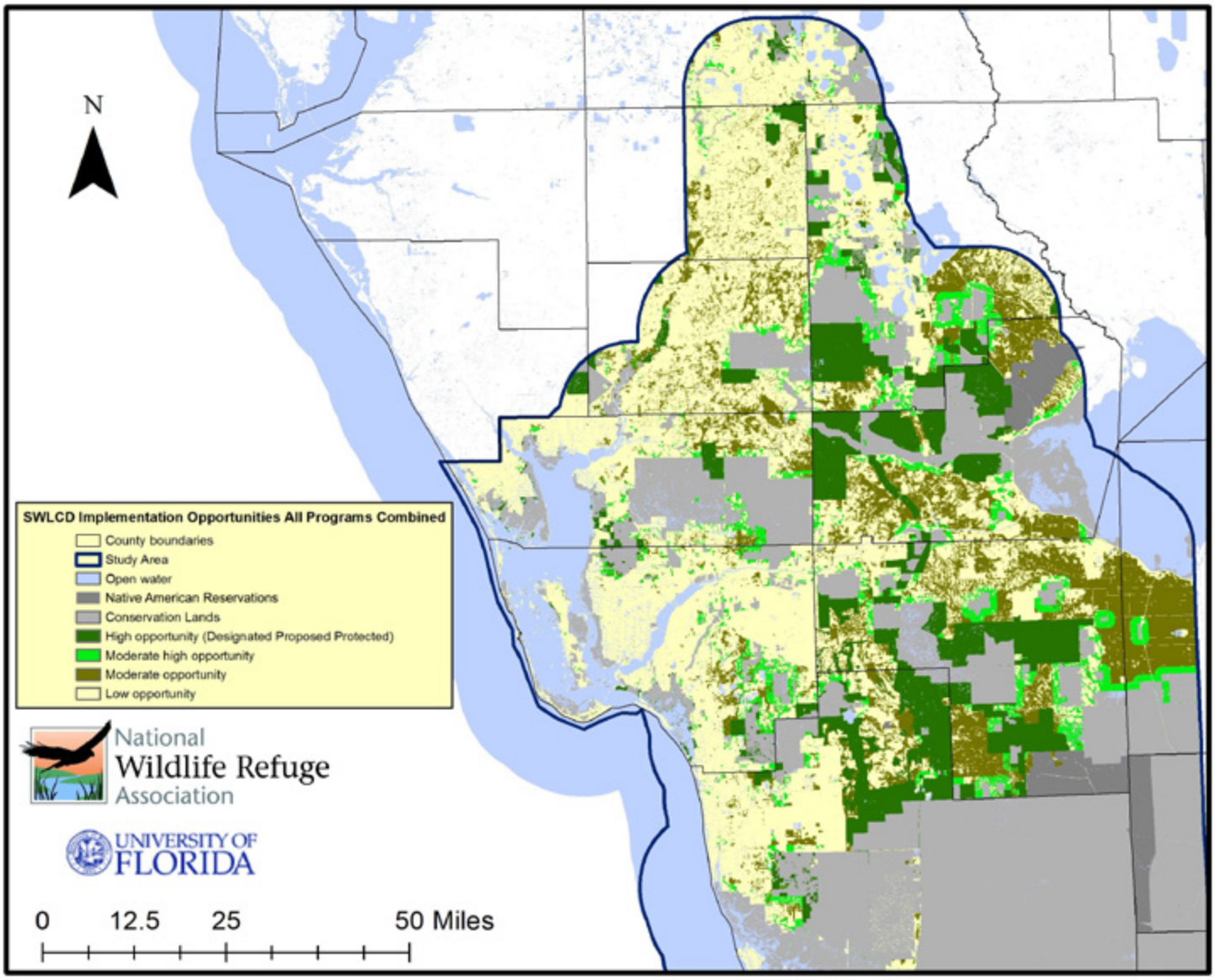


Figure 12. All potential protection opportunities combined.

Combined Opportunity Areas

We combined all of the Opportunity layers into one combined layer depicting potential protection opportunities using four tiers (**Figure 12**):

- Tier 1 (high opportunity): Designated Proposed Protected Areas
- Tier 2 (moderate high opportunity): All NRCS program opportunity areas within 1 mile of existing conservation lands
- Tier 3 (moderate opportunity): All other NRCS program opportunity areas or Forest Legacy opportunity areas
- Tier 4 (low opportunity): All other unprotected areas

Photo credit: Larry Richardson/US Fish and Wildlife Service

Threats from Future Development and Sea Level Rise

We identified potential threats based on the potential for current ecological priority areas to be lost to either land development or inundation from sea level rise. The goal was to provide spatial information that could be used to determine potential threats to Ecological Priority Tiers.

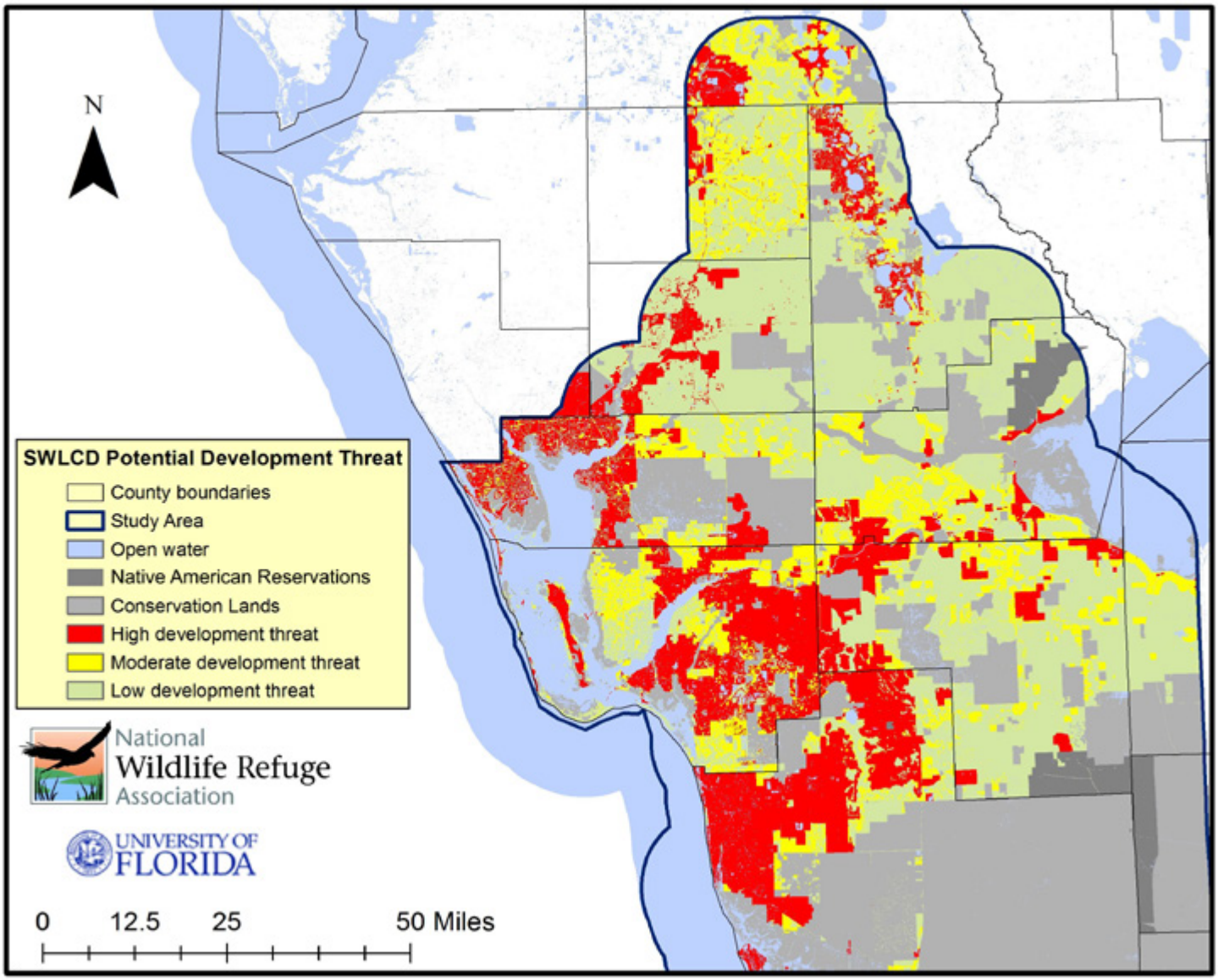


Figure 13. Potential threat from future development.

Potential Future Development

We identified potential future development with several GIS layers that depict lands more likely to be converted to development in the future. The data sources included Future Land Use maps from counties and municipalities, the RLSA program areas in eastern Collier County, the Florida panther HCP proposed developed areas, approved Sector Plans, GeoAdaptive's Scenario 1 statewide projection, and the new Florida 2070 development projection model. These layers were organized into three tiers of potential development threat as follows (**Figure 13**):

- Tier 1 (highest threat of development, approximate 2017-2030 time frame): All developed land use categories in Future Land Use data; All RLSA proposed developed areas; all Panther HCP proposed developed areas; all approved Sector Plan proposed developed areas
- Tier 2 (moderate threat of development, approximate 2030-2070 time frame): All projected development from the GeoAdaptive and Florida 2070 growth projection models (where they did not overlap with Tier 1 projected development)
- Tier 3: All other areas that are not currently developed

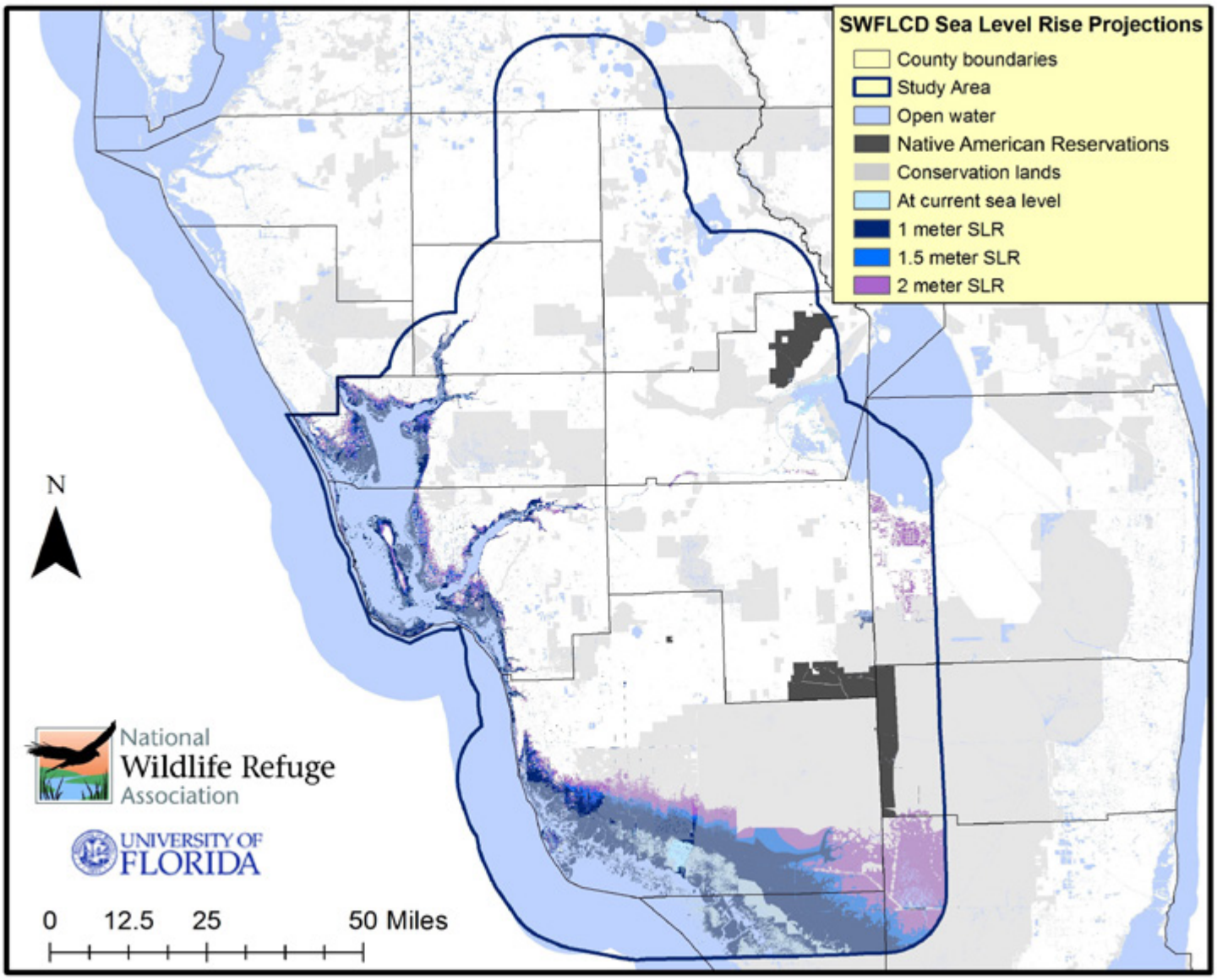


Figure 14. Potential Threat from Sea Level Rise.

