

Florida Ecological Greenways Network Update Project Final Report

May 31, 2021

Methods: Final FEGN 2020 Input GIS Data Layers and Process to Create New Base Boundary

Previous versions of the Florida Ecological Greenways Network (FEGN) have been built around three primary components: Priority Ecological Areas (PEAs), Hubs, and Corridors. This update is structured in the same way, however, with updated and new PEA and Ecological Connectivity data layers and analyses including modified methodologies for some of the PEA layers used or created in the 2013 FEGN update. The table below lists all the PEA criteria included in the new 2021 FEGN. The sections below the table describe the development of the Ecological Hubs based on the PEAs, the Ecological Connectivity methods, the compilation of the Hubs and Connectivity analyses into the new base boundary, and the process for revising the FEGN priorities.

Priority Ecological Areas

PEAs indicate areas of statewide, landscape-scale ecological significance, without explicit regard to landscape connectivity. They form the base data used to identify Hubs.

<u>Data Layer</u>	<u>Source</u>	<u>Criteria</u>
<p><i>Landscape Species Models</i></p> <ul style="list-style-type: none"> -Crested caracara (FNAI model) -FL sandhill crane (FWC model) -Short-tailed hawk (FWC model) -Swallow-tailed kite (FWC model) -Sherman's fox squirrel (FWC model) -Big Cypress fox squirrel (FNAI model) <p>Species added in this update:</p> <ul style="list-style-type: none"> -Eastern indigo snake (FNAI model) -Eastern diamondback rattlesnake (EDR) (FWC model) -Wood stork (FNAI model) -Snail kite (FNAI model) -Gulf sturgeon (FNAI model) -Manatee (FNAI model) 	FNAI, FWC, UF	All high and moderate priority FNAI habitat; All FWC EDR Maxent habitat in the top 2/3 of ranked potential habitat and 20 acres or larger; all FWC Short-tailed Hawk habitat; all Sherman's Fox Squirrel habitat in patches 250 acres or larger; all Florida Sandhill Crane in patches 1,250 acres or greater; all American Swallow-tailed Kite habitat in patches 5,000 acres or greater.
<p><i>Matrix-Landscape Natural Communities</i></p> <ul style="list-style-type: none"> -Sandhill -Pine flatwoods -Dry prairie -Upland hardwood forest -Upland pine <p>New natural communities now included as matrix natural communities or other landscape relevant natural communities:</p> <ul style="list-style-type: none"> -Slope forest -Larger wetland systems and especially swale; Slough marsh; basin marsh, strand swamp; marl prairie; basin swamp; Hydric hammock; that are 500 acres or larger -All blocks of natural communities at least 1000 acres or larger 	CLC version 3.4, FNAI modified version	All such natural communities combined in patches 500 acres or larger. In addition, All blocks of natural communities at least 1000 acres or larger.
<p><i>Florida Panther Conservation Zones</i></p>	USFWS	Panther Habitat Conservation Zones: Primary, Dispersal, Secondary, and North Zones. Removed areas with Landscape Integrity scores less than 6 from the Secondary and North Zones.
<p><i>Panther Habitat</i></p> <p>Using the USFWS Random Forest Florida Panther Habitat Model</p>	USFWS	Counties intersecting and south of I-4 used the 0.315 habitat score as the threshold; Counties north of I-4 used

Data Layer	Source	Criteria
		the 0.55 threshold (stricter).
<i>Florida Black Bear Habitat</i> Using the new University of Maryland Maxent habitat model combined with bear range data from FWC	University of Maryland and FWC	Used all habitat identified in Maxent model that was within or in patches intersecting bear frequent or common range.
<i>Existing Conservation Lands</i>	FNAI FLMA	All existing conservation lands
<i>Strategic Habitat Conservation Areas (SHCAs)</i>	FWC	P1-P3
<i>Rare Species Habitat Conservation Priorities (FNAIHAB)</i>	FNAI	P1-P3
<i>FL Forever Under-Represented Natural Communities</i>	FNAI	All rare natural communities
<i>FL Forever Functional Wetlands</i>	FNAI	P1-P3
<i>FL Forever Natural Floodplains</i>	FNAI	P1-P3
<i>Potential Natural Areas (PNAs)</i>	FNAI	P1-P4
<i>Coastal Barrier Resources Act (CBRA) lands</i>	DEP	All CBRA lands
<i>Dark Sky Regions</i> We are using The New World Atlas of Artificial Sky Brightness GIS data available from Heilmholtz Centre in Potsdam, Germany; https://dataservices.gfz-potsdam.de/contact/showshort.php?id=escidoc:1541893&contactform .	Heimholtz Centre	We compared these data to the two official dark sky parks in Florida (Kissimmee Prairie State Preserve and Big Cypress National Preserve) to determine the mean and standard deviation of night sky brightness in these two parks and identified all areas in Florida below this mean or within 1 standard deviation of the mean as additional dark sky areas with nighttime ecological conditions related to protected large, intact landscapes with low human disturbance.
<i>Air Force Conservation Partnership Priority Focal Species Habitat</i> We worked with the USFWS and the Air Force to identify habitat conservation priority areas adjacent or near Florida Air Force installations across the state. These habitat areas were prioritized based on proximity to installations or related conservation lands, patch size, and landscape integrity, and they represent significant landscape conservation opportunities that can also functionally buffer Air Force installations across the state.	U.S. Air Force, USFWS, University of Florida, FNAI, FWC	All high priority focal species habitat (top third of ranked habitat priorities)

