Heartland Ecological Assessment Report

June 2010

photos by Carlton Ward Jr.

Table of Contents

Executive Summary

The Nature Conservancy convened a Technical Advisory Group (TAG) and contractors to assist the Central Florida Regional Planning Council in developing the ecological foundation for the Heartland 2060 regional visioning project. The Heartland 2060 multi-year effort will result in a vision statement expressing common values, a regional future growth plan, and an action plan to address regional priorities. We designed this study to help create a sustainable future for Florida's Heartland (Polk, Highlands, Glades, Desoto, Okeechobee, Hendry and Hardee counties).

This report and the associated database synthesize the best available ecological data for this 7-county region. This information is intended to provide the best available science to help guide the Heartland 2060 visioning effort. The data is intended to be regional in scope not site specific. In crafting a vision for this region, it is essential to protect a functional landscape that will preserve critical ecosystem services and the viability of species and natural systems. This is an opportunity to be proactive and take into account these important ecosystem values (and our responsibilities as stewards of these resources) before they are compromised, requiring costly restoration or engineered solutions.

The database includes a suite of ecological information that can be viewed as individual layers or combined with other layers. Select data layers are provided as figures in this report.

The culmination of this study is the Conservation Strategies Matrix. The contractors developed this matrix (Table 1) to identify priority areas and propose different conservation approaches for natural and working lands. Areas identified in the highest levels of the natural category might be appropriately identified for fee title land acquisition programs; sites in the current working landscape category might be more appropriately identified as priorities for conservation easement or incentive programs. The methodology used to develop this matrix is described in the Explanation of Data Layers section.

Table 1. Conservation Strategy Matrix

	"Natural"	"Working Landscapes"
Priority 1	FNAIHAB P1 on natural landcover	FNAIHAB P1 on seminatural
	SHCA P1 on natural landcover	SHCA P1 on seminatural
	NC: Scrub and sandhill if on PNA 1-4,100 or LI 7-10	Riparian Buffers - Value 1 on seminatural
	NC: All dry prairie, seeps, SH upl lakes	Panther - Value 9 on seminatural landcover (or other ag)
	Riparian Buffers - Value 1 on natural	Bear - Values 9, 8 on seminatural landcover (or other ag)
	Panther - Value 9 on natural landcover	Greenways: C1-2 on seminatural lancover
	Bear - Values 9, 8 on natural landcover	
	Greenways: C1-2 on natural lancover	
Priority 2	FNAIHAB P2-3 on natural	FNAIHAB P2-3 on seminatural
	SHCA P2-3 on natural	SHCA P2-3 on seminatural
	NC: Rem. scrub and sandhill	Greenways P1-3 on seminatural (or other ag)
	NC: All Seepage Slope/Bog and Trop. Hammock	Smoke Buffers - Value 9 or 8 on seminatural landcover
	Greenways P1-3 on natural	Riparian Buffers - value 2-3 on seminatural
	Panther - Value 7 and 8 on natural	Panther - Value 7 and 8 on seminatural (or other ag)
	Bear - Value 7 on natural	Bear - Value 7 on semi-natural (or other ag)
	Wetlands - all	Conservation Buffers - Values 9, 8, or 7 on seminatural
	Smoke Buffers - Value 9 or 8 on natural landcover	
	Conservation Buffers - Value 9, 8, 7 on natural	
Priority 3	FNAIHAB P4-6 on natural	FNAIHAB P4-6 on seminatural
	SHCA P4-5 on natural	SHCA P4-5 on seminatural
	NC: All upland hardwd forest and pine flatwoods	Landscape Int P7-10 on seminatural
	Landscape Int P7-10 on natural	Greenways P4-6/Riparian Greenways on seminatural
	Greenways P4-6/Riparian Greenways on natural	Bear - Value 6, 5, 4 on seminatural (or other ag)
	Bear - Value 6, 5, 4 on natural	Smoke Buffers - Values 6-7 on seminatural
	Panther - Value 6 and 5 on natural	Panther - Value 6 and 5 on semi-natural (or other ag)
	Smoke Buffers - Values 6-7 on natural landcover	Conservation Buffers - Value 4-5-6 on seminaural
FNAIHAB	FNAI Rare Species Habitat Conservation Priorities	
SHCA	FWC Strategic Habitat Conservation Areas	
NC	Natural Community models	
Riparian Buffers	UF priority buffers along riparian corridors	
Panther	UF panther model	
Bear	UF bear model	
Greenways	UF/OGT Ecological Greenways Network	
Wetlands	WMD FLUCCS wetlands	
Smoke Buffers	TNC conservation land smoke buffers	
Conservation Buffers	conservation land buffers	
PNA	FNAI Potential Natural Areas	
LI or Landscape Int.	UF Landscape Integrity model	

The information helps us understand where ecological priorities are located and what should be preserved to protect a healthy environment. This report identifies an ecological footprint for the region that seeks to minimize potential conflicts between land uses and helps to ensure that ecosystem functionality can be maintained as the region grows in a sustainable manner.

The TAG focused on four main areas: protecting the biological diversity encompassed within this region; preserving the integrity of important water resources; examining management needs for conservation lands; and identifying regionally important ecological greenways, or corridors, for wildlife.

Heartland Overview

The ecological, agricultural, recreational and cultural attributes of the Heartland region are inextricably linked. A balanced approach is necessary for maintaining and growing a sustainable economy; protecting biodiversity and ecosystem services; and ensuring a high quality of life for residents and visitors. In crafting a vision for the region, Heartland 2060 must protect the ecological infrastructure that provides the foundation for a sustainable future.

The region supports a large concentration of threatened and endangered species, high quality habitats, endemic natural communities and significant hydrological resources. It is an important region for long-standing conservation efforts (See Figure 1). The large ranches characteristic of the region are a cornerstone of this area's economy and heritage and play a critical role in maintaining its ecological integrity. Sustainable and viable agricultural are critical for the future of this region. A 10-mile buffer around the project area was included to encourage thinking about ecological connections with adjacent regions. Certain ecological goals stand out:

- Strengthening north/south functional connections for panthers, bears and other wide-ranging species.
- Creating a permanently protected network of functionally connected public and private conservation lands across the region.
- Protecting the unique and imperiled biodiversity of the region's scrub and prairie ecosystems.

- Maintaining the ecological integrity of the high priority natural and working landscapes as identified in the Conservation Strategy Matrix.
- Creating compatible neighbors by minimizing potential conflicts between urban/suburban lands uses and conservation lands.
- Establishing, restoring and maintaining riparian networks and buffers.

Public and private conservation entities have invested years of effort and millions of dollars to create an interconnected landscape through this region of the state. It is essential that we protect investments already made and that we connect and buffer conservation areas to create a functional, resilient landscape rather than a collection of fragmented sites.

Explanation of Data Layers

Matrix of Priority Conservation Resources by Land Use Category

For the Heartland 2060 conservation priorities analysis, resources were grouped into three priority classes, with Priority 1 representing the highest priority for conservation. In addition to these priorities, we categorized resources by the intensity of land use that would be appropriate or compatible with those resources. Resources were grouped into two land use categories: Natural and Working Landscapes. The result is the Matrix of Priority Conservation Resources by Land Use Category (see Figure 2). The intent of this matrix is to acknowledge that areas important for conservation occur both within natural areas and on working landscapes.

Not all natural resources must be acquired as conservation lands for the resources to persist. Many rural land uses of varying intensities are compatible with various natural resource conservation objectives. Some natural resources such as scrub, most wetlands, and various habitat specialist species (for instance, the Florida scrub-jay and many rare plant species) require the maintenance or restoration of natural cover or conditions. However, many natural resources and species can persist or remain viable in conjunction with some degree of human-influenced land uses. Therefore, resources included in the "Natural" land use category are those resources that require relatively pristine natural systems to function and persist long term. These include high quality natural communities and sensitive species habitat. For the purpose of this analysis,

we included most resource priority areas that currently exist on natural land cover. While some of these resources could potentially remain viable with some degree of human disturbance, natural land cover is highly preferable, especially for those resources in Priority 1 in the Matrix. Resources included in the "Working Landscapes" category are resources that are compatible with relatively low-intensity human land uses such as ranching. Assuming that best management practices are used, these land uses are considered to be compatible with the long term persistence of the identified resources.