Sea Level Rise

We used bathtub based sea level rise scenarios created for a statewide sea level rise impact assessment by Noss et al. (2014) to identify areas potentially at risk from sea level rise. Scenarios were created using the best available high resolution LiDAR-based digital elevation model (DEM) data, and adjusted for MHHW tide levels and hydrologic connectivity. Scenarios used included sea level rise projections of 1 meter, 1.5 meters, and 2 meters (**Figure 14**).

Photo credit: Larry Richardson/US Fish and Wildlife Service

Ecological Priorities, Opportunities, and Threats Analysis

Comparison of Ecological Priority Tiers to Opportunities

We combined the Ecological Priority Tiers and the Opportunities layer to identify the best potential protection opportunities in each priority tier, with the most focus on the Tier 1 Ecological Priorities that have the highest protection opportunity (**Figure 15**). In addition we identified the acres of each Ecological Priority Tier in each of the opportunity tiers (**Table 3**).

Table 3. Acres Statistics for Ecological Priority Tiers in the Protection Opportunity Tiers

Category	Acres	Percent
Tier 1 Ecological Priority-High Opportunity	370,691	41.1%
Tier 1 Ecological Priority-Moderate High Opportunity	75,443	8.4%
Tier 1 Ecological Priority-Moderate Opportunity	157,655	17.5%
Tier 1 Ecological Priority-Low Opportunity	297,392	33.0%
	901,181	
Tier 2 Ecological Priority-High Opportunity	88,597	19.4%
Tier 2 Ecological Priority-Moderate High Opportunity	42,252	9.3%
Tier 2 Ecological Priority-Moderate Opportunity	84,087	18.4%
Tier 2 Ecological Priority-Low Opportunity	240,826	52.8%
	455,762	
Tier 3 Ecological Priority-High Opportunity	69,852	9.4%
Tier 3 Ecological Priority-Moderate High Opportunity	45,811	6.2%
Tier 3 Ecological Priority-Moderate Opportunity	103,399	13.9%
Tier 3 Ecological Priority-Low Opportunity	524,906	70.6%
	743,968	

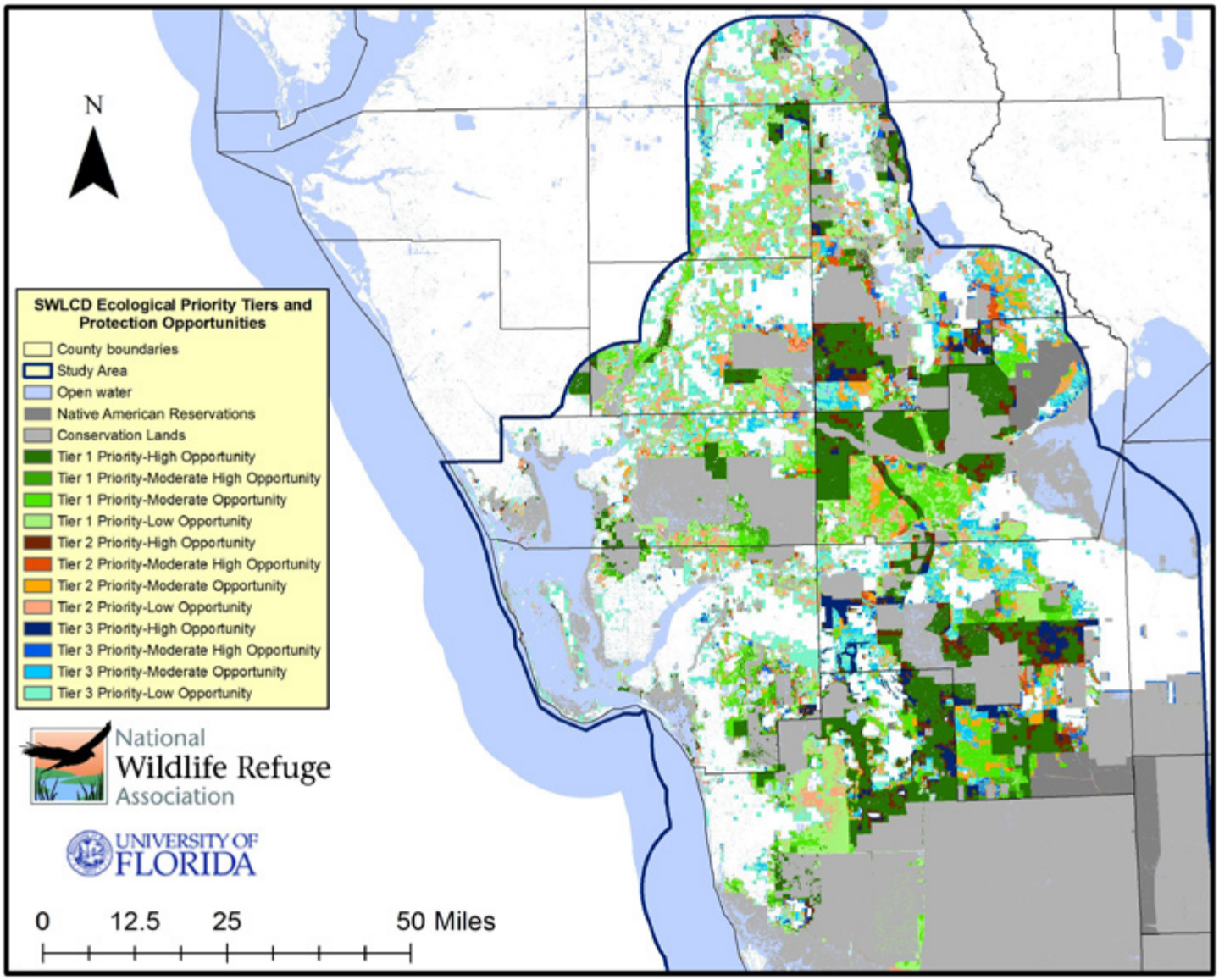


Figure 15. Comparison of Ecological Priority Tiers and Protection Opportunities.

Comparison of Ecological Priority Tiers to Potential Development Threats

We combined the Ecological Priority Tiers and the potential Development Threats layer to identify the ecological priorities that are most threatened by potential conversion to future development, with the most focus on the Tier 1 Ecological Priorities that have the highest potential threat of conversion (**Figure 16**). In addition we identified the acres of each Ecological Priority Tier in the three Threat Tiers (**Table 4**). In **Appendix B** we have also provided statistics showing how many acres are in each of the Potential Development Threat tiers for each focal species and natural community.

Table 4. Acres Statistics for Ecological Priority Tiers Potentially Threatened by Future Development.

Category	Acres	Percent
Tier 1 Ecological Priority-High Development Threat	149,854	16.6%
Tier 1 Ecological Priority-Moderate Development Threat	170,064	18.9%
Tier 1 Ecological Priority-Low Development Threat	581,263	64.5%
	901,181	
Tier 2 Ecological Priority-High Development Threat	97,836	21.5%
Tier 2 Ecological Priority-Moderate Development Threat	75,115	16.5%
Tier 2 Ecological Priority-Low Development Threat	282,812	62.1%
	455,762	
Tier 3 Ecological Priority-High Development Threat	191,704	25.8%
Tier 3 Ecological Priority-Moderate Development Threat	112,313	15.1%
Tier 3 Ecological Priority-Low Development Threat	439,951	59.1%
	743,968	

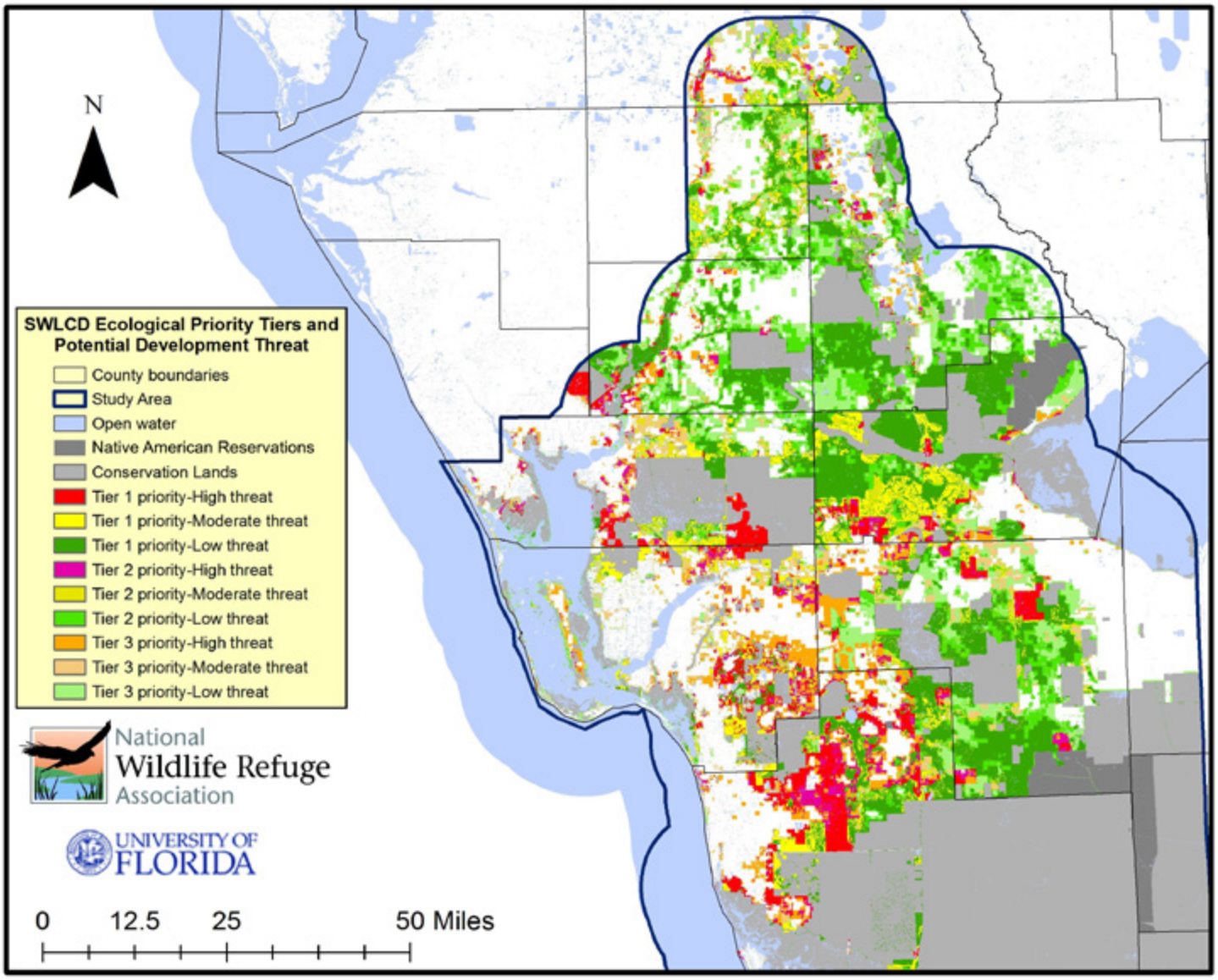


Figure 16. Comparison of Ecological Priority Tiers and Potential Threat from Future Development.