Hubs

All draft PEA data layers were combined. Removed all non-landscape PEAs in areas with Landscape Integrity scores less than 7. Removed all landscape PEAs (panther, bear, landscape species, matrix natural communities) with less than 5 (except for Panther Primary and Dispersal Zones). Narrow connections less than 300 meters were deleted from PEAs. Then closed small gaps narrower than 60 meters (such as roads). All remaining 5,000 acres or larger identified as Hubs, which is the first half of the components used to create the FEGN.

Connectivity Analyses

The Ecological Connectivity Models include:

- 1) Riverine/Riparian Corridor Buffers and Connectivity

Used the same methods as in 2013 for the primary model. Might have been changes to Special Outstanding Florida Waters. Model buffers all Major Rivers and connected Special Outstanding Florida Waters by 800 meters with all connected compatible land uses including all natural, semi-natural, and pasture land uses.

2) Sea Level Rise Coastal Gradient Connectivity

Used the same methods as in 2013 for the current version except integrating step from 2016 priorities update. Compatible areas of all natural and semi-natural land uses and with Landscape Integrity index scores of 5 or greater up to a mile beyond a projected 3m SLR were included instead of stopping at the 3m projection.

3) Xeric Natural Community Connectivity

Identified all xeric natural communities (upland pine, scrub, sandhill, and scrubby flatwoods) in 10 acre or larger patches as source patches. Developed a Cost Surface based on suitable gopher tortoise soils on natural or semi-natural land uses with Landscape Integrity index scores of 6 or greater. Deleted any connections in the Cost Surface less than 60 meters wide. Identified compatible soils and landcover connected to and within 1.5 miles of source patches. Retained only connectivity areas connecting at least 2 patches of xeric natural communities.

4) Florida Black Bear Habitat and Connectivity

Developed Cost Surface using the new FWC Maxent habitat model. Hubs were the larger existing conservation lands within occupied range. Used Cost Distance and Corridor tools in ArcGIS to identify best potential bear corridors between selected bear hubs. The used the Slice tool to identify the best 0.25-0.5 percent slice that best represented the highest suitability corridor path between each selected pair of hubs.

5) Florida Panther Habitat and Connectivity

Developed Cost Surface using the USFWS Random Forest habitat model. Hubs were the larger existing conservation lands within occupied range. Used Cost Distance and Corridor tools in ArcGIS to identify best potential bear corridors between selected bear hubs. The used the Slice tool to identify the best 0.25-0.5 percent slice that best represented the highest suitability corridor path between each selected pair of hubs.

6) Integrated Habitat Network

The Integrated Habitat Network was included as a PEA in the 2013 FEGN update. The TAG for the 2021 update decided that the IHN, based on its intent and the new modeling proposed for it in this update, was a better fit in the Connectivity Analysis portion of the FEGN modeling process. Base IHN data layer the same as used in 2013. In this update we expanded the IHN to provide a more landscape-based regional priority area based on connected natural, semi-natural, agricultural, or mining land uses. This was accomplished by first identifying all NHD flowlines (rivers, streams, and canals) within the IHN. These flowlines were then buffered by 200 meters to identify all natural, semi-natural, agricultural, and mining land uses connected to and within 200 meters of the IHN flowlines.

7) General Landscape Connectivity

Was run the same way as in the 2013 update, which means this model was run last after the Hubs and all other Ecological Connectivity models were combined to close any additional gaps. Cost Surface was based on the new Landscape Integrity layer and additional corridors were identified only in select locations not covered by other connectivity models.

Compiling the 2021 FEGN Base Boundary

The Hubs and all Connectivity Analysis results were combined. Narrow connections less than 120 meters wide were deleted. Then closed small gaps within the network narrower than 120 meters (such as roads). This is done in order to consider such small gaps as part of the network so that overall statewide connectivity can be identified to create the new FEGN base boundary. In addition, all existing conservation lands connected to network (from the FNAI managed areas database) and all Florida Forever projects connected to network were added as part of the new base boundary. Then filled holes within the network less than 1,000 acres with all suitable landcover/land use (natural, semi-natural, and improved pasture) connected to the network. Finally, all areas connected to the statewide network as the FEGN. This means that there are a few Hubs (filtered PEAs in patches of 5,000 acres or larger) that are not included within the FEGN because they are not connected to the larger statewide network.