Overall, the focus of conservation efforts should be first to maintain current land uses, or even restore natural systems, across resources grouped as Priority 1. Ideally, Priority 2 and 3 resources are also important to the goal of maintaining current compatible land uses, although these resources are lower priority for maintaining the overall suite of ecosystem functions in the region. One important caveat to these very general guidelines is that areas important for protecting state and regional ecological connectivity incorporate both lands in the Natural and Working Landscape categories. It is important that ecological connections across natural and working landscapes be carefully considered to maintain and restore functional connectivity. However, with this said, working land uses such as ranches in the Heartland region are at least generally compatible with the goal of protecting regional ecological connectivity and should be treated as such in planning efforts in the region.

Notes on the Modeling Process

Note that there can be overlap between different resource types included in this analysis. In case of overlap, Priority 1 overrides Priority 2, which overrides Priority 3. As a result, lands that meet one or more criteria for Priority 2 or 3 may also be identified in Priority 1 criteria. (For example, an area might be a high priority for Rare Natural Communities but a low priority for the Florida Ecological Greenways Network. In this model this areas would still be an overall high priority because it is a high priority for at least one of the component resources. This is called this a rules-based combination where an area's priority is based on the highest priority received for any single input layer.) Natural and semi-natural land covers were classified from two primary land cover data sources. The base layer was the water management districts FLUCCS land

cover. However, where FNAI natural community models have been developed, they superseded the FLUCCS classification. Ideally, natural resources occurring on semi-natural land cover might undergo detailed examination to determine if some might in fact require a more natural landscape for long term persistence (i.e., some semi-natural areas should be restored to natural systems to maintain viability of resources on those lands). That level of analysis was beyond the scope of this project.

0 = not priority

1 = working landscape P3

2 = working landscape P2

3 = working landscape P1

4 = natural P3

5 = natural P2

6 = natural P1

Florida Black Bear Habitat

The first major step in the process was to create a black bear habitat map for the study area. The Florida black bear potential habitat model was created using documented information about Florida black bear habitat preferences and assessment of connectivity thresholds based on distance from primary habitat and land use type (Maehr et al 2001, Hoctor 2003, Orlando 2003). Habitat was identified using 2004-2006 Water Management District land-use data at a 10 meter cell size. Three types of habitat/land use were identified:

1) Primary habitat—forest cover including flatwoods, hammocks, scrub, and forested wetlands. All patches of primary habitat greater than 6 hectares (approximately 15 acres) were identified (Cox et al. 1994).

2) Secondary habitat—sandhills, shrub and brush, and freshwater shrub wetlands and freshwater herbaceous wetlands. Patches of secondary habitat or smaller

patches of primary habitat that are near larger primary habitat (15 acres and larger) can also be used by bears. However, patches separated by intensive land uses that cannot be reached or easily reached may not be used. Therefore, "traversable matrix" land cover and land uses were also identified to determine which secondary patches were functionally connected to primary patches. All secondary habitat types and all smaller patches of primary cover within 1.5 kilometers of primary patches and connected by traversable matrix were identified as potential habitat.

3) Traversable matrix—almost all other land use types that bears are capable of moving through when proximal to primary habitat including agriculture, mining lands, and saltmarsh. Roads also were included to model habitat patches across roads that bears might be able to access (Larkin et al. 2004). Large water bodies were not included as potential habitat, but narrow channels that might be crossed were identified and included within the traversable matrix. Narrow water gaps were defined as <100 meters (Dave Maehr, personal communication).

Then, all primary and secondary habitat were combined to identify connected blocks >10,000 acres. This was done to identify areas that are more likely to be large enough to serve as minimum functional habitat units for black bear (Hellgren and Maehr 1992). Within these areas, primary habitat was given a value of 1, secondary habitat was given a value of 2, and traversable matrix was given a value of 3.

The second major step was to combine the black bear potential habitat map with areas representing occupied bear range or other habitat conservation priorities for black bear in the study area. The following data were used in this step:

1.) Florida Black Bear Strategic Habitat Conservation Areas from the Florida Fish and Wildlife Conservation Commission

2.) Primary and secondary bear range from the Florida Fish and Wildlife Conservation Commission

3.) Priority Bear Population Priority Conservation Areas identified by Tom Hoctor. These areas were identified using set of habitat and landscape variables relevant to identifying bear habitat with high integrity created under contract for the Florida Fish and Wildlife Conservation Commission in 2006. This model of habitat quality/integrity was then modified to give higher priority to areas near existing conservation areas within occupied bear range. Then, all habitat areas needed to secure a protected habitat base of at least 500,000 acres were identified for each Florida black bear population in Florida.

4.) A priority corridor connection south of Lake Kissimmee to connect priority bear habitat in Avon Park Air Force Range to Three Lakes Wildlife Management Area was also identified for this project.

These four different priority areas were then combined into one dataset and combined with black bear potential habitat in the following fashion:

9 = Potential primary habitat within priority areas; priority 1 (highest)
8 = Potential secondary habitat within priority areas; priority 2
7 = Potential traversable matrix with priority areas; priority 3
6 = Other potential primary habitat; priority 4
5 = Other potential secondary habitat; priority 5
4 = Other potential traversable matrix; priority 6
1 = All other areas in the study area

The reader should keep in mind that some areas are critical to achieving the ultimate objective of creating a connected network of protected lands that sustain a viable population of black bear. This means that areas of moderate bear habitat value (brown color) could become very important if they provide a vital linkage between higher priority habitat areas.

Although this map of priority bear habitat (Figure 3) depicts a pretty robust corridor for bear movement north and south through the region, the "Heartland Conservation Priorities" map

shows almost all of this area as "working priority" lands. For these lands to actually remain viable for black bear, it will be important that the type of agriculture remain conducive to the species (and for these areas to not be severed by roads). For example, forested areas should remain as such to support the black bear, rather than be converted to other forms of agriculture that might support other wildlife, but not the Florida black bear.

Florida Panther Habitat

The first major step in the process was to create a Florida panther potential habitat map for the study area (See Figure 4). The Florida panther requires intact landscapes with no to low human activity dominated by land cover and land use that supports suitable cover and prey (Kautz et al. 2006, USFWS 2008). Various types of forest are of primary significance but panthers also use rural mosaics containing upland and wetland forest, herbaceous wetlands, dry prairies, pasturelands, and other agricultural land uses (Kautz et al. 2006, Land et al. 2008. USFWS 2008). Panthers require large areas to support functional home ranges and the integrity of home ranges, with respect to impacts from roads and other human land use and activities, is an important consideration for maintaining or restoring suitable habitat (Kautz et al. 2006, USFWS 2008).

The Florida panther habitat model applied in this study was adapted from the potential habitat model created by the Florida Fish and Wildlife Conservation Commission as part of their update to Strategic Habitat Conservation Areas (http://research.myfwc.com/features/view_article.asp?id=29815). The model was created using 2004-2006 Water Management District land-use data at a 10 meter cell size to identify forest patches 2 hectares (approximately 5 acres) or larger and then adding all non developed (natural, semi-natural, agriculture) areas within 200 meters of such forest patches (Kautz et al. 2006). Forest patches 2 hectares or larger and all other habitats within 200 meters of these patches were all given a value of 1.