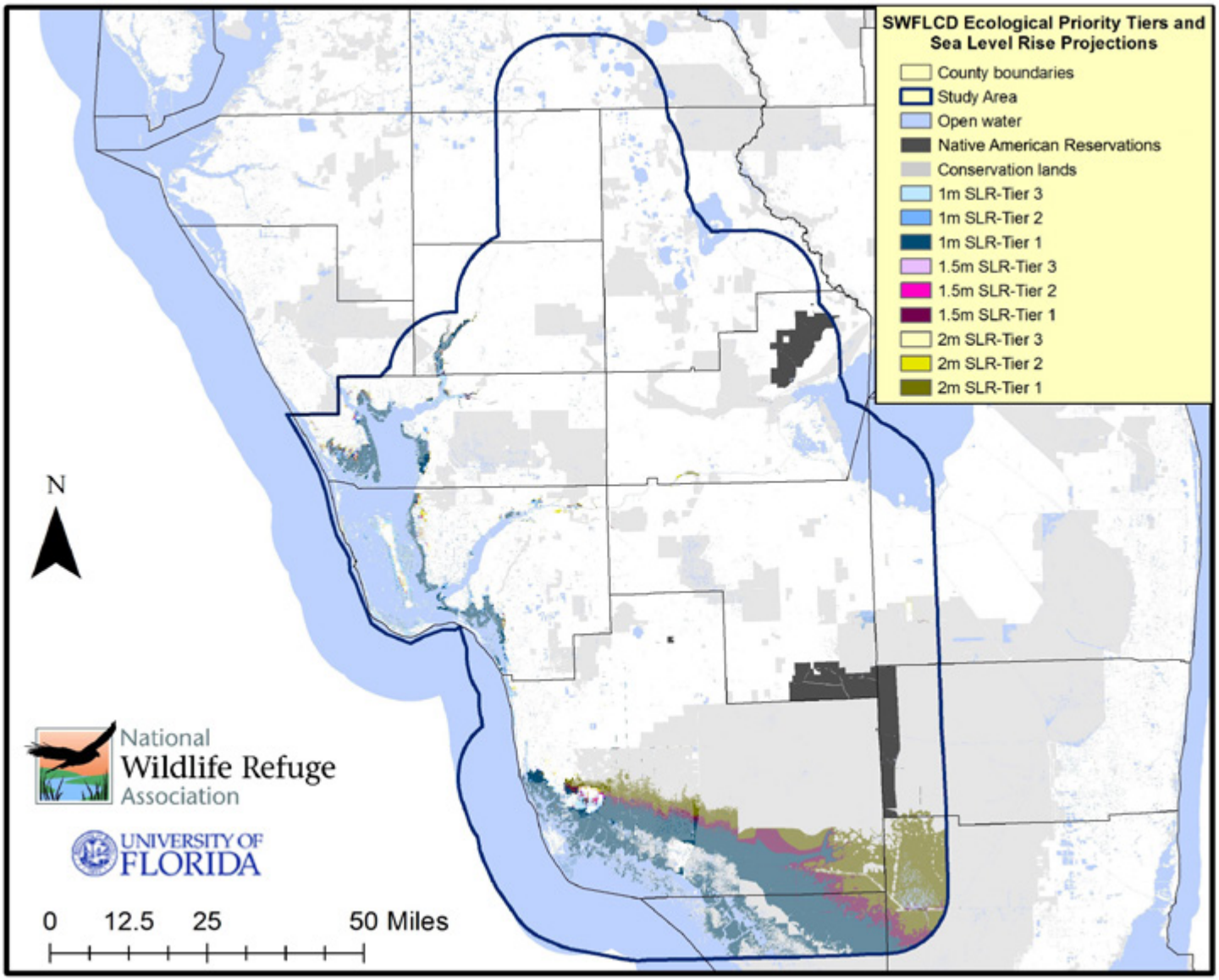


Figure 17. Comparison of Ecological Priority Tiers and Sea Level Rise Projections.

Comparison of Ecological Priority Tiers to Potential Sea Level Rise

We combined the Ecological Priority Tiers and the Sea Level Rise Projection layer to identify the ecological priorities that are most threatened by potential future sea level rise, with the most focus on the Tier 1 Ecological Priorities that have the highest potential threat from inundation (**Figure 17**). In addition, we have provided statistics showing how many acres are in each of the sea level rise projection tiers for each focal species and natural communities in **Appendix B**.

Ecological Priorities, Opportunities, and Threats Matrix (EPOTS)

To provide additional information regarding potential future protection priorities, we combined each of the three Ecological Priority Tiers with both the Opportunity Tiers and the Potential Development Threat Tiers (**Figures 18-20**). This index is intended to combine these three factors into a set of combinations that can inform conservation land protection decision making in the study area. These three categories of relevant decision-making criteria can be combined into a three way "matrix" to determine relative suitability for different actions.

A three tier matrix like this is created in GIS by assigning each factor a numerical "rank" (in this case corresponding to the Priority, Opportunity, and Threat Tiers) and then combining by multiplying one of the factors by 100 (Ecological Priority), the other by 10 (Opportunity), and keeping the third the same (Threat). For example, a Tier 1 Ecological Priority with a high opportunity and high threat is a 343; and a Tier 1 Ecological Priority with a high opportunity and low threat is a 341.

Though decision options will always be context specific, these combinations could help inform decisions. For example areas with a 343 index score are clear priorities where relatively quick action is warranted and lobbying for protecting such areas needs to be a priority. Areas that are 341 are also warranted as high action priorities given that they are likely to be good opportunities with less cost (potentially) than high priorities with high development threat. A 342 may be a good opportunity to consider adding as a Florida Forever or RFLPP project or for one of the relevant federal conservation easement programs.

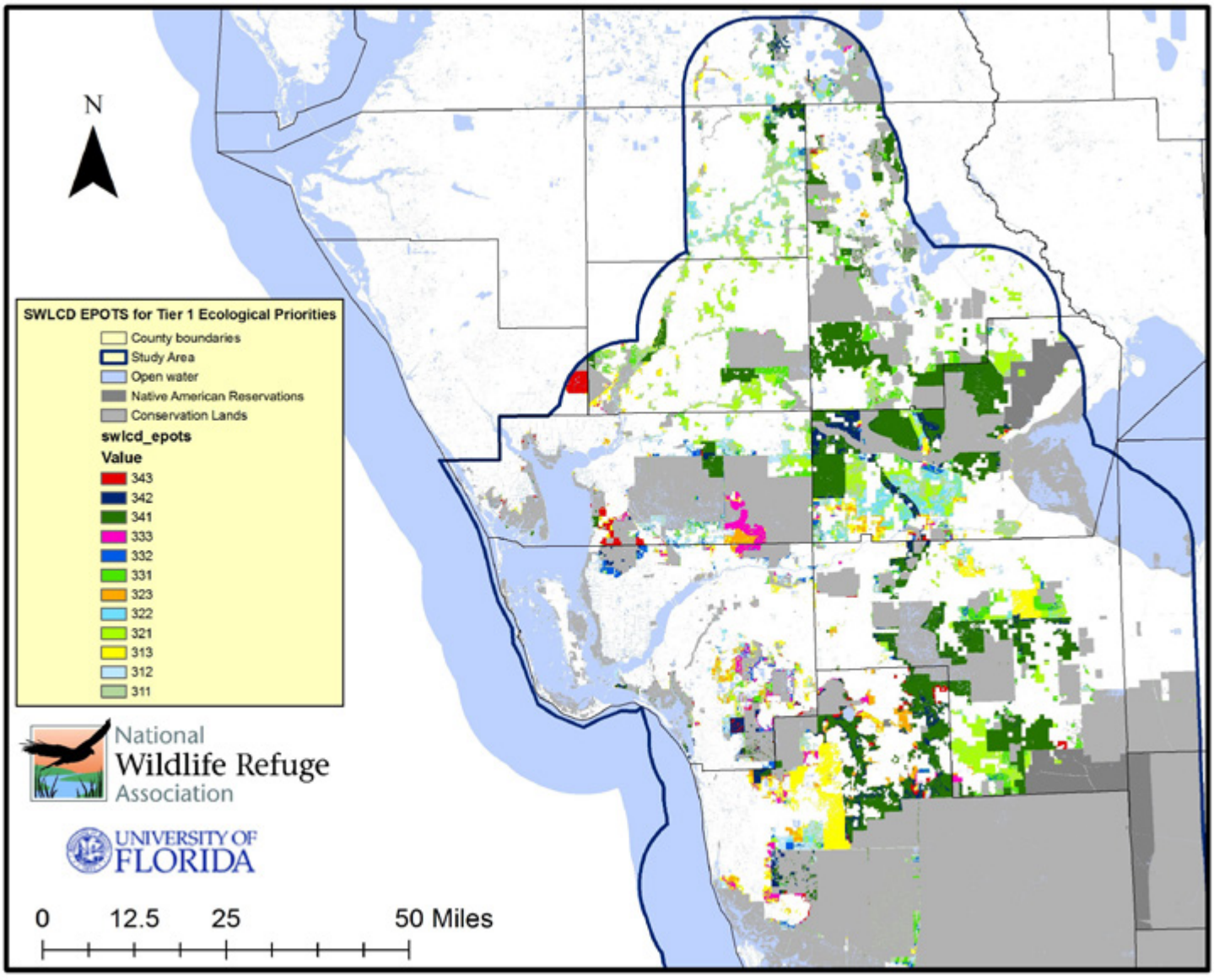


Figure 18. Comparison of Ecological Priority Tier 1, Opportunities, and Development Threats where a 343 represents an area that is a Tier 1 ecological priority, high protection opportunity, and highly threatened from conversion to development.

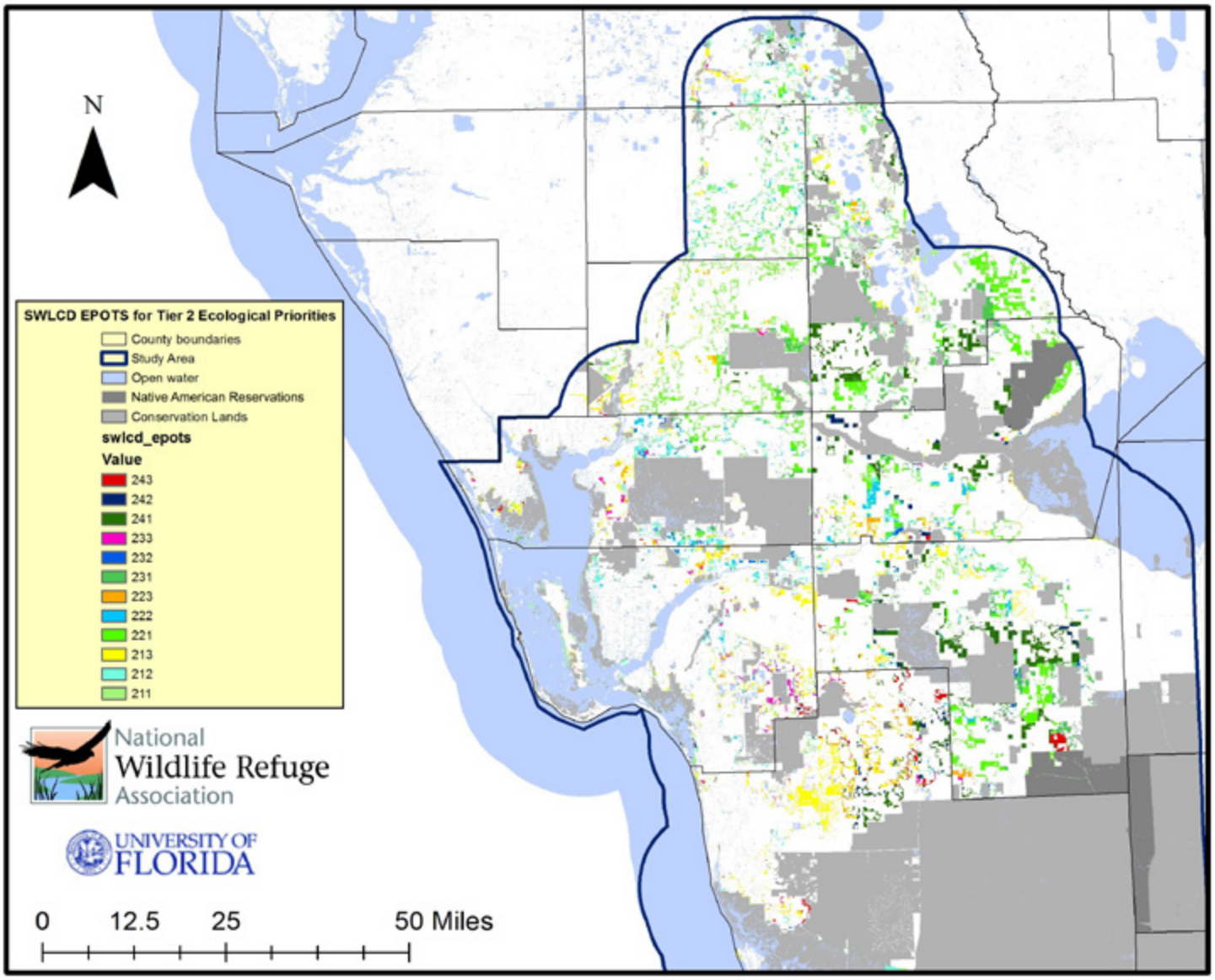


Figure 19. Comparison of Ecological Priority Tier 2, Opportunities, and Development Threats where a 243 represents an area that is a Tier 2 ecological priority, high protection opportunity, and high threat of conversion to development.