Assigning and Updating the FEGN 2021 Priorities

Started by using the Cost Allocation method for assigning 2016 priorities to the new base boundaries. This means wherever the 2016 and 2021 boundaries overlap, the priority matches the old priority. New areas added to the base boundary are assigned the closest 2016 priority class. The reviewed all P3 Corridors for additions to enhance functional connectivity. In 2016 the focus of additions was on the P1 and P2 priority classes of the FEGN. Given that FEGN P3 represents major alternatives and other statewide priorities to complement P1 and P2 corridors, it was appropriate to focus on enhancing functional connectivity within P3. That is especially the case now the P3 is also included as part of the Florida Wildlife Corridor. To make the network priorities more efficient and as a first step towards strategic prioritization with the FEGN higher priorities, we then reviewed all P1-P4 priorities to determine if there were outlying “appendix” areas that could be assigned lower priorities. Finally, in a few cases, promoted areas to P1-P2 status based on occurrence in panther or bear corridors and other functional connectivity considerations.

Results: The new FEGN 2021 Base Boundary, Priorities, and Comparison to the 2016 FEGN

Figure 1 represents the new 2021 FEGN. Figure 2 compares the 2021 base boundary to the 2016 FEGN. Figure 3 identifies changes in priority where the new base boundary overlaps with the 2016 base boundary. Figure 4 shows the 2021 FEGN Priorities 1-3 represented collectively as the Florida Wildlife Corridor. Figure 5 shows the current Florida Forever projects that overlap with FEGN P1-P3. Figure 6 shows the Rural and Family Lands Protection Program projects that overlap with FEGN P1-P3.

Table 1 shows the land category statistics for the new 2021 FEGN base boundary, and Table 2 compares the land category statistics from the 2016 FEGN with the new 2021 FEGN.

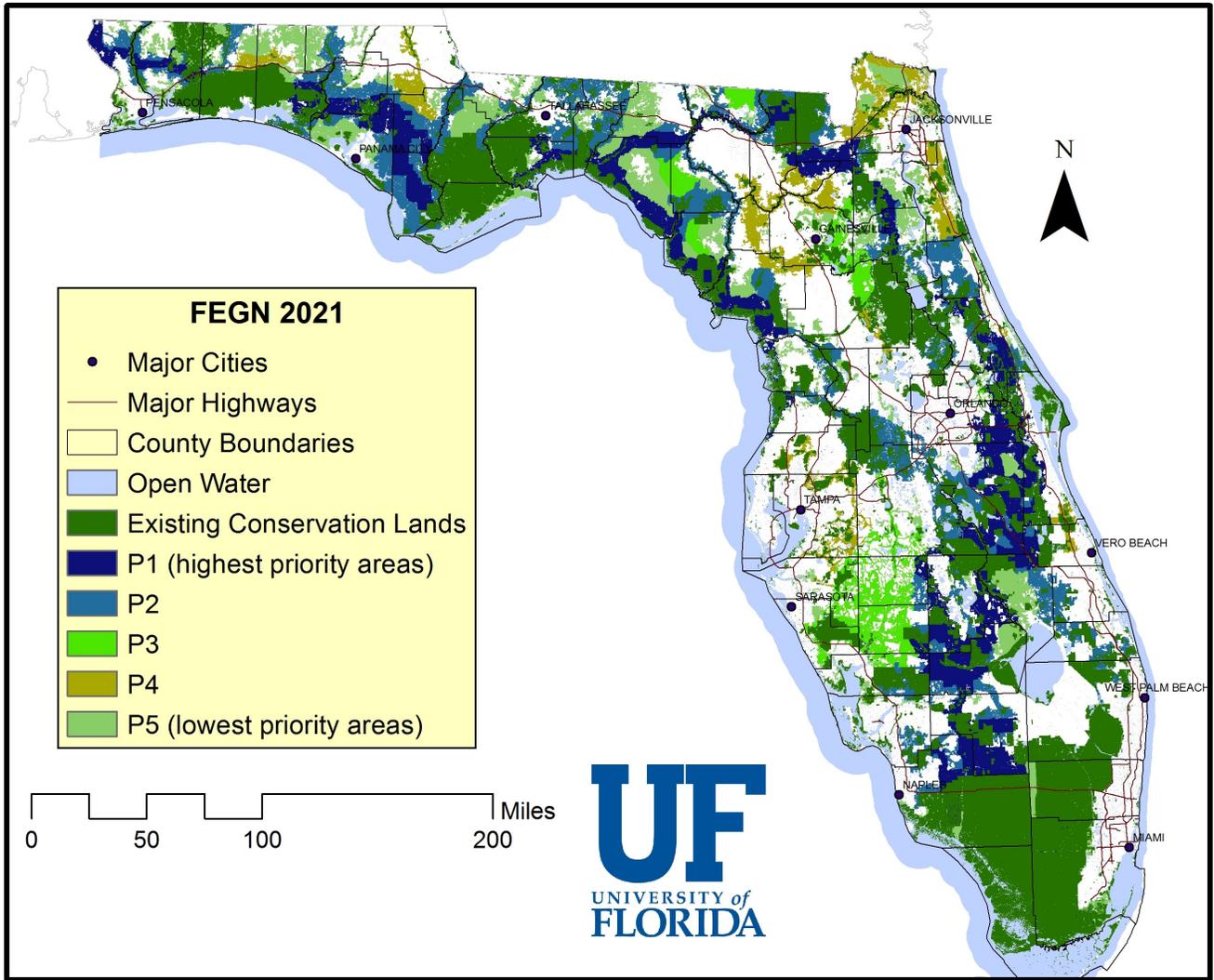


Figure 1. The new 2021 FEGN.