The second major step was to combine the Florida panther potential habitat map with areas representing habitat conservation priorities for panther in the study area. The following data were used in this step:

1. U.S. Fish and Wildlife Service (USFWS) Florida Panther Subteam Primary, Secondary, and Dispersal Conservation Zones
2. University of Tennessee Florida Panther Potential Habitat Priorities Analysis for the USFWS
3. Potential Florida Panther corridors identified by Tom Hoctor connecting Babcock Ranch to Myakka conservation lands complex, Avon Park Air Force Range, and Okaloachoochee Slough State Forest (Noss and Hoctor 2010)

To start the combination of the Florida panther potential panther habitat and priority areas, we combined the Panther Subteam Primary and Dispersal Zones; University of Tennessee high, medium, low probability habitat areas; and potential panther corridors from the Babcock Ranch connectivity study. These priority areas were only retained if they also overlapped with panther potential habitat. Then we ran a connectivity analysis and retained only the areas that were connected together in a regional network of priority potential panther habitat. Finally, we combined this panther habitat network with other data to identify the following priority habitat values:

9 = Panther habitat network within Panther Subteam Primary and Dispersal Zones; priority 1 (highest)

8 = Panther habitat network within Panther Subteam Secondary Zone; priority 2

7 = Panther habitat network within University of Tennessee high and medium probability habitat areas; priority 3

6 = Panther habitat network within University of Tennessee low probability habitat areas; priority 4

5 = Panther habitat network within other panther potential habitat; priority 5

4 = University of Tennessee high probability habitat areas NOT within the panther habitat network; priority 6

1 = All other areas in the study area

As with the bear layer, the reader should keep in mind that some areas are critical to achieving the ultimate objective of creating a connected network of protected lands that sustain a viable population of panthers. This means that areas of moderate panther habitat value (brown color) could become very important if they provide a vital linkage between higher priority habitat areas.

Riparian Greenways

Since the Florida Ecological Greenways Network (FEGN) focuses on state and regional corridor priorities, there can be other significant corridors at the regional to local scale that are not included within the FEGN (Figure 5). Riparian networks including rivers, streams, lakeshores and associated wetlands, floodplains, and forests, are important landscape features used by many species. Therefore, any intact riparian corridors that might provide additional connectivity within the study area were identified. The riparian corridor layer was created by combining all forested wetlands from Water Management District land use data with streams from NHD flowlines data. Then we identified all additional natural or semi-natural land cover (defined as all FLUCCS values from 3000 to 7399) within 400 meters (half the corridor distance we would like to see at regional scales, but a good starting point for riparian based networks; Hoctor 2003) of these forested wetlands and streams. We then identified all parts of the FEGN in natural and semi-natural land use and combined these areas with riparian habitat. Finally, only areas of riparian habitat and/or FEGN in natural/semi-natural land use in swaths 1000 acres or larger were retained. Values are:

1 = Combined patches of intact FEGN and/or riparian habitat/corridors that are 1,000 acres or larger

0 = Not within these larger patches/corridors

Ecological Network

This dataset was not used in the Natural Resources prioritization matrix, but it provides an explicit identification of priority areas for protecting a functionally connected network of public and private conservation lands across the study region. However, this identification of ecological connectivity priority areas is a regional-scale model that identifies general opportunities. In reserve design at the landscape or site scale, areas included might be modified and widths of corridors may need to be wider or could be made narrower than depicted here depending on the scale of the corridor, context, protection of functional buffers (including both hydrology and negative edge effects), and the focal species under consideration. With that said, the two most demanding species regarding required space, corridor width, and sensitivity to intensive human activities are the Florida panther and Florida black bear, and each of these species are the best candidates for serving to identify, design, restore, protect, and manage functional corridors and connectivity.

This dataset was created by identifying all natural and semi-natural land uses within any of the following areas: the Panther Primary and Dispersal Zones, all high and medium probability areas in the University of Tennessee panther potential habitat model, all Florida black bear potential habitat, and Riparian Buffers (See Figure 6). These areas were then buffered by 400 meters and all other rural land uses within these buffers were also identified. Areas within the Integrated Habitat Network were also added included as either natural/semi-natural, other rural/agricultural, or more intensive land use categories depending on the overlaying land use. The values are:

1 = Natural/semi-natural land uses within the regional ecological network; priority 1 (highest)

2 = Rural/other agricultural land uses within the regional ecological network; priority 2

3 = Areas of more intensive land uses (mostly mining) within the Integrated Habitat Network; priority 3

Groundwater Priorities

We reclassified the Groundwater priorities map from the Florida Forever Needs Assessment to identify areas important for protecting groundwater resources (See Figure 7). These resources are potentially compatible with moderate or even high intensity land uses, if potential impacts to the resources are carefully considered and appropriate design, mitigation, and management practices are used. For example, a variety of land uses can potentially occur on high recharge areas, as long as the quality and quantity of water being recharged to groundwater aquifers is minimally impacted.

One of the legislatively stated goals of the Florida Forever program is to acquire acres of groundwater recharge critical to springs, sinks, aquifers, other natural systems or water supply. In order to develop a means of identifying these areas, Florida Natural Areas Inventory subcontracted with Advanced Geospatial, Inc. (AGI) to develop a statewide Recharge Potential model.

Input data layers for the model were consistent with those used in the Florida Aquifer Vulnerability Assessment (FAVA) developed by the Florida Geological Survey and consisted of soil hydraulic conductivity, proximity to karst features, depth to water, and overburden. These input layers were combined using a spatial analysis called Fuzzy Logic. Detailed documentation for the base model may be found in AGI's final report, "FNAI- Recharge Component, 2009".

The AGI model is a statewide grid of 300 x 300m cells, with cell values ranging from 0 - 1 on a continuous scale. The continuous values allow for flexibility in how the model is applied. For Florida Forever reporting and evaluation it was necessary to group the values into several priority classes, ranging from high to low, to help focus on the most important places statewide to protect significant recharge areas. The prioritization also addresses the intent of Florida Forever to acquire recharge areas important for springs and water supply. FNAI consulted with AGI, Florida Geological Survey and DEP to accomplish this prioritization. For more details please refer to the Florida Forever Conservation Needs Assessment Technical Report version 3.2, available online at http://www.fnai.org/FlForever.cfm.

The final Prioritized Recharge dataset is a 30m grid with 6 priority classes.

1 = Priority 1 (Highest)

2 = Priority 2

3 = Priority 3

4 = Priority 4

5 = Priority 5

6 = Priority 6

Smokesheds

This shapefile consists of smokesheds for the existing fire-dependent conservation lands within Heartland 2060 region (See Figure 8). To avoid conflicting land uses, The Nature Conservancy developed the smokeshed data layer to serve as a land-use planning tool that provides guidance for the best locations of new development to minimize smoke impact from prescribed fires. It is important to note that this model does not map smoke buffers for agricultural lands that also rely on prescribed burning. If additional lands are acquired, this data layer will need to be updated. The smokeshed areas are classified into four stacked buffer zones extending outward from conservation boundaries up to 2 mi. The buffer zones are numbered 1 through 4, reflecting increasing suitability for development types of greater smoke sensitivity (i.e., development types of greater smoke sensitivity are limited to zones of higher value than are development types of lesser smoke sensitivity). To preserve the smokesheds, land-use planners would allow new roads, road expansions, and developments only within the appropriate buffer zones (Table 1). For example, a new hospital should occur only within an area classified as buffer zone 4; a new local-rural road should be sited within a buffer zone 2 or higher.

The distribution of smoke-sensitive development types among the four buffer zones is determined by a set of minimum distance criteria (Table 2) from conservation boundaries. The development types consist of roads by Florida Department of Transportation (FDOT) functional

class, hospitals, nursing homes, airports and other aviation sites, and commercial, residential, and industrial areas. These criteria were developed by Nature Conservancy fire managers and reviewed by land managers of Lake Wales Ridge conservation sites.

Table 2. Minimum distance criteria for smoke sensitive development.

FDOT Road Class	Description	Distance from Conservation Boundary	Smokeshed Buffer Zone(s)
6	minor arterial -rural	> 0.25 mile	2, 3, 4
8	minor collector - rural	> 0.25 mile	2, 3, 4
9	local - rural	> 0.25 mile	2, 3, 4
1	principal arterial - interstate, rural	> 0.5 mile	3, 4
2	principal arterial - other, rural	> 0.5 mile	3, 4
7	major collector - rural	> 0.5 mile	3, 4
16	minor arterial - urban	> 0.5 mile	3, 4
17	collector - urban	> 0.5 mile	3, 4
19	local - urban	>0.5 mile	3, 4
11	principal arterial - interstate, urban	> 1 mile	4
12	principal arterial - freeways\ expressways, urban	> 1 mile	4
14	other principal arterial - urban	> 1 mile	4
Other land use types			
residential\commercial\ industrial		> 0.25 mile	2, 3, 4
hospitals \ nursing homes		> 1 mile	4
airports, airstrips, heliports		> 2 miles	outside of smokesheds

To identify the smokesheds, a land-use analysis was conducted using ArcGIS Spatial Analyst's cost-weighted distance tool. Road data was obtained from the Florida Department of

Transportation; airport, hospital and nursing home locations were obtained from the Florida Geographic Data Library (www.FGDL.org); commercial, industrial, and residential areas were digitized from the latest DOQQ imagery available from each county; conservation area boundaries were provided by the Florida Natural Areas Inventory, The Nature Conservancy, Archbold Biological Station, and Polk County Environmental Lands Program.