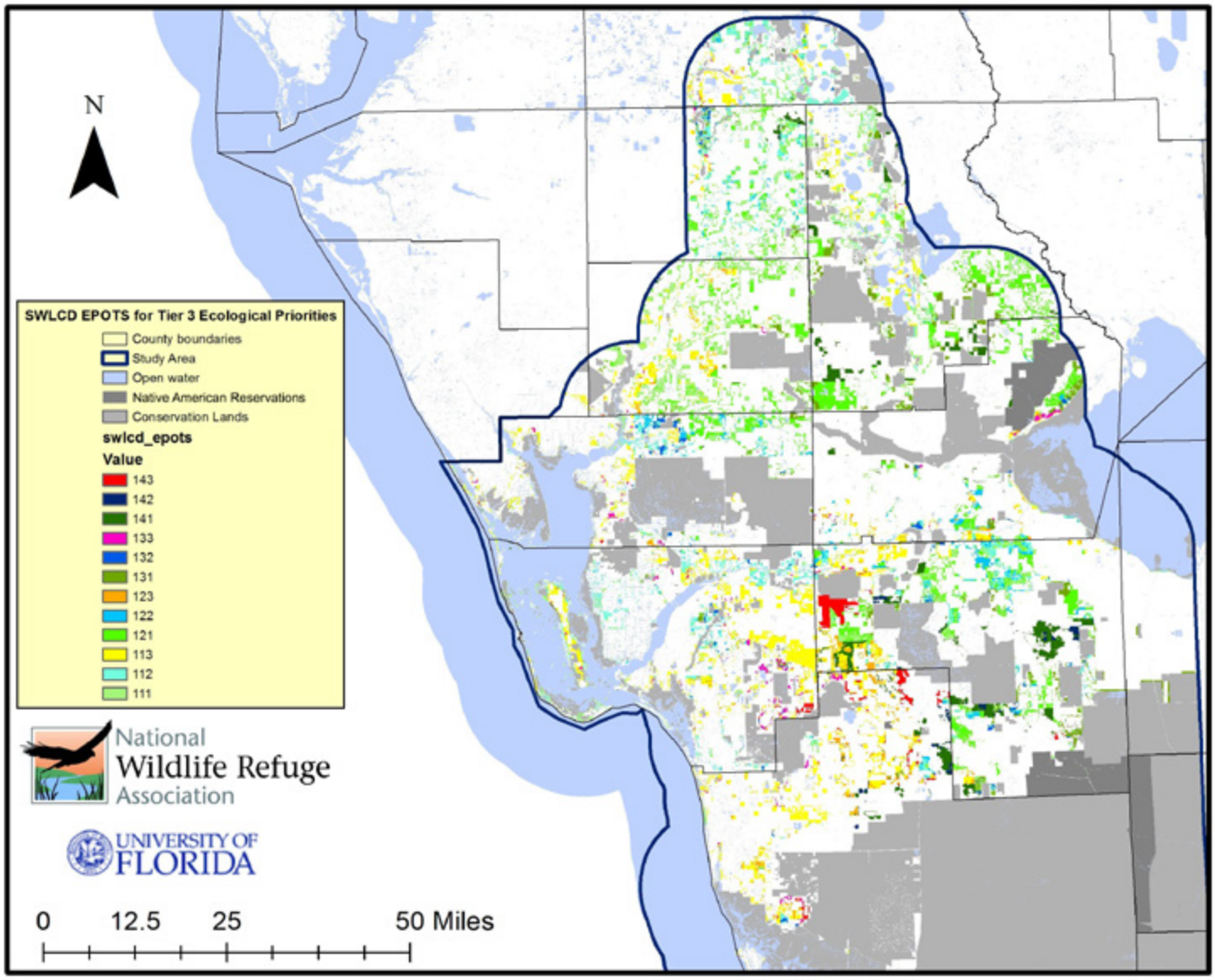


Figure 20. Comparison of Ecological Priority Tier 3, Opportunities, and Development Threats where a 143 represents an area that is a Tier 3 ecological priority, high protection opportunity, and high threat of conversion to development.

Photo credit: Larry Richardson/US Fish and Wildlife Service

Summary and Discussion of Results

Tier 1 Ecological Priorities and Protection Opportunities

There are over 890,000 acres that are currently unprotected in Tier 1 Ecological Priority areas. Approximately 320,000 of those unprotected acres are in Florida Forever projects or Rural and Family Land Protection Program Tier 1 Projects, constituting 36.3% of unprotected Ecological Priority Tier 1 acres. This reinforces two important points that mirror the discussion about fully funding Florida Forever and Rural and the Family Lands Protection Act with Florida Land Legacy funding:

1) Protection of a significant portion of our most important ecological conservation priorities would be addressed by protecting existing Florida Forever projects.
2) The vast majority of Florida Forever projects DO represent the “best of the best” as reflected by this and other analyses including the Critical Lands and Waters Identification Project. Florida Forever projects go through a rigorous evaluation process and are essential for protecting Florida’s biodiversity and ecosystem services. Based on this analysis, they are also critical for protecting the focal species and ecosystems found within the Southwest Florida Landscape Conservation Design study area.

These points are reinforced by comparing existing Florida Forever projects and Tier 1 Rural and Family Lands Protection Program projects to the Ecological Priority Tiers from this project analysis. Eighty-nine percent of Florida Forever projects in the study area are within Tier 1 or Tier 2 Ecological Priorities (**Table 5**) and 79% of Tier 1 Rural and Family Land Protection Program projects in the study area are within Tier 1 or Tier 2 Ecological Priorities (**Table 6**).

Table 5. Number and Percent of Acres of Florida Forever Projects in the Study's Ecological Priority Tiers

Category	Acres	Percent
Florida Forever Projects in High Priority	301,710	73.0%
Florida Forever Projects in Moderately Priority	67,719	16.4%
Florida Forever Projects in Moderate Priority	37,876	9.2%
Florida Forever Projects in not in Priorities	5,879	1.4%
Total Acres	413,184	

Table 6. Number and Percent of Acres of Tier 1 Rural and Family Land Protection Program Projects in the Study's Ecological Priority Tiers

Category	Acres	Percent
RFLPP Tier 1 Projects in High Priority	39,166	63.8%
RFLPP Tier 1 Projects in Moderately Priority	9,612	15.7%
RFLPP Tier 1 Projects in Moderate Priority	7,899	12.9%
RFLPP Tier 1 Projects in not in Priorities	4,685	7.6%
Total Acres	61,362	

In addition, another 230,000 acres of Tier 1 Ecological Priority areas are within Moderate High Opportunity or Moderate Opportunity areas that potentially represent good locations for using federal and state conservation easement and incentives programs to protect additional land (See **Table 3**). In total that means approximately 67 percent of the currently unprotected Tier 1 Ecological Priority areas are within high to moderate opportunity areas for protection. However, the key is that these programs including Florida Forever, Rural and Family Lands Protection Program, NRCS grassland, agricultural, and wetland conservation easement programs, forest protection programs, and local transfer of development and other conservation policies need to be funded more than they are currently (especially Florida Forever) in order to protect the hundreds of thousands of acres in southwest Florida that are the highest priorities for conserving biodiversity and ecosystem services.

Focal Species and Natural Communities Less Well Represented by Tier 1 Ecological Priorities

Though the majority of the focal species and focal natural communities in this study are very well represented in both protected and unprotected Tier 1 Ecological Priorities, there are some focal biodiversity elements that are not as well protected in these highest priority areas. Regarding focal species, 12 species out of 34 (approximately 35%) have less than 50 percent of one or both habitat priority categories represented in Tier 1 Ecological Priorities. These species can be found in **Appendix B, Table 2**. The species in **Table 7** have less than 50% of their habitat within Tier 1 Ecological Priority areas. **Table 7** has at least two sets of species that share commonalities in habitat needs. First, American oystercatcher, least tern, piping plover, and snowy plover all have habitat identified as primarily nesting and/or wintering beaches or other potentially suitable coastal sandy island or water edge habitat. Diamondback terrapin is another coastal species dependent on both estuarine wetlands and suitable upland nesting habitat in close proximity to such wetlands. Another group of species are partially dependent on open agricultural lands including improved pastures that are not primary habitat for many other focal species in this study. Such species include burrowing owl, caracara, Florida sandhill crane, and southeastern American kestrel. In the case of eastern indigo snake and swallow-tailed kite, these species both have more than 50 percent of their priority 1 habitat represented within Tier 1 Ecological Priorities, but not their priority 2 habitat. In both cases, these species have patch size criteria that limits the size of patches of priority 2 habitat in comparison to priority 1 habitat, which may also result in these lower quality areas of potential habitat overlapping with other area-sensitive focal species less frequently.

Finally, bald eagle habitat includes large areas of open water, which is an unusual habitat component for most other species. In conclusion, these species are not well addressed by Tier 1 Ecological Priorities and therefore may require more specific attention to accommodate their habitat conservation needs. Regarding focal natural communities, only three of the nineteen focal natural communities (16%) had less than 50% of their acres in Tier 1 Ecological Priority areas (**Table 8**). All are coastal natural communities that, like the most of the strictly coastal focal species, were not as well represented as the larger, inland rural landscapes that cover much of the study area. The statistics for all focal natural communities can be found in **Appendix B, Table 3**.

Table 7. Focal Species with either priority 1 or priority 2 habitat with less than 50% of the habitat in that category represented in Tier 1 Ecological Priorities.

Species Name	Habitat Priority	Tier	Acres	Percent
American Oystercatcher	1	SWLCD Tier 1	6,732	23.6%
Bald Eagle	1	SWLCD Tier 1	203,486	37.3%
Burrowing Owl	1	SWLCD Tier 1	73,768	46.4%
Caracara	1	SWLCD Tier 1	605,276	47.9%
Caracara	2	SWLCD Tier 1	208,225	45.4%
Diamondback Terrapin	1	SWLCD Tier 1	85,678	40.8%
Eastern Indigo Snake	2	SWLCD Tier 1	211,094	45.1%
Florida Sandhill Crane	1	SWLCD Tier 1	588,018	49.8%
Least Tern	1	SWLCD Tier 1	6	0.7%
Piping Plover	1	SWLCD Tier 1	89	4.6%
Snowy Plover	1	SWLCD Tier 1	111	6.5%
Southeastern American Kestrel	1	SWLCD Tier 1	310,922	49.7%
Swallow-tailed Kite	2	SWLCD Tier 1	69,636	24.4%

Table 8. Focal Natural Communities with less than 50% of their acres in Tier 1 Ecological Priorities.

Community	Tier	Acres	Percent
Coastal Grass and Shrubs Category	SWLCD Tier 1	111	6.6%
Coastal Scrub	SWLCD Tier 1	106	38.9%
Coastal Upland Hammock Category	SWLCD Tier 1	364	17.2%

Focal Species and Natural Communities with Less Protection in Existing Conservation Areas

Representation of focal species and natural communities in Tier 1 Ecological Priority areas is one way to gauge to what degree protection of these areas would meet basic biodiversity conservation goals in the study area, with acknowledgment that the Tier 2 and Tier 3 Ecological Priority areas are also important and deserving of protection. However, as discussed above, some of the Tier 1 Ecological Priority areas are already protected with approximately 42% of Tier 1 in existing conservation lands and approximately 58% of Tier 1 on unprotected lands. Therefore, it is also important to identify focal species and natural communities that have a majority of their potential habitat or acreage in Tier 1 areas that are unprotected versus protected. These species and natural communities are the most important targets for land protection that meets the conservation goals of these focal resources but also provide more strategic opportunities for conservation by maximizing the resources protected per acre protected (i.e., more EFFICIENT conservation). With this in mind, focal species and natural communities that have the majority of habitat or acreage in Tier 2 and/or Tier 3 Ecological Priority areas are also important conservation targets, which addresses the "fine filter" portion of the process for identifying conservation priority areas.