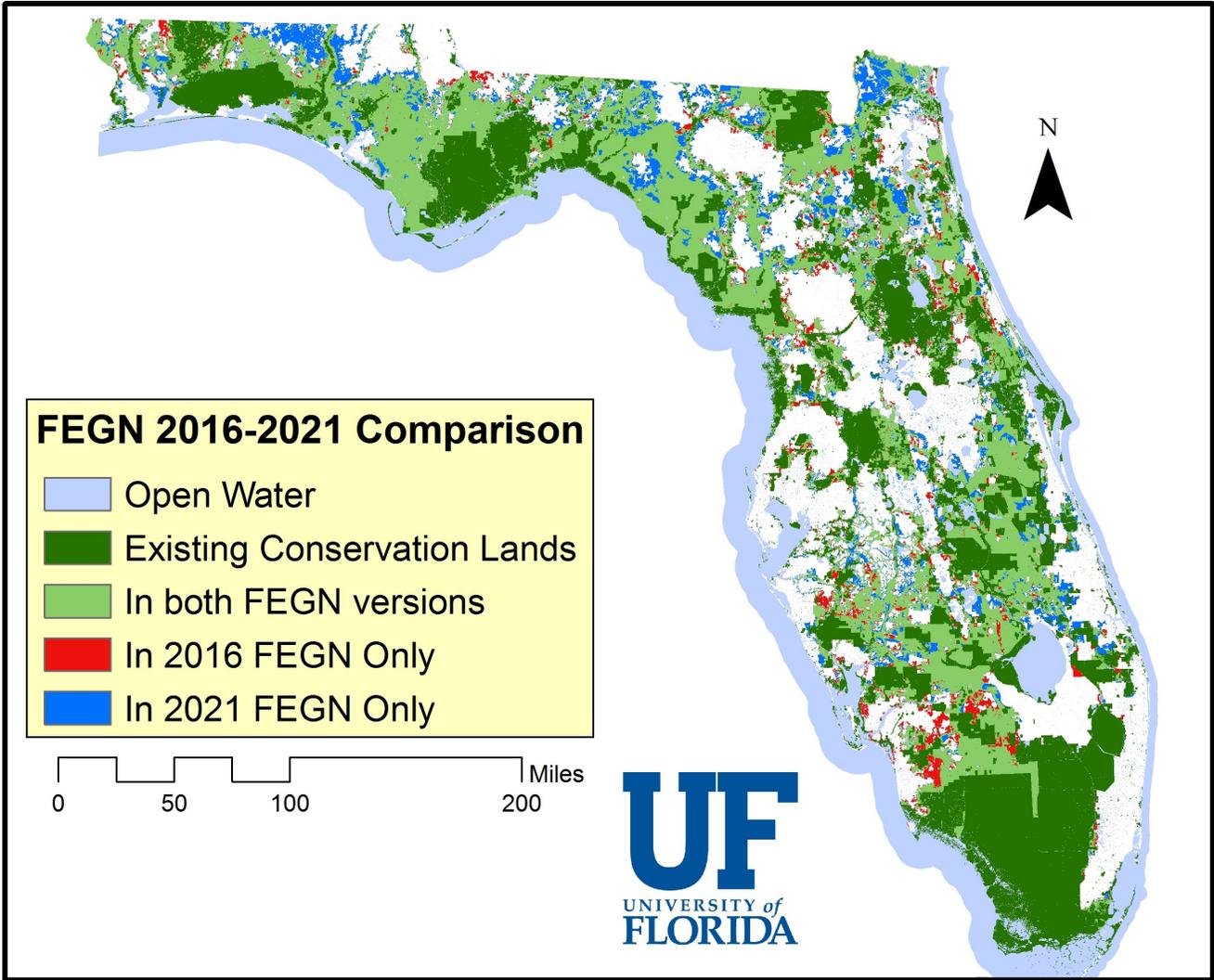


Figure 2. The changes in the base boundary comparing the new 2021 FEGN to the 2016 FEGN.