The default maximum buffer zone widths are 0.25 mi, for each of buffer zones 1 and 2, 0.5 mi for buffer zone 3, and 1 mi for buffer zone 4. Where developments occur at less than the minimum recommended distances, the category, location, and width of the buffer zones are determined by the existing development types and their distances from the nearest conservation edge. For example, where residential, commercial, or industrial area occurs immediately adjacent to a conservation boundary, the area is classified as a zone 2 at best. Where there are no developments extending at a perpendicular distance from a conservation edge or where all developments are at or exceed the recommended distances, the buffer zones are at their full width from the nearest conservation boundary.

Areas where smokesheds are compromised by smoke-sensitive development in too close proximity may have one or more buffer zones narrower than the maximum width or may be missing one or more zones all together. In these cases, the area is still crucial for protection from further deterioration because they still function as part of smokesheds for areas up to two miles away within the conservation boundary.

Data layers with no Figures

All of the following data layers were used in the Conservation Strategy Matrix. Separate figures are not provided in this report.

Rare Species Habitat Conservation Priorities

This data layer was created by FNAI as part of the Florida Forever Conservation Needs Assessment, a statewide analysis of natural resource conservation priorities for the Florida Forever statewide environmental land acquisition program. The model was explicitly designed to identify areas important for species habitat based on both species rarity and species richness. This data layer closely reflects the conservation priorities of FNAI and the rare species and natural communities we track.

FNAI mapped occurrence-based potential habitat for 248 species of plants, invertebrates, and vertebrates, including aquatic species. Because land acquisition was the focus, species were included according to their need for additional habitat placed in conservation. All federally listed species were included, as well as many state listed species and several rare species not listed at either the federal or state levels. Suitable habitat was mapped only in the vicinity of known occurrences so that lands acquired because of these priorities are assured of protecting a known population of the species.

Riparian Buffers

Riparian buffers were identified by starting with NHD Flowlines data modified by the Florida Fish and Wildlife Conservation Commission to improve its accuracy. Then all ditches were removed from the flowline data, which included a manual step where additional ditches that were not identified as ditches in the flowline attribute data. Then, all the remaining flowlines were combined with all wetlands from the Water Management District land use data and all flowlines plus all wetlands that intersected with these flowlines were identified as the riparian network.

This riparian network was then buffered by 305 meters, and all natural (except open water), semi-natural, and pasture land cover or land uses that were within 305 meters and connected to the riparian network were identified as potentially functional buffers. In addition, all areas with

the Florida Department of Environmental Protection's Integrated Habitat Network (IHN) were added to the riparian network and functional buffers. The IHN represents both existing and proposed restored riparian networks in the phosphate mining region within the study area.

Then, only larger areas within this combined riparian network and buffer systems were retained, where large was defined as all areas that were 1000 acres or larger. Finally the following values were assigned to these remaining areas to create the final Riparian Buffers data layer:

> 1 = Natural and semi-natural land use within the riparian buffer network (or IHN); Priority 1 (highest)
> 2 = Improved pasture within the riparian buffer network (or IHN); Priority 2
> 3 = Other parts of the IHN in other land uses: Priority 3
> 0 = All other areas

Conservation Buffers

The Conservation Land Buffers dataset identifies and prioritizes areas around existing conservation lands where intensive land uses may be inappropriate because of potential impacts on the conservation lands themselves. Inclusion and prioritization were based on a blend of two factors, distance from the perimeter of existing conservation lands and current land use. First, these factors were applied individually as follows: Distance: existing conservation land perimeters were offset by one-quarter and one mile, creating concentric rings one-quarter and one mile outside the existing perimeters. Current land use: Water Management District land-use data were reclassified so that all land uses fell into one of three categories, high, moderate, or low compatibility with conservation. Then the two factors were blended as shown below to achieve a prioritization:

> 9 = ¼ mile high compatibility; priority 1 (highest)
> 8 = ¼ mile moderate compatibility; priority 2
> 7 = 1 mile high compatibility; priority 3

6 = 1 mile moderate compatibility; priority 4

5 = ¼ mile low compatibility; priority 5

4 = 1 mile low compatibility; priority 6

0 = all other areas not within buffers

Strategic Habitat Conservation Areas

The Florida Fish and Wildlife Conservation Commission originally identified strategic habitat conservation areas (SHCA) in the Commission report, "Closing the Gaps in Florida's Wildlife Habitat Conservation System". The goal of the SHCAs is to identify the minimum amount of land needed in Florida to ensure long-term survival of key components to Florida's biological diversity. In 2007, the SHCAs underwent a significant revision based on a new suite of species, updated datasets, new datasets that did not exist when the original analysis was conducted, and improved analytical techniques including spatially explicit population viability analyses. The SHCAs identify important remaining habitat conservation needs on private lands for 30 terrestrial vertebrates.

Natural Communities

With the exception of cutthroat seep, all of the natural community models used came from the FNAI Under-Represented Natural Communities data layer. The Under-protected Natural Communities data layer shows the statewide distribution of 12 natural communities needing additional protection in Florida, including upland glade, pine rockland, rockland hammock, scrub, dry prairie, seepage slope, sandhill, sandhill upland lake, coastal uplands, upland hardwood forest, pine flatwoods, and coastal wetlands (mangrove and salt marsh).

This data layer was created by FNAI as part of the Florida Forever Conservation Needs Assessment, a statewide analysis of natural resource conservation priorities for the Florida Forever statewide environmental land acquisition program. Under-protected communities include those that are under-represented on conservation lands as well as fragile coastal resources.

Depending on the classification system followed, Florida features as many as 81 different natural community types. Many of these community types, particularly wetland communities, are relatively well represented on existing conservation lands, and therefore are less of a priority for land acquisition than some of Florida's rarest communities that are currently not well-protected.

Based on Florida Department of Environmental Protection criteria, a natural community is considered to be inadequately represented on conservation lands if less than 15% of the original extent of that community is currently found on existing conservation lands. Coastal uplands, which include beach dune, coastal grassland, coastal strand, and maritime hammock, and coastal wetlands, which include mangrove and salt marsh, were mapped because these communities are considered fragile coastal resources, a priority of the Florida Forever program.

The natural communities were mapped based on a combination of field observations, remotely sensed vegetation data (FWC satellite imagery landcover) and aerial photography (classed into FLUCCS codes by Florida's Water Management Districts).

The cutthroat seep community model was developed separately for Highlands County. This model consists of areas with soils identified as indicators of cutthroat seep by Archbold Biological Station, overlayed on current FLUCCS land cover to show areas still in natural condition.

Greenways

The Florida Ecological Greenways Network model was created to delineate the ecological component of a Statewide Greenways System plan developed by the DEP Office of Greenways and Trails, under guidance from the Florida Greenways Coordinating Council and the Florida Greenways and Trails Council. The model started with an aggregation of a variety of existing habitat models including FWC Strategic Habitat Conservation Areas, FWC Biodiversity Hotspots, FWC Priority Wetlands for Listed Species, FNAI Potential Natural Areas, FNAI Areas of Conservation Interest, existing and proposed conservation lands, and vegetation from FWC satellite imagery landcover. These data were used to identify a series of hubs, or core areas, of

large, landscape-scale ecological significance, and a network of corridors connecting the hubs into a statewide ecological greenways system. The entire model was updated in 2004 to include newly identified areas of ecological significance (including the FNAI Rare Species Habitat Conservation Priorities and High Quality Watersheds models) and to remove recently developed areas.

Wetlands

The wetlands used in this analysis come directly from water management district FLUCCS land cover data. All FLUCCS wetland categories were included.

Potential Natural Areas

Potential Natural Areas were not directly included in the analysis, but were used to prioritize certain natural community models as outlined in the Heartland 2060 Matrix.