Appendix B, Table 4 and Table 5 list the acres and percent of unprotected focal species habitat and focal natural community acres in the Ecological Priority Tiers. Regarding species, many of the species with less than 50% of their potential habitat represented in Tier 1 Ecological Priorities also have less than 50% of their habitat on existing conservation lands (**Table 9**). This includes coastal nesting species, which may be protected by state sovereign land and other laws, but not necessarily in designated conservation lands and deserving of conservation attention due to potential human disturbance of nesting habitat and sea level rise, etc. Species adapted to or dependent on open lands now dominated by pasture uses are also prominent on this list including burrowing owl, caracara, Florida sandhill crane, mottled duck, and southeastern American kestrel. Scrub and flatwoods species are represented on this list by Florida scrub-jay, Florida scrub lizard, gopher tortoise, Sherman's fox squirrel, and eastern diamondback rattlesnake. And eastern indigo snake and swallow-tailed kite are both wide-ranging, area sensitive species with large ranges in the study area across remaining private rural landscapes. All of these species are worthy of additional conservation attention based on their status with less than 50 percent of their remaining habitat base protected. However, users of this report should also keep in mind that other focal species warrant special attention based on other relevant factors. These can include small total area of remaining potential habitat (range restricted and/or extremely restricted habitat availability species), wide-ranging species with large home ranges and requiring vast areas to support viable populations (such as the Florida panther and Florida black bear), and species sensitive to or threatened by various human activities including nest disturbance, climate change, etc.

Photo credit: Larry Richardson

Table 9. Focal Species with less than 50 percent of their potential habitat in existing conservation lands.

Species Name	Habitat Priority	Tier	Acres	Percent
Burrowing Owl	1	Protected	61,245.52	38.5%
Burrowing Owl	1	SWLCD Tier 1	42,689.59	26.8%
Burrowing Owl	1	SWLCD Tier 2	20,137.92	12.7%
Burrowing Owl	1	SWLCD Tier 3	34,969.56	22.0%
Caracara	1	Protected	430,878.05	34.1%
Caracara	1	SWLCD Tier 1	390,254.38	30.9%
Caracara	1	SWLCD Tier 2	238,526.06	18.9%
Caracara	1	SWLCD Tier 3	203,357.36	16.1%
Eastern Diamondback Rattlesnake	1	Protected	338,953.38	49.9%
Eastern Diamondback Rattlesnake	1	SWLCD Tier 1	277,195.82	40.8%
Eastern Diamondback Rattlesnake	1	SWLCD Tier 2	44,854.62	6.6%
Eastern Diamondback Rattlesnake	1	SWLCD Tier 3	18,052.70	2.7%
Eastern Diamondback Rattlesnake	2	Protected	123,688.36	37.0%
Eastern Diamondback Rattlesnake	2	SWLCD Tier 1	105,787.08	31.6%
Eastern Diamondback Rattlesnake	2	SWLCD Tier 2	53,378.73	16.0%
Eastern Diamondback Rattlesnake	2	SWLCD Tier 3	51,705.34	15.5%
Eastern Indigo Snake	1	Protected	247,687.08	42.8%
Eastern Indigo Snake	1	SWLCD Tier 1	231,582.38	40.0%
Eastern Indigo Snake	1	SWLCD Tier 2	53,033.23	9.2%
Eastern Indigo Snake	1	SWLCD Tier 3	46,700.47	8.1%
Eastern Indigo Snake	2	Protected	200,929.90	42.9%
Eastern Indigo Snake	2	SWLCD Tier 1	127,336.69	27.2%
Eastern Indigo Snake	2	SWLCD Tier 2	56,004.87	12.0%
Eastern Indigo Snake	2	SWLCD Tier 3	83,659.10	17.9%
Florida Sandhill Crane	1	Protected	422,015.31	35.8%
Florida Sandhill Crane	1	SWLCD Tier 1	348,539.65	29.5%
Florida Sandhill Crane	1	SWLCD Tier 2	223,339.63	18.9%
Florida Sandhill Crane	1	SWLCD Tier 3	186,277.51	15.8%
Florida Scrub Lizard	1	Protected	1,192.95	36.7%
Florida Scrub Lizard	1	SWLCD Tier 1	1,014.49	31.2%
Florida Scrub Lizard	1	SWLCD Tier 2	861.48	26.5%
Florida Scrub Lizard	1	SWLCD Tier 3	177.54	5.5%
Florida Scrub-Jay	1	Protected	20,464.03	46.2%
Florida Scrub-Jay	1	SWLCD Tier 1	15,820.45	35.7%
Florida Scrub-Jay	1	SWLCD Tier 2	5,842.01	13.2%
Florida Scrub-Jay	1	SWLCD Tier 3	2,130.59	4.8%

Species Name	Habitat Priority	Tier	Acres	Percent
Gopher Tortoise	1	Protected	174,987.16	46.4%
Gopher Tortoise	1	SWLCD Tier 1	134,676.52	35.7%
Gopher Tortoise	1	SWLCD Tier 2	39,180.85	10.4%
Gopher Tortoise	1	SWLCD Tier 3	28,144.69	7.5%
Gopher Tortoise	2	Protected	35,035.39	26.9%
Gopher Tortoise	2	SWLCD Tier 1	61,702.84	47.4%
Gopher Tortoise	2	SWLCD Tier 2	16,639.58	12.8%
Gopher Tortoise	2	SWLCD Tier 3	16,745.76	12.9%
Least Tern	1	Protected	314.76	34.3%
Least Tern	1	SWLCD Tier 1	0.35	0.0%
Least Tern	1	SWLCD Tier 2	246.98	26.9%
Least Tern	1	SWLCD Tier 3	355.93	38.8%
Mottled Duck	1	Protected	738,834.61	48.1%
Mottled Duck	1	SWLCD Tier 1	362,218.54	23.6%
Mottled Duck	1	SWLCD Tier 2	232,729.47	15.1%
Mottled Duck	1	SWLCD Tier 3	202,980.87	13.2%
Piping Plover	1	Protected	391.14	20.3%
Piping Plover	1	SWLCD Tier 1	70.60	3.7%
Piping Plover	1	SWLCD Tier 2	623.99	32.3%
Piping Plover	1	SWLCD Tier 3	843.42	43.7%
Sherman’s Fox Squirrel	1	Protected	241,225.01	47.6%
Sherman’s Fox Squirrel	1	SWLCD Tier 1	201,993.88	39.9%
Sherman’s Fox Squirrel	1	SWLCD Tier 2	43,291.21	8.6%
Sherman’s Fox Squirrel	1	SWLCD Tier 3	19,756.66	3.9%
Snowy Plover	1	Protected	669.78	39.2%
Snowy Plover	1	SWLCD Tier 1	1.33	0.1%
Snowy Plover	1	SWLCD Tier 2	255.48	15.0%
Snowy Plover	1	SWLCD Tier 3	782.11	45.8%
Southeastern American Kestrel	1	Protected	204,582.26	32.7%
Southeastern American Kestrel	1	SWLCD Tier 1	199,025.95	31.8%
Southeastern American Kestrel	1	SWLCD Tier 2	115,950.64	18.5%
Southeastern American Kestrel	1	SWLCD Tier 3	106,646.29	17.0%
Swallow-tailed Kite	2	Protected	126,661.55	44.4%
Swallow-tailed Kite	2	SWLCD Tier 1	40,503.67	14.2%
Swallow-tailed Kite	2	SWLCD Tier 2	52,077.01	18.2%
Swallow-tailed Kite	2	SWLCD Tier 3	66,314.38	23.2%

Regarding focal natural communities, six of the nineteen focal natural communities (32%) had less than 50% of their acres in existing conservation lands (**Table 10**). These included three freshwater wetland natural communities, two upland hardwood community types, and scrub. Scrub is particularly significant because it is rare in southwest Florida and essential for two focal species (Florida scrub-jay and Florida scrub lizard) and important for others. The wetland communities all provide important habitat but receive some potential protection through state and federal laws.

Table 10. Focal Natural Community with less than 50 percent of their acres in existing conservation lands.

COMMUNITY	TIER	ACRES	PERCENT
Freshwater Hardwood Wetlands Category	Protected	80,734.74	44.5%
Freshwater Hardwood Wetlands Category	Tier 1	66,973.49	36.9%
Freshwater Hardwood Wetlands Category	Tier 2	19,221.19	10.6%
Freshwater Hardwood Wetlands Category	Tier 3	14,460.07	8.0%
Freshwater Marshes Category	Protected	121,324.21	43.3%
Freshwater Marshes Category	Tier 1	93,660.73	33.4%
Freshwater Marshes Category	Tier 2	42,104.17	15.0%
Freshwater Marshes Category	Tier 3	22,965.54	8.2%
Scrub Category	Protected	9,589.40	41.0%
Scrub Category	Tier 1	8,959.56	38.3%
Scrub Category	Tier 2	2,884.51	12.3%
Scrub Category	Tier 3	1,955.79	8.4%
Upland Hammock Category	Protected	29,701.55	41.1%
Upland Hammock Category	Tier 1	33,290.78	46.0%
Upland Hammock Category	Tier 2	6,681.99	9.2%
Upland Hammock Category	Tier 3	2,622.57	3.6%
Upland Hardwoods Category	Protected	204.06	15.6%
Upland Hardwoods Category	Tier 1	771.24	58.8%
Upland Hardwoods Category	Tier 2	188.39	14.4%
Upland Hardwoods Category	Tier 3	147.37	11.2%
Wet Prairie	Protected	31,362.42	44.6%
Wet Prairie	Tier 1	24,961.48	35.5%
Wet Prairie	Tier 2	10,982.95	15.6%
Wet Prairie	Tier 3	2,974.08	4.2%

Ecological Priority, Focal Species, and Natural Community Impacts from Potential Future Development

Overall, approximately 35.5% of the currently unprotected Tier 1 Ecological Priorities are in areas with high to moderate threats from conversion to development (See **Table 4**). For Tier 2 and Tier 3 priorities the percentage of unprotected areas overlapping with high to moderate threats from conversion to development are 38% and 40.9% respectively. This indicates that a significant portion of the areas essential or important for conserving the region's biodiversity is threatened by potential future development, and highlights the need for timely action to protect the most strategic areas of ecological priority with a variety of strategies. However, it is also important to point out that the determination that an area has "low threat" for conversion to development must be treated carefully. These analyses are based on assumptions about growth related to current future development plans and factors that tend to determine future growth including location and future projected population growth. This analysis cannot account for the fact that land use change is currently generally poorly controlled and development plans can change very rapidly based on landowner interest and the political will of local governments. Any landowner in areas determined to have a "low threat" from development in this analysis could apply to a county or municipal government to develop their property. Landowner interests are therefore a key element of future conservation planning in this and other regions. This includes the need to work with landowners on conservation incentive programs to increase the value of their properties as conservation assets instead of as areas of future development.

Based on our development threat analysis, as expected some focal species are more threatened by future development than others. The statistics comparing focal species potential habitat and potential development threat can be found in **Appendix B, Table 8.** Focal species in **Table 11** have more than 25% of their potential habitat in a combination of either high or moderate development threat. Keep in mind that these percentages are based on total habitat and not just habitat that is unprotected. Twelve of the 34 focal species (35%) meet this threshold for development threat. Most of the focal species meeting this development threat threshold are primarily upland dependent, particularly on xeric uplands that are usually most desirable for development. Florida scrub lizard again stands out regarding its low total habitat base and threat from future development. In fact, the status of this species in the southern 2/3 of the study area is in question. There were populations in eastern Collier County but much of the former scrub there has been developed and what remains is mostly highly threatened by development. Since genetic studies have shown potentially significant differences in coastal and inland populations of Florida scrub lizards, determining the status of this species in the southern 2/3 of the study area and protection of any remaining unprotected populations is a priority.

The vulnerability of least tern, piping plover, and snowy plover to potential future development is also interesting. Most of the threat to their habitat is classified as high threat, which means that based on the Future Land Use (FLU) data we collected and used for this study that one or more areas of nesting/wintering habitat for these species is in a FLU classification indicating some form of future development. This may be a data issue that should be checked in more detail to determine if this threat is genuine or an artifact of available data limitations. In addition, though one or more areas for these species may be within an area generally designated for future development, it is likely that any future development plan would have to take these species' habitat needs into account based on their limited habitat availability, listing status, and the sensitivity of habitat from a coastal development and protection perspective.