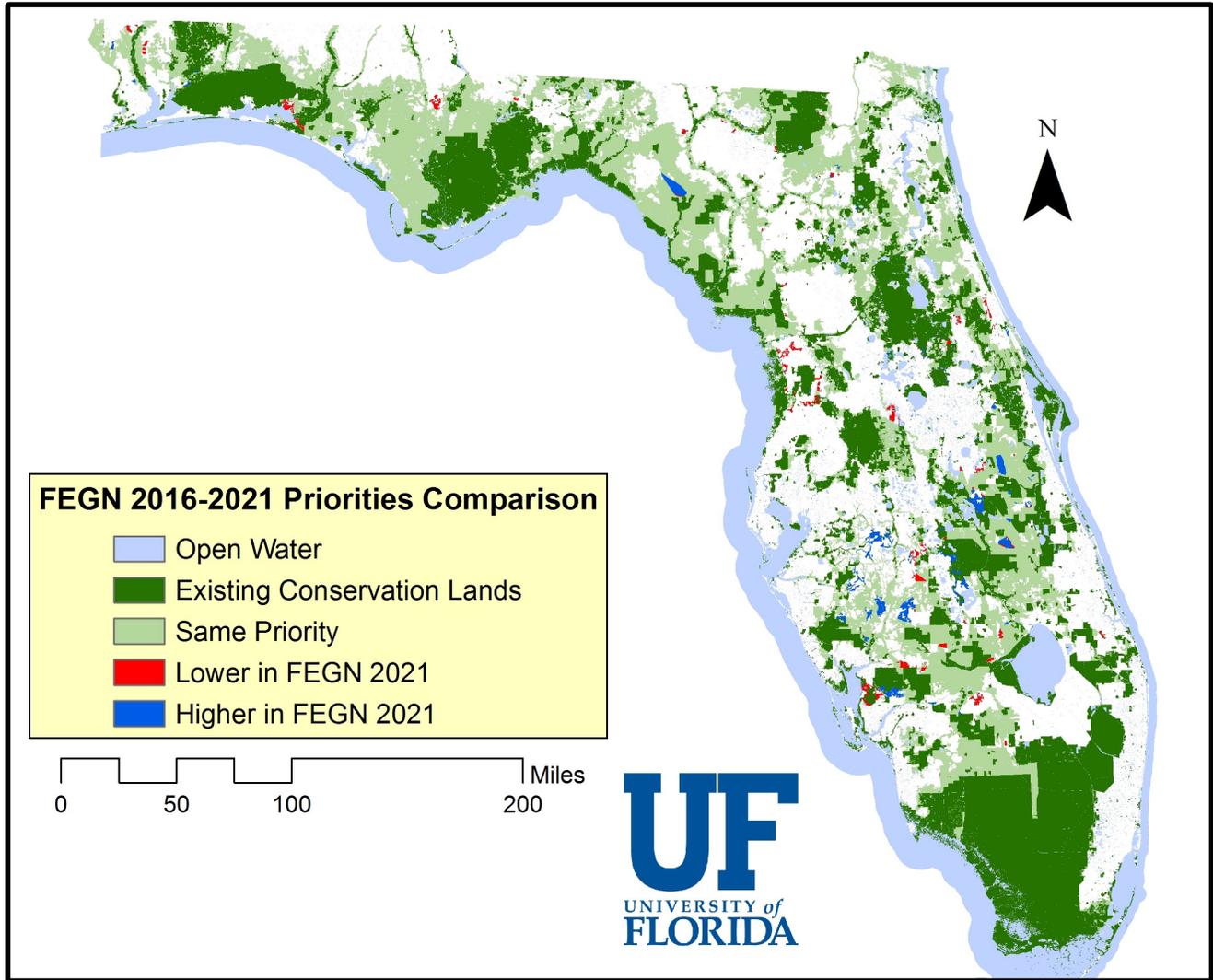


Figure 3. Identification of changes in priority level where the 2021 FEGN overlaps with the 2016 FEGN.