The Potential Natural Areas (PNA) data layer identifies, throughout the State of Florida, privately owned lands that are not managed or listed for conservation purposes, which may contain good quality natural communities. These areas were delineated by FNAI scientific staff through interpretation of natural vegetation from 1988-1993 FDOT aerial photographs and from input received during Regional Ecological Workshops held for each regional planning council. These workshops were attended by experts familiar with natural areas in the region. All PNA classifications and rankings were made based on the combined judgment of at least two scientists making independent determinations. Element occurrences in the FNAI database may or may not be present on these sites. In order to be classified as a Potential Natural Area the natural communities identified through aerial photographs had to meet the following criteria:

1. Must be a minimum of 500 acres. *Exceptions*: sandhill, min. 320 acres; scrub, min. 80 acres; pine rockland, min. 20 acres; dry prairie, min. 320 acres; *or* any example of coastal rock barren, upland glade, coastal dune lake, spring-run stream or terrestrial cave.
2. Must contain at least one of the following:
    a. One or more high quality examples of FNAI state-ranked S3 or above natural communities.
    b. An outstanding example of any FNAI tracked natural community.

Potential Natural Areas were assigned ranks of Priority 1 through Priority 5 based on size, perceived quality, and type of natural community present. The areas included in Priority 5 are exceptions to the above criteria. These areas were identified through the same process of aerial photographic interpretation and regional workshops as the PNA 1 through 4 ranked sites, but do not meet the standard criteria. These PNA 5 areas are considered lower priority for conservation than areas ranked PNA 1- 4, but nonetheless are believed to be ecologically viable tracts of land representative of Florida's natural ecosystems.

Landscape Integrity

The Landscape Integrity model was not directly included in the analysis, but was used to prioritize certain natural community models as outlined in the Heartland 2060 Matrix.

The landscape integrity layer was developed by the University of Florida GeoPlan Center, and is comprised of two related landscape indices assessing ecological integrity based on land use intensity, patch size of natural communities and semi-natural land uses. The landscape integrity layer was developed as part of the CLIP TAG process after discussion about the need for an additional landscape layer that identified areas of high ecological integrity based on land use intensity and patch size, where areas dominated by large patches of natural and semi-natural land use are assigned the highest significance. Since these analyses are dependent on landscape scale analysis buffer areas in Georgia and Alabama were included to provide accurate

assessment of the areas of Florida near the Georgia or Alabama border. Please note that this index is intended to primarily characterize terrestrial ecosystems and therefore values for large water bodies are not considered significant.

The land use intensity index characterizes the intensity of land use across the state based on five general categories of natural, semi-natural (such as rangelands and plantation silviculture), improved pasture, agricultural/low-intensity development, and high intensity development. The assumption is that areas dominated by high intensity land uses are more likely to have severe ecological threats and much lower ecological integrity than areas dominated by natural land cover. The land use data is from the Water Management Districts 2004 data for most of the state (SJRWMD, SWFWMD, SFWMD, parts of SRWMD) and then a hybrid between either 1995 land use, the 2003 FWC landcover data, and the 2004 FNAI development layer wherever 2004 land use data was not available (small parts of the SRWMD and all of the NWFWMD). In Georgia and Alabama the National Land Cover Data set (NLCD) from 2001 was used.

The patch size index combines the land use data with major roads data to identify contiguous patches of natural and semi-natural land cover and ranks them based on area. In addition all pasturelands within the south-central prairies region were also considered "intact" and potentially part of patches. This region was defined using the Davis Potential Natural Vegetation map for Florida. Major roads were defined as all roads that have 4 or more through lanes and all roads with average annual daily traffic of 5,000 or more vehicles per day. These roads were selected because they are considered to be the most likely to fragment habitat through a combination of road width and traffic level. The assumption is that small patches are likely to have the highest threat and lowest ecological integrity and large patches are likely to have the lowest threat and highest ecological integrity. The following scheme was used to rank patches based on area:

    10-100 acres = 2
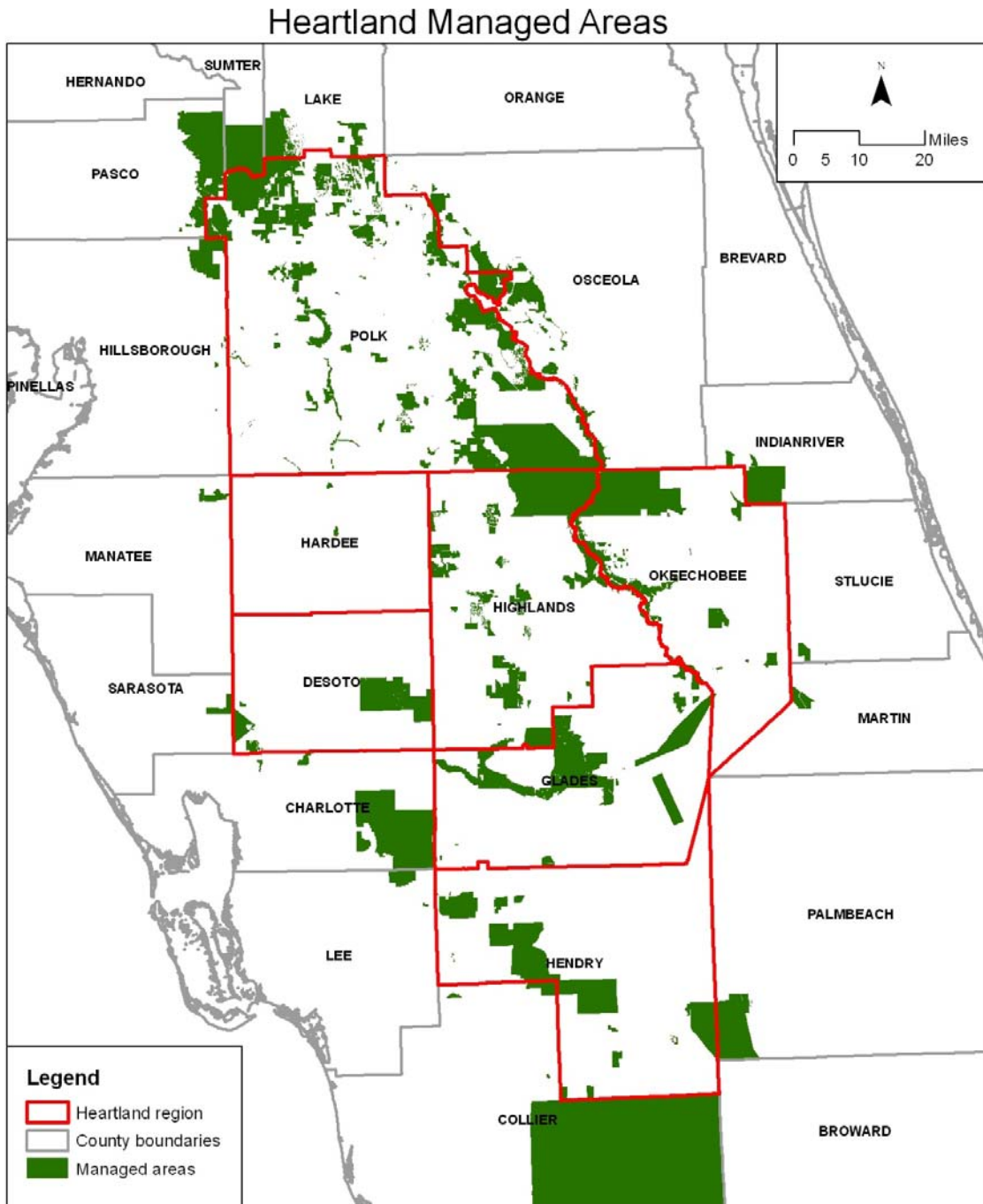   100-1000 acres = 3
    1000-5000 acres = 4

5000-10,000 acres = 5

10,000-50,000 acres = 6

50,000-100,000 acres = 7

100,000-500,000 acres = 8

500,000-1,000,000 acres = 9

1,000,000 and larger = 10

The combination of the land use intensity and patch size indices was created by adding the two together and dividing by two to create a non-weighted average of the two indices. Values of 10 represent areas with the highest potential ecological integrity based on these landscape indices and 1 represents the lowest ecological integrity (Fig. 6). The following are general descriptions of the landscape integrity priority levels: Index Level 10—areas with the highest ecological integrity where natural lands predominate in very large patches; Index Level 9—areas with the highest ecological integrity; Index Level 8—areas with high ecological integrity; Index Level 7—areas with moderately high ecological integrity; Index Level 6—areas with moderate ecological integrity; Index Level 5—areas with moderate ecological integrity and also includes most large areas of coastal water and large lakes, which are not intended to be a primary target of this index; Index Level 4—areas with moderately low ecological integrity; Index Level 3—areas with low ecological integrity; Index Level 2—areas with very low ecological integrity; Index Level 1—areas with little or no ecological integrity due to predominance of intensive land uses.