Table 11. Focal species with more than 25% of their potential habitat in high or moderate development threat combined.

Species Name	Habitat Priority	Potential Threat	Acres	Percent
Burrowing Owl	1	Moderate Development Threat	25,754.20	16.2%
Burrowing Owl	1	High Development Threat	55,688.89	35.0%
Eastern Diamondback Rattlesnake	2	Moderate Development Threat	56,227.61	16.8%
Eastern Diamondback Rattlesnake	2	High Development Threat	101,523.73	30.3%
Eastern Indigo Snake	1	Moderate Development Threat	97,224.94	16.8%
Eastern Indigo Snake	1	High Development Threat	81,509.41	14.1%
Eastern Indigo Snake	2	Moderate Development Threat	85,074.84	18.2%
Eastern Indigo Snake	2	High Development Threat	140,881.95	30.1%
Florida Scrub Lizard	1	Moderate Development Threat	438.54	13.5%
Florida Scrub Lizard	2	Low Development Threat	15.52	1.4%
Florida Scrub Lizard	2	Moderate Development Threat	151.65	14.1%
Florida Scrub Lizard	2	High Development Threat	398.16	37.1%
Florida Scrub-Jay	1	Moderate Development Threat	5,518.20	12.5%
Florida Scrub-Jay	1	High Development Threat	8,239.22	18.6%
Florida Scrub-Jay	2	Moderate Development Threat	1,720.27	9.9%
Florida Scrub-Jay	2	High Development Threat	3,025.11	17.5%
Gopher Tortoise	1	Moderate Development Threat	54,385.66	14.4%
Gopher Tortoise	1	High Development Threat	65,130.65	17.3%
Gopher Tortoise	2	Moderate Development Threat	39,689.26	30.5%
Gopher Tortoise	2	High Development Threat	34,624.33	26.6%
Least Tern	1	High Development Threat	310.31	33.8%
Piping Plover	1	High Development Threat	576.17	29.9%
Red-cockaded Woodpecker	1	Moderate Development Threat	84,087.68	15.7%
Red-cockaded Woodpecker	1	High Development Threat	63,525.38	11.8%
Red-cockaded Woodpecker	2	Moderate Development Threat	420.77	6.4%
Red-cockaded Woodpecker	2	High Development Threat	1,973.21	30.2%
Snowy Plover	1	High Development Threat	483.93	28.3%
Southeastern American Kestrel	1	Moderate Development Threat	94,604.77	15.1%
Southeastern American Kestrel	1	High Development Threat	65,988.20	10.5%
Swallow-tailed Kite	2	Moderate Development Threat	33,016.51	11.6%
Swallow-tailed Kite	2	High Development Threat	71,964.61	25.2%

The statistics comparing focal natural communities and potential development threat can be found in **Appendix B, Table 9.** Focal communities in **Table 12** have more than 25% of their area in a combination of either high or moderate development threat. Six of the 19 focal natural communities (32%) meet the threshold for having high combined development threat. Most of these are uplands as would be expected. However, freshwater hardwood wetland and probably hydric flatwoods would receive some protection based on wetland protection law and policy, though in typical land development these wetlands would be removed from a larger intact upland context that would make them much less functional as habitat.

Table 12. Focal natural communities with more than 25% of their potential habitat in high or moderate development threat combined.

Community	Potential Threat	Acres	Percent
Freshwater Hardwood Wetlands Category	Moderate Development Threat	19,067.04	10.5%
Freshwater Hardwood Wetlands Category	High Development Threat	29,278.38	16.1%
Hydric Flatwoods Category	Moderate Development Threat	13,446.49	10.0%
Hydric Flatwoods Category	High Development Threat	20,997.77	15.6%
Mesic Flatwoods Category	Moderate Development Threat	37,986.49	11.7%
Mesic Flatwoods Category	High Development Threat	48,410.61	14.9%
Scrub Category	Moderate Development Threat	3,994.80	17.1%
Scrub Category	High Development Threat	4,407.78	18.8%
Scrubby Flatwoods Category	Moderate Development Threat	1,787.83	8.0%
Scrubby Flatwoods Category	High Development Threat	4,242.79	18.9%
Upland Hardwoods Category	Moderate Development Threat	305.25	23.3%
Upland Hardwoods Category	High Development Threat	147.15	11.2%

Focal Species and Natural Community Impacts from Sea Level Rise

Most of the potential impacts to Tier 1 Ecological Priorities (and in general) from sea level rise (SLR) occur on existing conservation lands in the northwestern Everglades portion of the study area. Regarding focal species and natural communities, **Table 13** and **Table 14** provide statistics regarding the potential loss of focal species habitat and natural communities to sea level rise . Species with at least 25% of their total potential habitat or acreage lost cumulatively up to a 2 meter rise in sea level are listed. All of the statistics for potential SLR impacts to focal species and natural communities are in **Appendix B**, **Table 10** and **Table 11**. Impacts assume that any habitat or natural communities overlain by potential inundation are lost as habitat. However, this method may overestimate the loss of habitat for some estuarine/marine species based on the likelihood that new shorelines and estuarine wetlands would develop along with open water inundation. In addition, this method likely underestimates potential habitat loss for upland dependent species with current habitat near the current coastline, since some upland habitat that is not directly inundated could still be altered due to the development of new coastal wetlands in current upland habitat. Nevertheless, these statistics provide a starting point for identifying the species and natural communities potentially most threatened by sea level rise.

Virtually all of the focal species with more than 25% of their habitat affected are coastal species. Others include wetland dependent species that can use either fresh or saltwater wetlands, especially the wading bird guild and wood stork. However, as stated above, a bathtub analysis such as the one used here does not take into account the creation of new estuarine wetlands or sand habitats as SLR progresses. Therefore, some of these species may gain as much or more habitat back as their habitat shifts inland with SLR. However, the rate of habitat change is important, and in some cases species could lose much or all of their habitat base before new habitat becomes available. In addition, there are no guarantees that suitable or similar quality wetlands or sand habitats will develop as SLR progresses. Therefore it is important that: 1) more detailed vegetation change-based simulations be done to better quantify potential habitat change as SLR progresses (such as SLAMM modeling), and 2) these species and their habitat should be closely monitored as coastal change continues. Other species meeting the 25% threshold include limpkin, short-tailed hawk, and red-cockaded woodpecker. Limpkin are strictly freshwater wetland dependent and this analysis suggests that there could be significant habitat loss to SLR for this species. However, limpkins also have a large habitat base including large areas of protected habitat in the study area. Short-tailed hawks do use saltwater wetlands and coastal edge habitat as part of their habitat base. But significant increases in coastal water at the expense of forested and grassland habitats in coastal regions could significantly reduce its total habitat base. Red-cockaded woodpeckers are also an interesting example of an upland dependent species with potentially significant SLR impacts in the study area. More detailed analysis of their potential habitat loss and its significance for maintaining viable population clusters that are functionally connected is warranted.

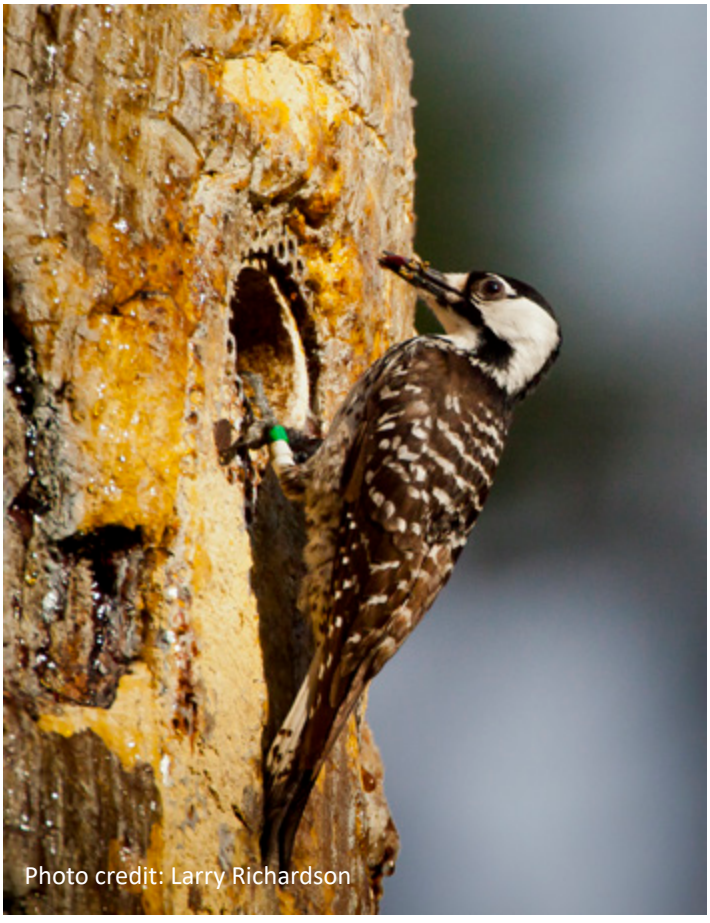


Photo credit: Larry Richardson

Table 13. Focal Species with more than 25% cumulative habitat loss from SLR up to 2 meters.

Species Name	Habitat Priority	Potential Threat	Acres	Percent
American Crocodile	1	Near current sea level	26,151.49	30.24%
American Crocodile	1	1 meter	60,029.37	69.42%
American Crocodile	1	1.5 meters	132.65	0.15%
American Crocodile	1	2 meters	123.53	0.14%
American Oystercatcher	1	Near current sea level	24,921.31	87.23%
American Oystercatcher	1	1 meter	3,357.04	11.75%
American Oystercatcher	1	1.5 meters	115.77	0.41%
American Oystercatcher	1	2 meters	128.00	0.45%
Bald Eagle	1	Near current sea level	187,768.74	34.45%
Bald Eagle	1	1 meter	63,003.13	11.56%
Bald Eagle	1	1.5 meters	5,414.22	0.99%
Bald Eagle	1	2 meters	9,117.09	1.67%
Bald Eagle	2	Near current sea level	341,565.14	24.94%
Bald Eagle	2	1 meter	79,920.70	5.84%
Bald Eagle	2	1.5 meters	28,624.92	2.09%
Bald Eagle	2	2 meters	50,370.03	3.68%
Black-whiskered Vireo	1	Near current sea level	48,756.02	29.05%
Black-whiskered Vireo	1	1 meter	118,253.68	70.46%
Black-whiskered Vireo	1	1.5 meters	341.82	0.20%
Black-whiskered Vireo	1	2 meters	358.65	0.21%
Diamondback Terrapin	1	Near current sea level	125,019.76	59.59%
Diamondback Terrapin	1	1 meter	83,845.91	39.96%
Diamondback Terrapin	1	1.5 meters	404.14	0.19%
Diamondback Terrapin	1	2 meters	391.88	0.19%
Everglades Mink	1	Near current sea level	85,475.08	5.93%
Everglades Mink	1	1 meter	288,918.03	20.04%
Everglades Mink	1	1.5 meters	65,994.80	4.58%
Everglades Mink	1	2 meters	188,127.12	13.05%
Florida Panther	2	Near current sea level	39,456.14	9.90%
Florida Panther	2	1 meter	143,638.63	36.05%
Florida Panther	2	1.5 meters	3,370.19	0.85%
Florida Panther	2	2 meters	8,863.51	2.22%
Least Tern	1	Near current sea level	215.18	23.44%
Least Tern	1	1 meter	581.44	63.34%
Least Tern	1	1.5 meters	69.81	7.60%
Least Tern	1	2 meters	47.89	5.22%