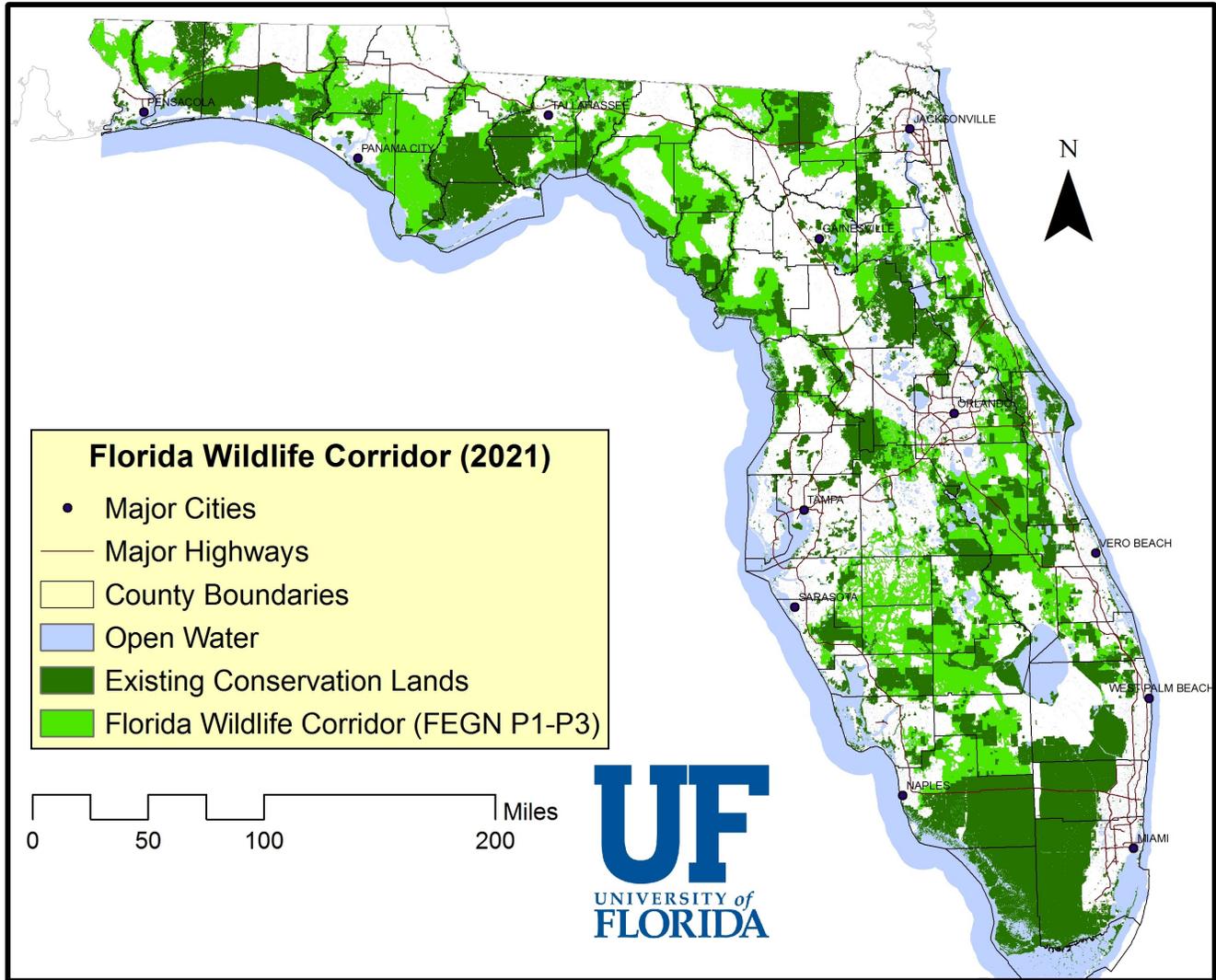


Figure 4. The 2021 FEGN P1-P3 priorities combined into the Florida Wildlife Corridor.