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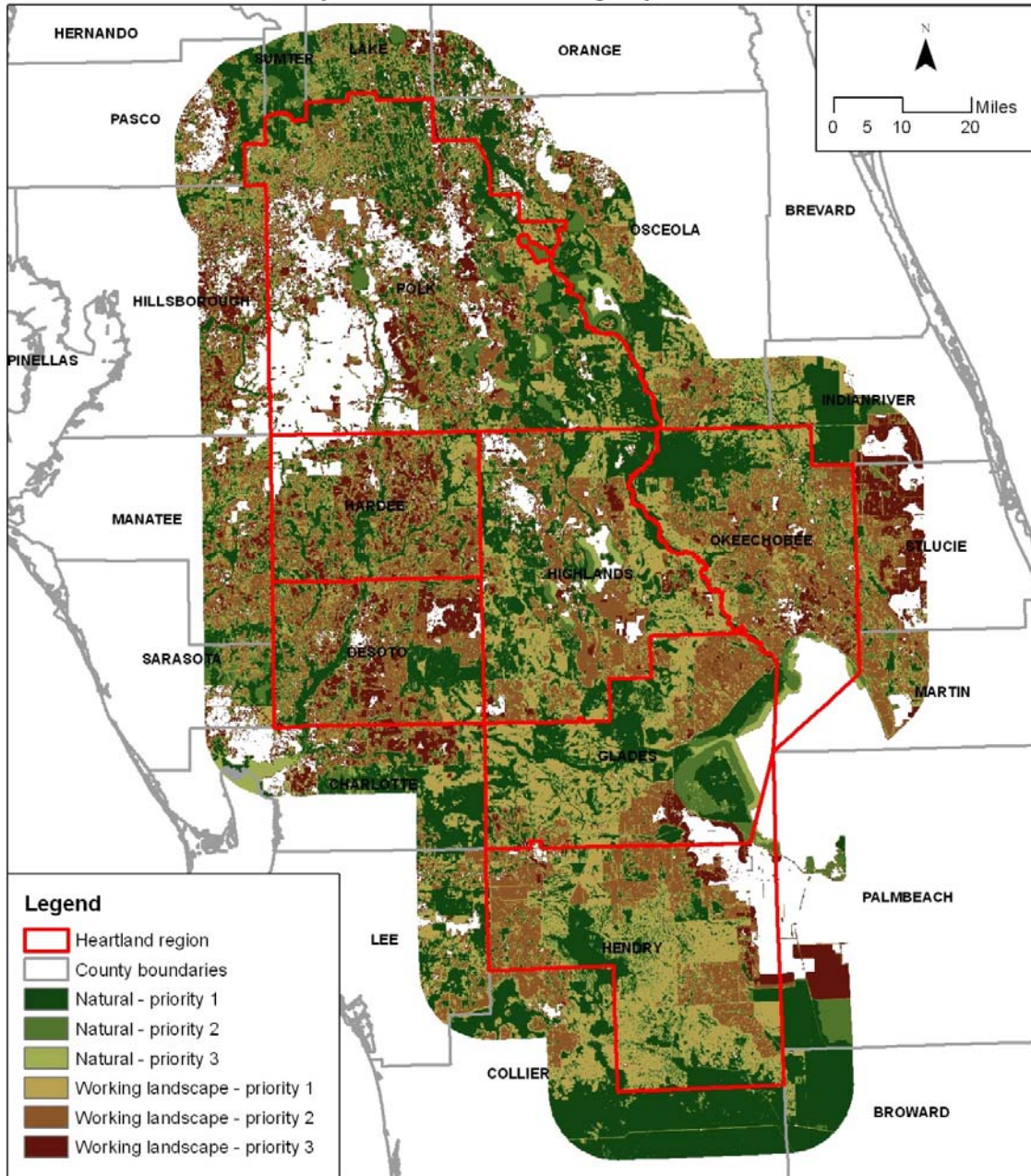
Figure 1

Heartland Managed Areas

Figure 2

Heartland Matrix of Priority Conservation Resources by Land Use Category

Figure 3

Heartland Bear Habitat Priorities

Figure 4

Heartland Panther Habitat Priorities

Figure 5

Heartland Riparian Greenways

Legend
- Heartland region
- County boundaries
- Patches of intact FEGN and/or riparian habitat/corridors that are 1,000 acres or larger