Species Name	Habitat Priority	Potential Threat	Acres	Percent
Limpkin	1	Near current sea level	40,386.25	2.50%
Limpkin	1	1 meter	189,081.58	11.68%
Limpkin	1	1.5 meters	63,209.24	3.91%
Limpkin	1	2 meters	174,515.39	10.78%
Mangrove Cuckoo	1	Near current sea level	49,671.74	26.52%
Mangrove Cuckoo	1	1 meter	136,638.09	72.95%
Mangrove Cuckoo	1	1.5 meters	414.40	0.22%
Mangrove Cuckoo	1	2 meters	415.06	0.22%
Piping Plover	1	Near current sea level	1,234.98	64.02%
Piping Plover	1	1 meter	590.98	30.63%
Piping Plover	1	1.5 meters	52.21	2.71%
Piping Plover	1	2 meters	43.44	2.25%
Red-cockaded Woodpecker	2	1 meter	732.07	11.20%
Red-cockaded Woodpecker	2	1.5 meters	441.55	6.75%
Red-cockaded Woodpecker	2	2 meters	1,069.22	16.35%
Short-tailed Hawk	1	Near current sea level	39,351.79	2.36%
Short-tailed Hawk	1	1 meter	196,022.76	11.76%
Short-tailed Hawk	1	1.5 meters	61,683.91	3.70%
Short-tailed Hawk	1	2 meters	172,875.45	10.37%
Snowy Plover	1	Near current sea level	335.91	19.66%
Snowy Plover	1	1 meter	1,056.74	61.84%
Snowy Plover	1	1.5 meters	144.58	8.46%
Snowy Plover	1	2 meters	139.74	8.18%
Wading Bird Guild	1	Near current sea level	193,615.14	10.79%
Wading Bird Guild	1	1 meter	356,579.43	19.87%
Wading Bird Guild	1	1.5 meters	64,131.06	3.57%
Wading Bird Guild	1	2 meters	181,991.57	10.14%
Wood Stork	1	Near current sea level	30,336.61	2.73%
Wood Stork	1	1 meter	107,964.30	9.70%
Wood Stork	1	1.5 meters	41,307.08	3.71%
Wood Stork	1	2 meters	153,541.66	13.80%

Regarding focal natural communities, except for bay wetlands the results are obvious. All coastal natural communities are potentially significantly threatened by SLR. However, as discussed above, at least the wetland coastal natural communities could maintain or increase total area as SLR progresses. That isn't necessarily true for coastal uplands, and opportunities to restore or protect coastal grasslands, coastal hammock, and coastal scrub from SLR impacts is a priority in the study area. Follow up work could include analysis of detailed DEM data to determine where future areas of these habitats could persist or develop as freshwater wetlands currently inland transform into saltwater wetlands or open water. This work could eventually include transplanting any rare species associated with coastal uplands as well as habitat management to help reestablish coastal uplands. Bay wetlands are the only "outlier" in the group of focal natural communities meeting this potential SLR impact threshold. The results suggest that there are bay wetlands adjacent or near the current saltwater-freshwater transition vulnerable to saltwater wetland conversion as SLR progresses. Therefore more detailed analysis of bay wetland impacts and potential for migration as freshwater wetlands also potentially expand inland is also recommended.

Table 14. Focal Natural Communities with more than 25% cumulative habitat loss from SLR up to 2 meters.

Community	SLR	Acres	Percent
Bay Wetlands Category	1 meter	98.05	0.6%
Bay Wetlands Category	1.5 meters	385.16	2.4%
Bay Wetlands Category	2 meters	3,597.11	22.5%
Coastal Grass and Shrubs Category	1 meter	882.12	52.3%
Coastal Grass and Shrubs Category	1.5 meters	234.33	13.9%
Coastal Grass and Shrubs Category	2 meters	381.01	22.6%
Coastal Scrub	1 meter	213.57	78.4%
Coastal Scrub	1.5 meters	19.92	7.3%
Coastal Scrub	2 meters	26.93	9.9%
Coastal Upland Hammock Category	1 meter	1,416.60	67.1%
Coastal Upland Hammock Category	1.5 meters	257.24	12.2%
Coastal Upland Hammock Category	2 meters	272.21	12.9%
Mangrove Swamp	1 meter	150,593.22	77.0%
Mangrove Swamp	1.5 meters	474.81	0.2%
Mangrove Swamp	2 meters	456.97	0.2%
Salt Marsh	1 meter	27,664.66	61.3%
Salt Marsh	1.5 meters	60.34	0.1%
Salt Marsh	2 meters	53.57	0.1%

Photo credit: Larry Richardson/US Fish and Wildlife Service

Implementation Opportunities and Obstacles

Relevant Policy Issues from Past and Current Projects

The Cooperative Conservation Blueprint Pilot Project (the Blueprint) provides a starting point for a discussion regarding future efforts to effect protection of conservation priorities through voluntary conservation land protection and incentives programs. Relevant recommendations from the Blueprint include:

- Consider an inter-agency MOU to address partnerships in common priority areas;
- Elevate high priority areas for Florida Forever and Rural and Family Lands Protection Funding;
- Streamline agency easement language (so side by side easements are compatible, similar in restrictions, requirements and value);
- Explore the ability to streamline the partnership between federal and state easement programs to be able to further leverage dollars;
- Consider policy modifications for conservation and mitigation banks with appropriate agencies. Extra credit points can be given to banks located within highest priority areas;
- Work with the SFWMD to develop a science-based PES dispersed water storage program;
- Work within the WRE ranking criteria process to:
  - Address prioritizing high priority areas in their ranking process.
  - Address the AGI cap.
  - Explore possibility of giving extra consideration to areas considered a high priority by all the relevant agencies.

Relevant Acquisition and Conservation Easement Programs

There are a multitude of land acquisition and easement programs that are active throughout our study area. Partnering with these programs (listed below) on mutual priority areas is essential to achieving meaningful conservation on the ground. The Cooperative Conservation Blueprint began the process of establishing a framework for agency partnerships; the work done in the Everglades Headwaters NWR and Conservation Area has demonstrated the success of such partnerships. We can build on this model as we move into conservation planning and implementation within our study area. Building relationships with landowners is a critical first step, prior to moving ahead with additional planning efforts. The programs listed below are for informational purposes only; we are not advocating any particular program for specific properties.

Department of Environmental Protection-Division of State Lands: Florida Forever

Florida Forever is the state land acquisition program and is run by the Florida Department of Environmental Protection (DEP). Florida Forever and its predecessor programs have been funded at $300 million annually since 1990; in 2008 this dropped dramatically with the economic recession. The Florida Forever program has a fairly strict protocol for acceptance including an application process that is 6 months in duration. Once accepted into the program applications are ranked and placed into categories (projects are ranked based on natural resource value). The program purchases properties with high conservation value, utilizing both fee-simple and less-than-fee acquisition strategies (conservation easements). DEP has a history of partnering with water management districts and county governments on conservation land acquisition. **Figures 21** and **22** depict the Florida Forever Projects in our study area; we can identify future partnerships in the areas where Florida Forever Projects overlap with the priorities identified in this LCD.

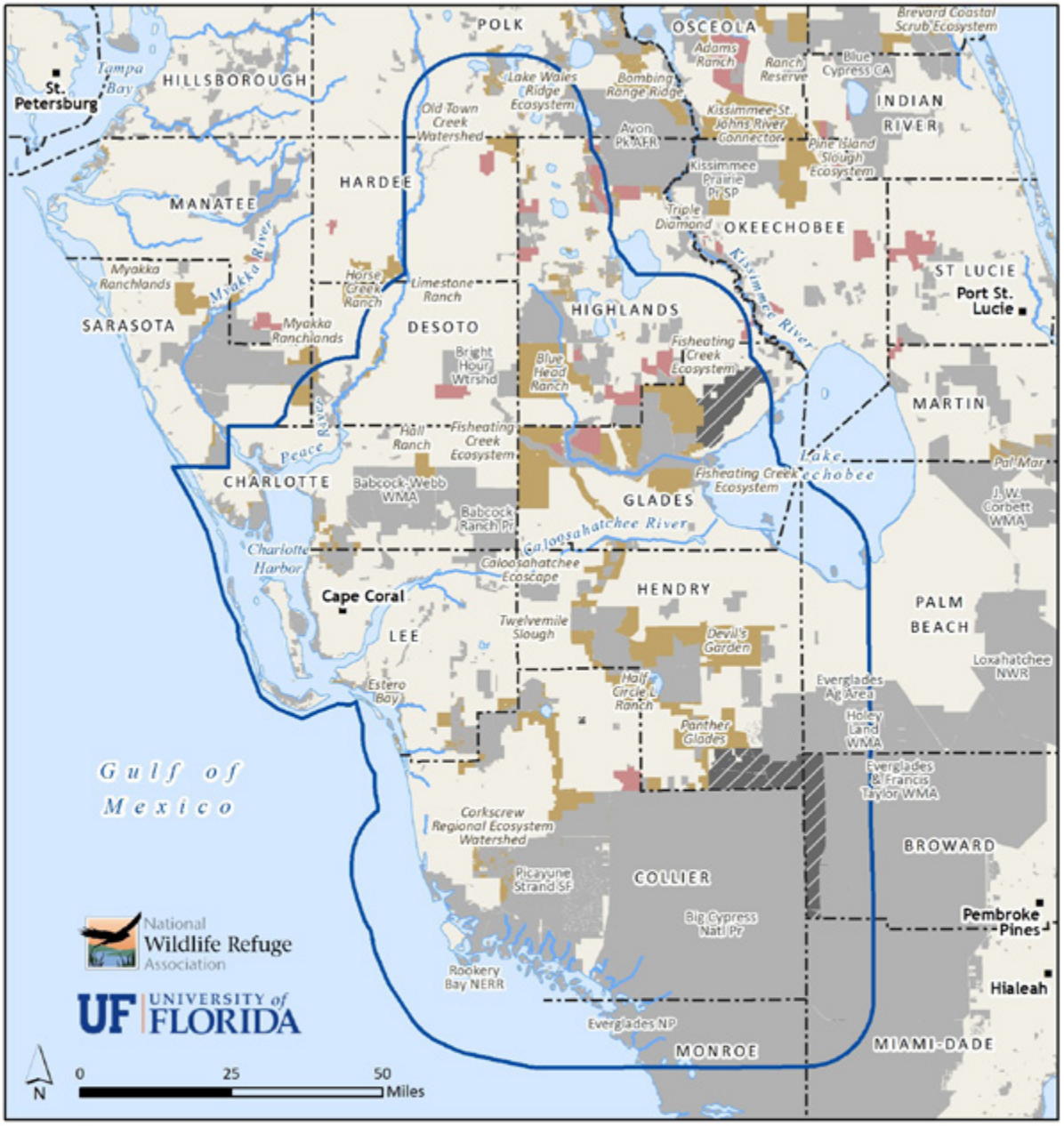
Florida Forest Service: Rural and Family Lands Protection Program (RFLPP)

The RFLPP is an agricultural easement program run by the Florida Forest Service; it is designed to protect important agricultural lands through the acquisition of permanent land conservation easements. The purpose of the program is to protect working landscapes, and easements are not restrictive. The program is very popular among landowners who would like to continue their agricultural operations- projects are ranked based on the QUALITY of their agricultural operations. The application and acceptance process is 6 months; projects are placed into one of three 'tiers', with 'Tier 1' projects the most likely to receive funding. Funding for the program has been increasing in recent years due to its success. **Figures 21** and **22** depict the RFLPP projects in our study area; we can identify future partnerships in the areas where the RFLPP Projects overlap with the priorities identified in this LCD.

Florida Forest Service: The Forest Legacy Program

The Forest Legacy Program aims to protect and conserve forests that are threatened by conversion to non-forest uses. The program is led by the Florida Forest Service; the U.S. Forest Service makes the final selections and distributes the funds. Florida can submit multiple projects, but the U.S. Forest Service Regional Office can submit no more than 3 projects from the state to the national office for consideration each year; the maximum funding is $10 million per year per state (maximum funding for one project is $7million). The Florida Forest Service places an emphasis on purchasing conservation easements, although past projects to date have been fee-simple. The Florida program focuses on conservation easements to ensure that forests in the state remain economically viable. The program can partner with other state and county government entities to leverage funding.

The state's Forest Legacy Area map identifies which portions of the state are eligible for protection under the Forest Legacy program. Please see this map for an idea of where there are current Forest Legacy Areas: *http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/Our-Forests/Land-Planning-and-Administration-Section/Florida-Forest-Legacy-Program/Florida-Forest-Legacy-Areas-Map*. Several of the Forest Legacy eligible areas overlap with priorities identified in our study area (See Figure 11).