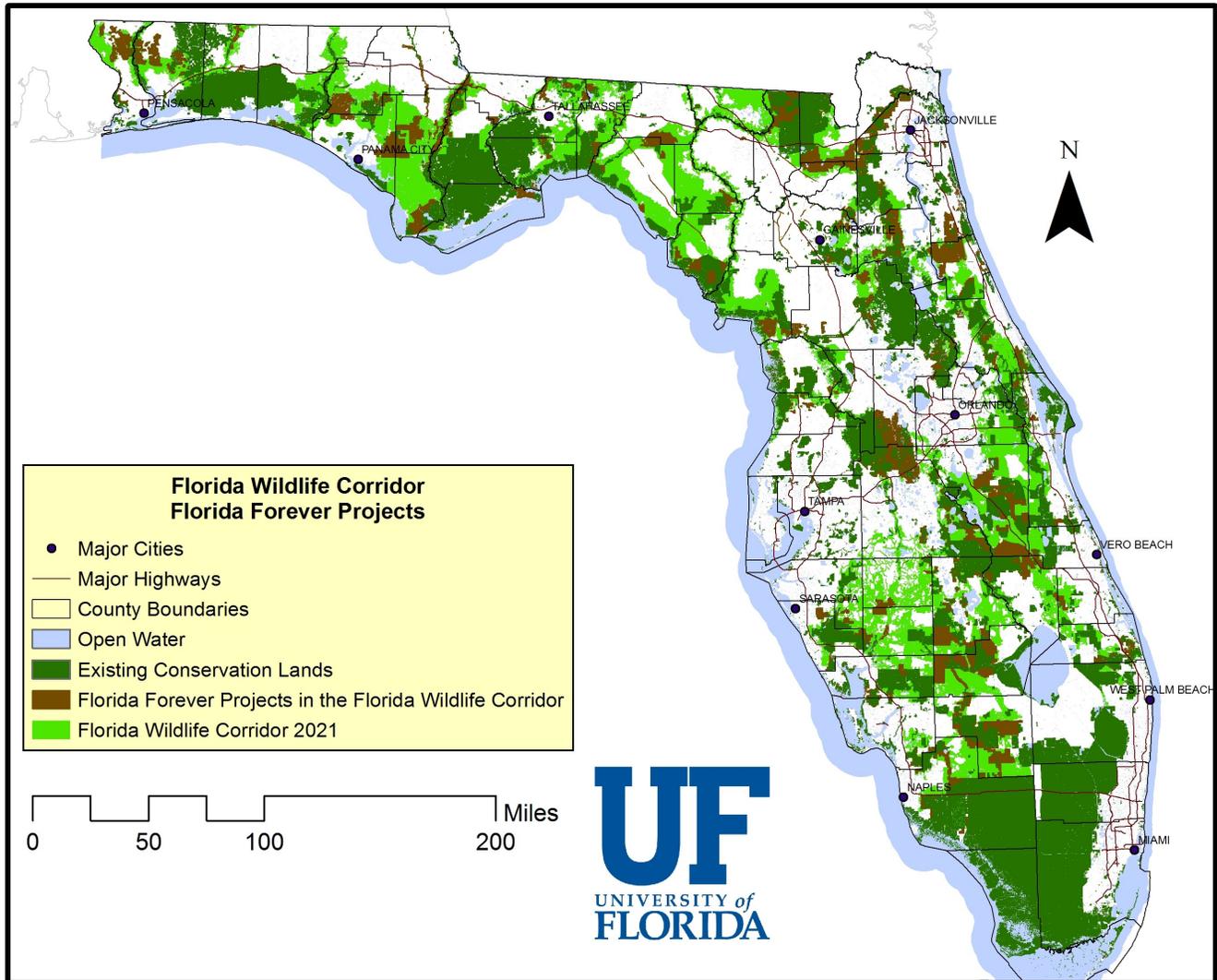


Figure 5. Current Florida Forever projects that intersect with the 2021 FEGN P1-P3 priority areas (i.e., the Florida Wildlife Corridor).

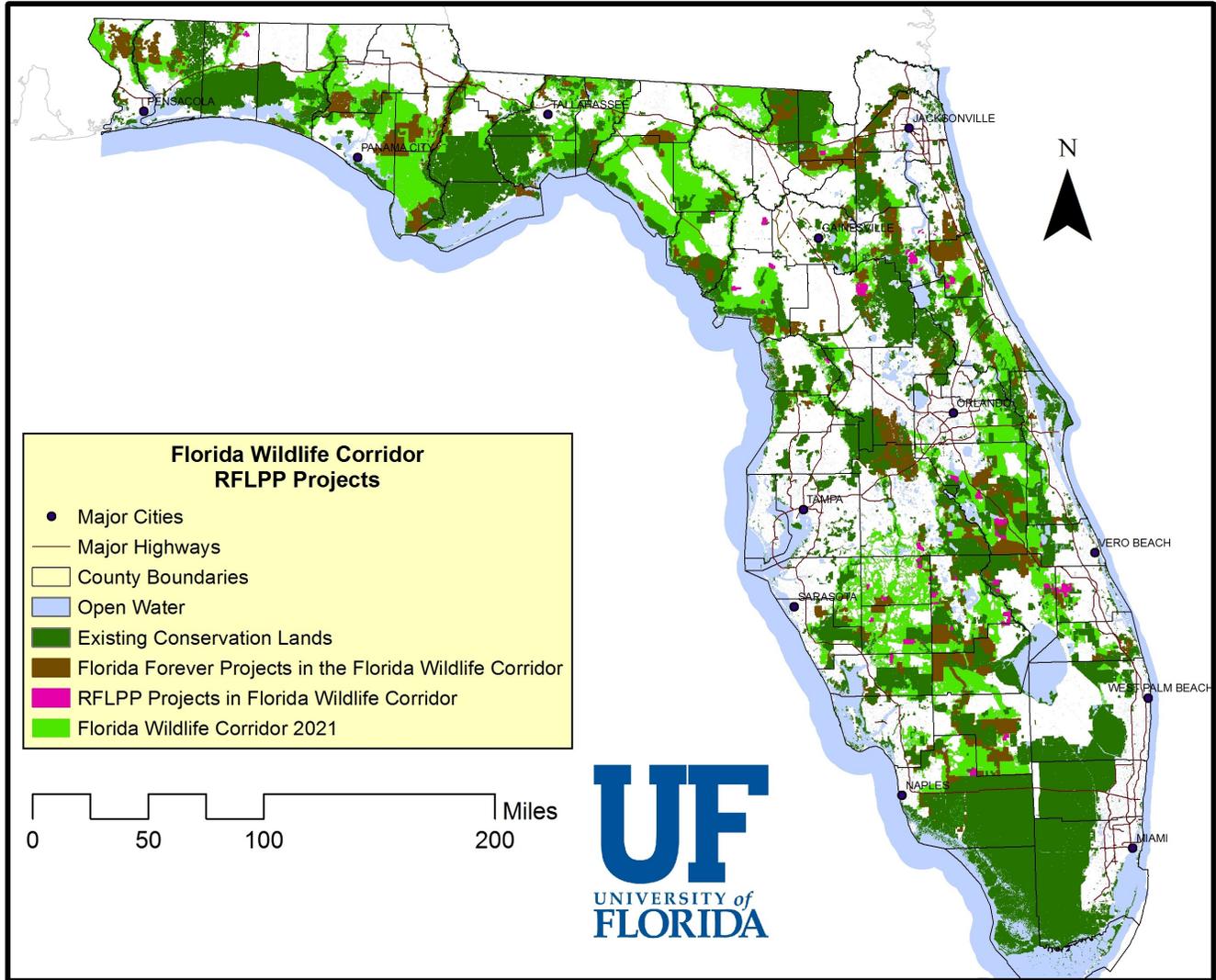


Figure 6. Rural and Family Lands Protection Program projects that intersect with the 2021 FEGN P1-P3 priority areas (i.e., the Florida Wildlife Corridor).