May 3, 2010

Figure 6

Heartland Ecological Network Priorities

Figure 7

Heartland Groundwater Priorities

Legend
- Heartland region
- County boundaries

Grouindwater priorities
- 1 (highest)
- 2
- 3
- 4
- 5
- 6
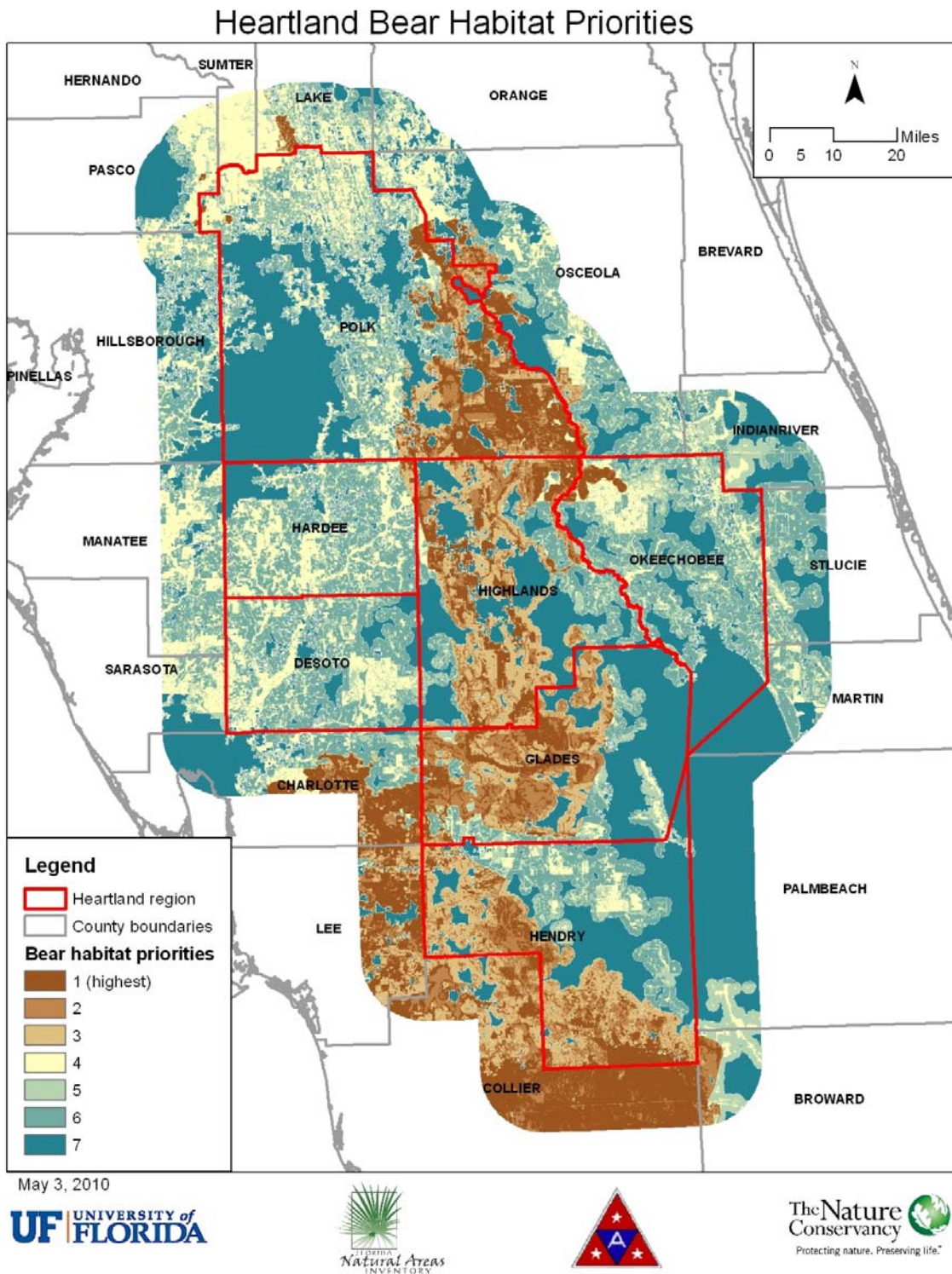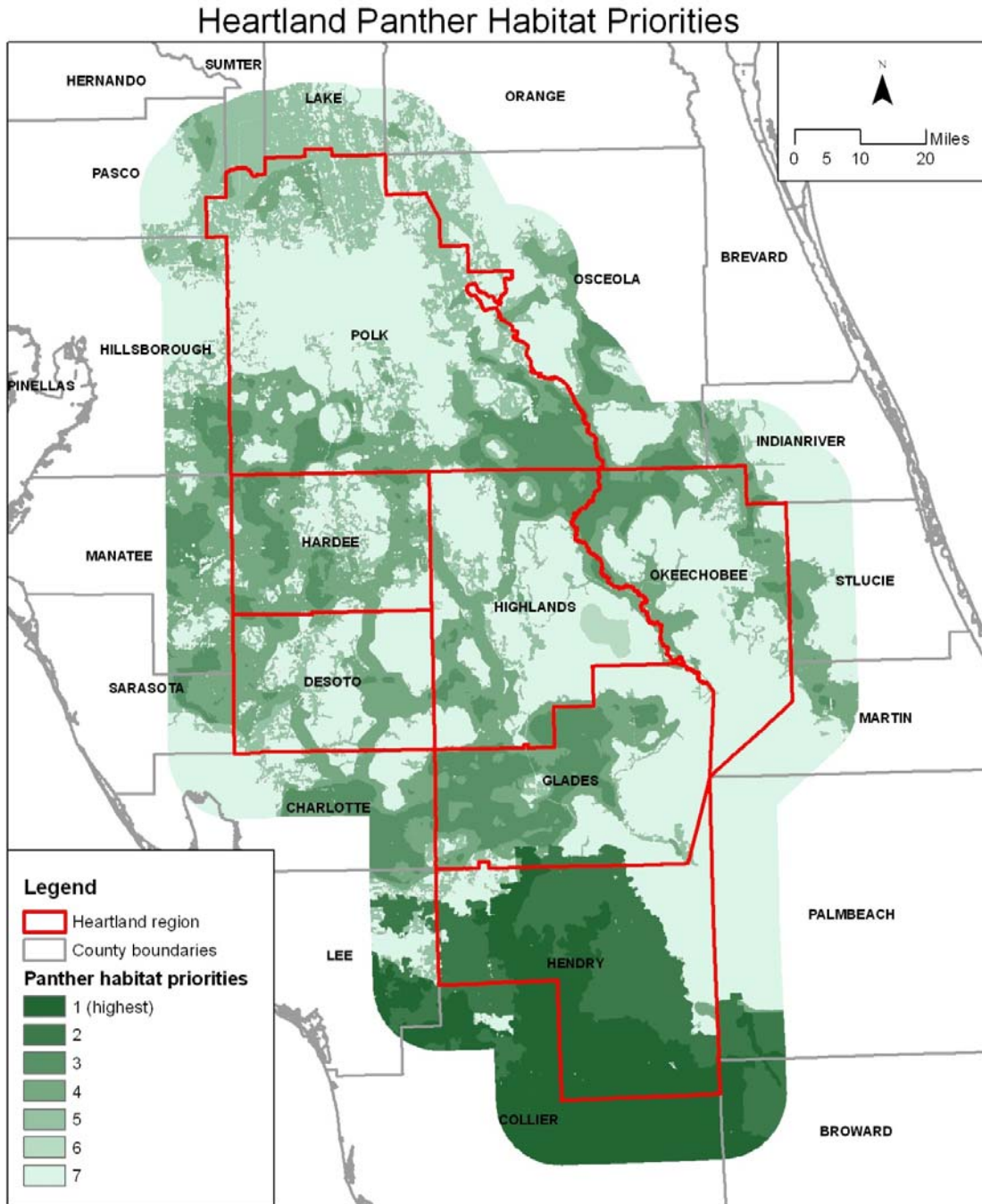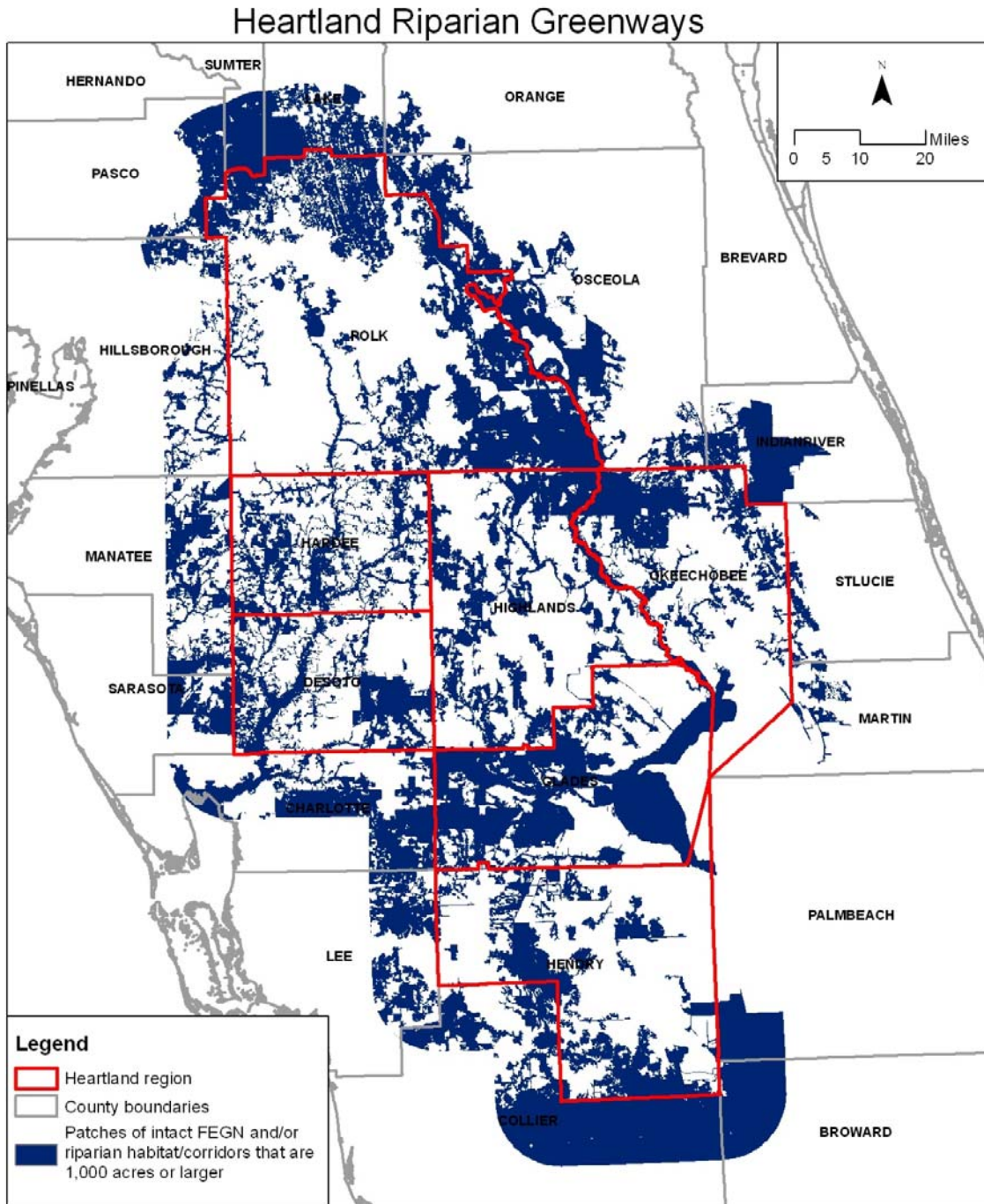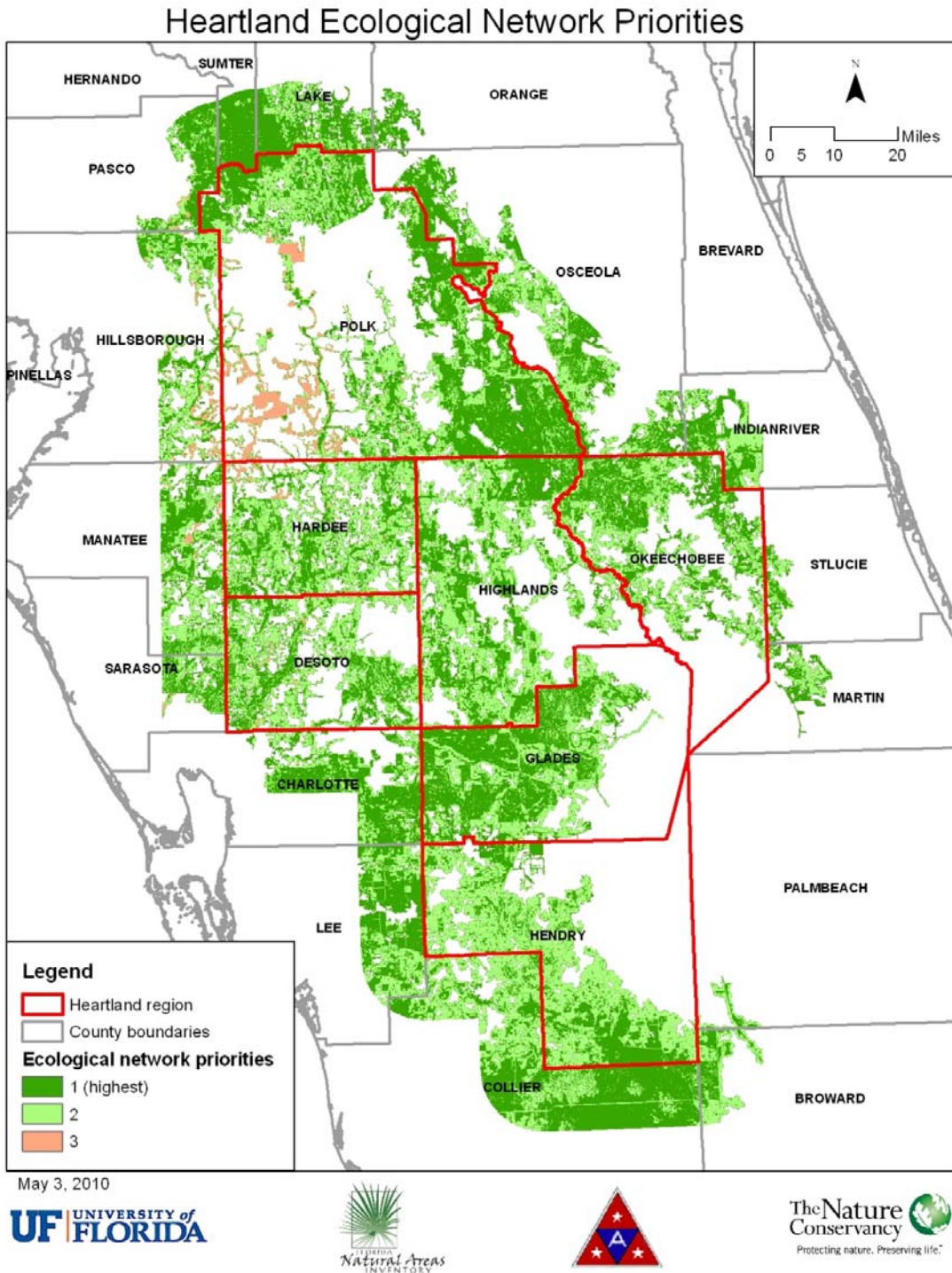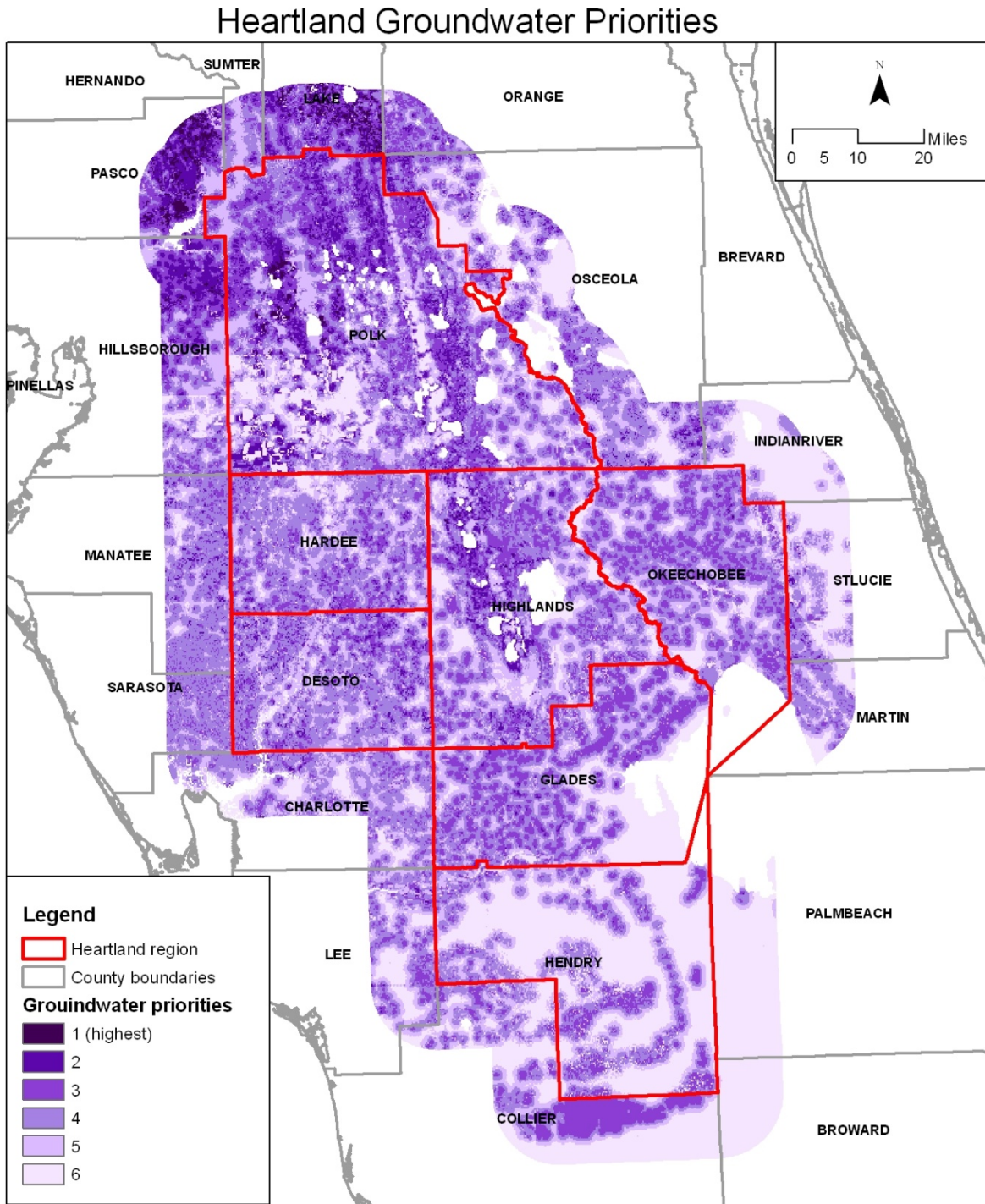
May 3, 2010

Figure 8

Heartland Smokesheds