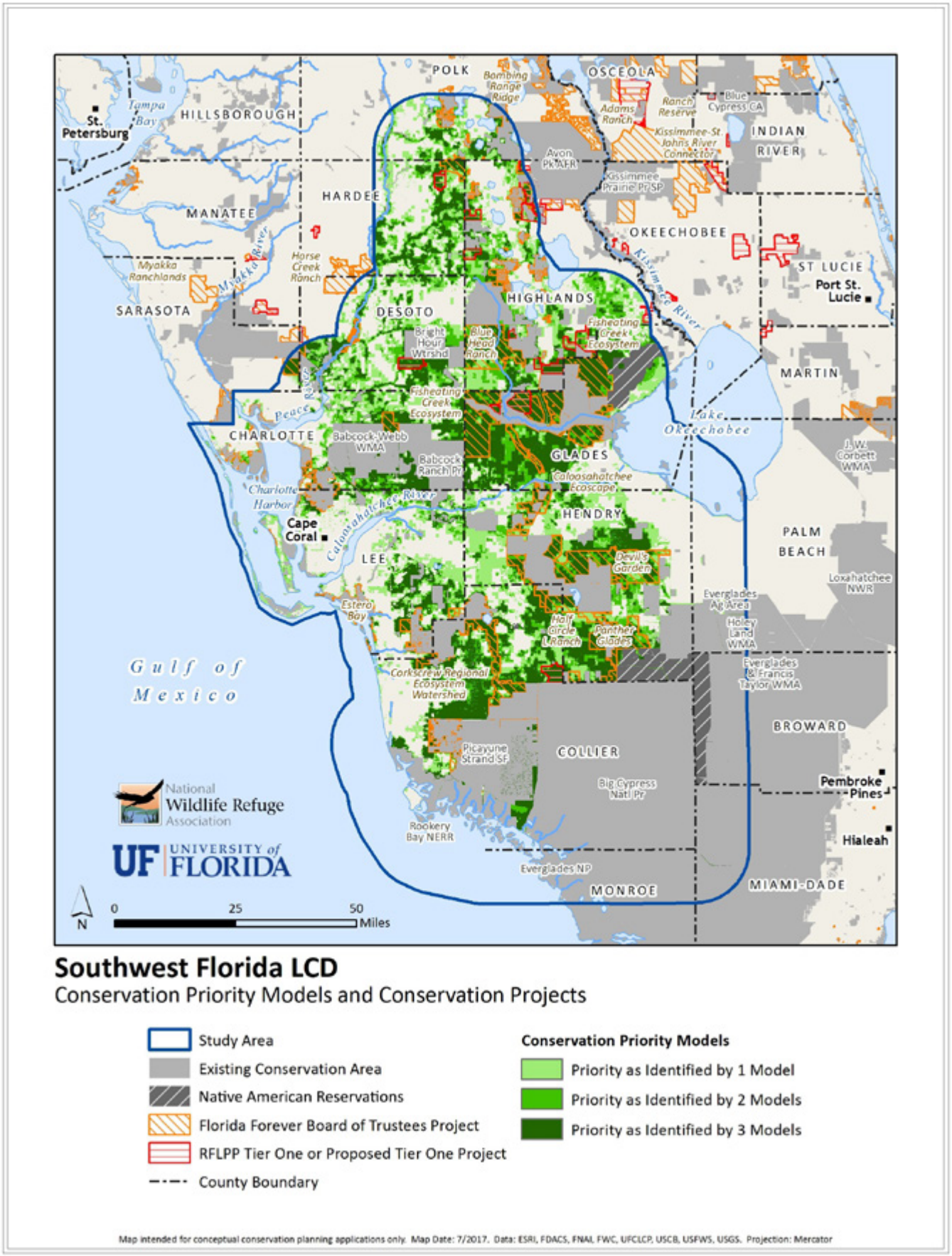
Southwest Florida LCD

Florida Forever Board of Trustees and Rural and Family Lands Protection Program Projects

- Study Area
- Existing Conservation Area
- Native American Reservations
- Florida Forever Board of Trustees Project
- Proposed RFLPP Tier One Project
- County Boundary

Map intended for conceptual conservation planning applications only. Map Date: 7/2017. Data: ESRI, FDACS, FNAI, FWC, UFCLCP, USCB, USFWS, USGS. Projection: Mercator

Figure 21. Current Florida Forever and Rural and Family Lands Protection Program projects in the study area.



Southwest Florida LCD

Conservation Priority Models and Conservation Projects

- Study Area
- Existing Conservation Area
- Native American Reservations
- Florida Forever Board of Trustees Project
- RFLPP Tier One or Proposed Tier One Project
- County Boundary

Conservation Priority Models

- Priority as Identified by 1 Model
- Priority as Identified by 2 Models
- Priority as Identified by 3 Models

Map intended for conceptual conservation planning applications only. Map Date: 7/2017. Data: ESRI, FDACS, FNAI, FWC, UFCLCP, USCB, USFWS, USGS. Projection: Mercator

Figure 22. Current Florida Forever and Rural and Family Lands Protection Program projects in the study area overlaying the Ecological Priority Tiers.

Photo credit: Larry Richardson/US Fish and Wildlife Service

NRCS: The Agricultural Conservation Easement Program (ACEP)

The ACEP provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits. Under the Agricultural Land Easements component, NRCS helps Indian tribes, state and local governments and non-governmental organizations protect working agricultural lands and limit non-agricultural uses of the land. Under the Wetlands Reserve Easements component, NRCS helps to restore, protect and enhance enrolled wetlands. NRCS easement programs are very popular in Florida and well-funded.

NRCS ACEP: Wetland Reserve Easement

The Wetland Reserve Easement Program under the NRCS ACEP is an easement program that purchases conservation easements on degraded or former wetlands in need of restoration. NRCS prioritizes wetlands that have been converted into other agricultural uses. NRCS will prioritize applications based on the easement's potential for protecting and enhancing habitat for migratory birds and other wildlife. WRE's are more restrictive than other easements. NRCS has the right to restrict grazing rights for restoration purposes. NRCS has not done this and they say it is highly unlikely they ever will, as cattle are an important management tool in Florida. WRE prices are set by the Geographic Area Cap Rate (GARC); they are not subject to appraisal. WRE's tend to have a higher dollar value than other easements, due to their restrictive nature. WRE's are stand-alone easements; NRCS doesn't partner with other entities to purchase these easements. Figure 10 depicts potential areas that meet WRE criteria.

NRCS- Agricultural Conservation Land Easement Program: Agricultural Land Easements (ALE)

The ALE is a partnership program and is geared for working landscapes. NRCS provides financial assistance to eligible partners for purchasing Agricultural Land Easements that protect the agricultural use and conservation values of eligible land. Eligible partners include Indian tribes, state and local governments and non-governmental organizations that have farmland or grassland protection programs. The ALE program will provide up to 50% match for working agricultural lands and 75% where there are grasslands of special significance. NRCS does not purchase these easements, rather they contribute to the partner that is acquiring the easement. This is a relatively new program so there is not a long history of NRCS partnering with local governments yet. However, the Rural and Family Lands Protection Program (RFLPP) under the Florida Forest Service has been successfully partnering with the NRCS ALE program on several easements. Figure 9 depicts areas that meet NRCS ALE criteria; properties submitted to NRCS are chosen by the lead agency, not NRCS.

Southwest Florida Water Management District (SWFWMD)

SWFWMD has purview over the water resources in the northern portion of the study area. They have historically had a strong program in purchasing fee-simple and less-then-fee lands that meet certain criteria. SWFMWD has a strong history in partnering with local governments, the state and may be a potential partner with the NRCS ALE program. Historically their funding for acquisition comes from state dollars and local taxation.

South Florida Water Management District (SFWMD)

SFWMD has purview over the water resources in the southern portion of the study area. They have historically had a strong program in purchasing fee-simple and less-then-fee lands that meet certain criteria. Their land acquisition dollars historically were funded through the state and through local taxation. The majority of their land acquisition is focused on identified lands for Everglades restoration needs.

Conservation Collier

Conservation Collier is the Collier County land acquisition program. The program was initiated in 2003 after voters approved a $75 million limited tax general obligation bond to buy conservation lands. In 2006 voters approved raising additional funding through a quarter mill ad valorem property tax; the program was extended through to 2013. Currently acquisition is suspended and the county is focused on managing its existing properties. The Program is still authorized to consider bargain sales and land donations. A coalition of conservation organizations is working with the county to put the program on the ballot in 2018.

Conservation 20/20

Conservation 20/20 is Lee County's land acquisition program. The county has a strong history of land acquisition and the program is used as a model for other county programs. In 1996 Lee County voters passed a referendum to establish a land acquisition fund through a half mill tax increase. In 2016 voters supported extending the program. Conservation 20/20 presently has approximately 89 million in acquisition funding. Properties are nominated and most go through an intensive review process prior to approval for acquisition.

Photo credit: US Fish and Wildlife Service

Other Relevant Incentive Programs

Many landowners may prefer to engage in incentive programs that don't involve selling their land or conservation easements. The programs described below are examples of what can be utilized to achieve benefits from our conservation dollars, in the event that fee simple acquisition or conservation easements aren't feasible.

Conservation and Wetland Mitigation Banking

Banking can be a very effective conservation tool, but the permitting process is often long and complex. Outside financing/investment groups are often utilized in conservation and wetland mitigation banking. Market conditions also dictate if a bank is appropriate or not. Many areas are ideal for banking, but the market may not exist, or it may already be saturated. Many of the priority areas identified in the LCD are appropriate for banking from an ecological perspective.

Species Conservation Banking

Species conservation banks are permanently protected lands that contain important species habitat administered by the U.S. Fish and Wildlife Service (FWS). These lands are conserved and permanently managed for species that are federally listed as endangered, threatened, candidates for listing as endangered or threatened, or are otherwise species-at-risk. Conservation banks function to offset adverse impacts that occurred elsewhere to these species, sometimes referred to as off-site mitigation. In exchange for permanently protecting the land and managing it for these species, the FWS approves a specified number of habitat or species credits that bank owners may sell. In Florida the most common conservation banks are for the following listed species: Florida scrub-jay, the blue-tailed mole skink and the sand skink. Panther banks are also a tool utilized south of the Caloosahatchee River. Often conservation banks are funded by an investment group (banker), which funds the permitting and fees associated with the bank. The landowner often receives a portion of the credit sales. All banks must be placed under a conservation easement in order to be permitted. Lands already under easement will not be considered for a bank.

Wetland Mitigation Banking

Wetland mitigation banking is a practice in which an environmental enhancement and preservation project is conducted by a public agency or private entity ("banker") to provide mitigation for wetland impacts within a defined region (mitigation service area). The bank is the site itself, and the currency sold by the banker to the entity impacting wetlands is referred to as a credit, which represents the wetland ecological value equivalent to the complete restoration of one acre. The number of potential credits permitted for the bank and the credit debits required for impact permits are determined by the permitting agencies. Mitigation banks are authorized by a State permit, issued by either a Water Management District or the Department of Environmental Protection, and by the US Army Corps of Engineers. Wetland bankers receive more credits for wetlands they restore versus preserve. Restorable wetlands will more likely receive approval by the regulatory entities.

South Florida Water Management District: Dispersed Water Storage

Since 2005 the South Florida Water Management District has been working with private landowners to store excess surface water on private lands. The Dispersed Water Management Program pays property owners to retain water on their land rather than drain it, accept and detain regional runoff, or both. Holding water on these lands is one tool to reduce the amount of water flowing into Lake Okeechobee and to restore both water quality and the timing of water flows in the Greater Everglades watershed. It also allows for groundwater recharge for increased water supply, water quality improvement, rehydration of drained systems, and potentially habitat restoration for wetland dependent species. The program funds efforts to restore wetland, floodplain, and watershed functions and is becoming a more important part of Florida conservation efforts.

Conclusions and Intended Use

The purpose of this document is to collate all scientific and conservation planning efforts to date in order to coordinate conservation, habitat management, restoration and land protection efforts among various agencies, landowners and stakeholders within the SWFLCD study area. It is a synthesis of important wildlife habitats, known threats to those habitats, and existing conservation programs that are helpful in protecting the lands and waters of southwest Florida for wildlife and people.

This document should not be used for regulatory decisions involving a specific project's impact on individual species as further analysis of the data for a specific species would be necessary.

This document is intended to assist agencies, local governments and organizations in prioritizing their conservation efforts and to assist landowners with making conservation decisions including identifying the most appropriate conservation or incentive program(s) for the land owner's needs.

By coordinating the use of all non-regulatory conservation incentive programs in the most appropriate areas on the landscape, we keep active agricultural lands working for people, rural communities and wildlife by maintaining and protecting a functional ecosystem throughout southwest Florida.

MAPS – For internal planning efforts only

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Photo credit: Larry Richardson/US Fish and Wildlife Service

Southwest Florida Landscape Conservation Design
December 2017