Table 1. Table 1 Land category statistics for the new 2021 FEGN base boundary.

Land Protection Category	Acres	Percent
Open Water	1,198,171	5.2%
Existing Conservation	10,074,156	43.6%
Proposed Conservation	2,259,036	9.8%
Unprotected Wetlands	3,307,243	14.3%
Unprotected Floodplains	1,454,027	6.3%
Other Private	4,804,391	20.8%
	23,097,024	100.0%

Table 2. Comparison of the land category statistics from the 2016 FEGN with the new 2021 FEGN.

Land Use Category	FEGN Priority Level	2016 Acres	2021 Acres
Open Water	Priority 1 (Critical Linkage)	946,636	499,437
Existing Conservation Lands	Priority 1 (Critical Linkage)	7,315,712	7,160,041
Florida Forever Projects	Priority 1 (Critical Linkage)	1,054,290	1,072,998
Other Private Wetlands	Priority 1 (Critical Linkage)	730,757	806,255
Other Private Land	Priority 1 (Critical Linkage)	1,561,999	1,421,132
Unprotected Subtotal		3,347,047	3,300,385
Total		14,956,442	10,959,863
Open Water	Priority 2	188,895	265,365
Existing Conservation Lands	Priority 2	1,420,256	1,586,859
Florida Forever Projects	Priority 2	571,620	683,543
Other Private Wetlands	Priority 2	864,675	907,229
Other Private Land	Priority 2	1,978,505	1,788,789
Unprotected Subtotal		3,414,800	3,379,560
Total		5,023,951	5,231,875
Open Water	Priority 3	26,953	74,735
Existing Conservation Lands	Priority 3	299,329	293,514
Florida Forever Projects	Priority 3	86,104	118,161
Other Private Wetlands	Priority 3	273,581	346,820
Other Private Land	Priority 3	551,783	613,345
Unprotected Subtotal		911,469	1,078,326
Total		1,237,751	1,446,576
Open Water	Priority 4	70,860	87,990
Existing Conservation Lands	Priority 4	393,537	379,662
Florida Forever Projects	Priority 4	138,597	155,053
Other Private Wetlands	Priority 4	268,961	335,348
Other Private Land	Priority 4	651,611	766,479
Unprotected Subtotal		1,059,170	1,256,880
Total		1,523,566	1,724,533
Open Water	Priority 5	538,282	270,644
Existing Conservation Lands	Priority 5	584,944	654,080
Florida Forever Projects	Priority 5	226,806	229,282
Other Private Wetlands	Priority 5	754,688	911,591
Other Private Land	Priority 5	1,533,681	1,668,582
Unprotected Subtotal		2,515,175	2,809,455
Total		3,638,401	3,734,178

Likely Next Steps

The Florida Wildlife Corridor legislation will likely result in additional work on the identification of land protection projects that are most strategic for protecting the highest priority areas with the new Florida Ecological Greenways Network. The strategic prioritization conducted by FNAI in partnership with the University of Florida Center for Landscape Conservation Planning is a good start on these efforts. We expect to continue to refine the strategic prioritization methods including the possibility of adding additional spatial significance methods including the potential use of new wildlife and ecological corridor modeling tools. The goal is to identify Florida Forever, Rural and Family Lands Protection Program, and other land conservation program projects that are essential or most important for closing unprotected gaps in the Florida Wildlife Corridor.

In addition, in past versions of the FEGN project, the only primary data product has been the prioritized Florida Ecological Greenways Network. However, many of the PEA, Connectivity, and other data layers created during the modeling process also have potential value for conservation and land use planning. Therefore, with future funding the UF Center for Landscape Planning proposed to develop a new FEGN GIS database and data guide for expanding the layers available for various analysis and planning efforts.

This new FEGN database could be part of a new CLIP 5.0. CLIP 4.0 was developed in 2016. Since then, many of the core data layers including the Landscape Integrity and new 2021 FEGN, which were both developed in this project, have been updated. In addition, we are interested in re-engaging past CLIP pilot projects including supporting landscapes for landscape-level conservation (in support of the FEGN and related efforts), storm protection priorities, and water restoration priorities to complete these parts of the CLIP project to add them to CLIP 5.0.

Finally, the UF Center for Landscape Conservation Planning is working with the Florida Department of Agriculture and Consumer Services, 1000 Friends of Florida, the Florida Conservation Group, the University of Florida Bureau of Economic and Business Research, and the University of Florida GeoPlan Center to develop a new Florida 2070 growth scenarios that will be completed in the summer of 2021. Once completed, we expect to compare these scenario results to the new 2021 FEGN and other relevant data to further enhance both strategic prioritization and policy/program development for protecting the high priorities in the FEGN and related landscape-level conservation efforts.