Florida Landscape Assessment Model (FLAM)

Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute
Center for Spatial Analysis

620 South Meridian Street
Tallahassee, FL 32399

Overview

The Florida Landscape Assessment Model (FLAM) was developed in 2019 and replaces the Integrated Wildlife Habitat Ranking System (IWHRS) created in 2009. The model was created to determine the landscape value based on natural resources and fish and wildlife habitat. The FLAM was developed from 15 spatial variables. The variables were created from various sources including FWC, FNAI, and LCC. In general, the variables were based on species habitat, managed areas, disturbed areas, natural area connectivity, and aquatic resources. Each variable was assigned a weight to determine its influence on the final model. After assigning weights, the variables were summed and categorized into 10 classes using a quantile classification method. A transportation (e.g., paved roads) variable (value = 0) was burned on top of the summed layer so the final model had 11 classes ranging from 0–10 where 0 = worst and 10 = best landscape quality. The FLAM is updated annually (usually each November) as new data become available. Changes between annual FLAM versions could be minor if updates to supporting variables are minimal.

GIS Layers

Florida Fish and Wildlife Conservation Commission (FWC)

Species Spatial Richness: Potential habitat models were developed for 146 species (terrestrial and freshwater (some brackish)). Models were overlaid in the GIS and

count of model overlap per raster cell was tabulated. Counts of overlap (richness) ranged from 0 to 26, converted to 0–1 scale using fuzzy logic.

Listed Species Spatial Richness: Potential habitat models were developed for 77 listed species (terrestrial and freshwater). Species are a subset of Species Richness models mentioned above. Models were overlaid in the GIS and count of model overlap per raster cell was tabulated. Counts of overlap (richness) ranged from 0 to 14. Values were converted to 0–1 scale using fuzzy logic.

Endemism: The potential habitat range of each species was counted as it occurred within 100 km^2 cells of a hexagon grid across the state. Ranges that occurred in fewer hexagons and if those hexagons had lower species richness were considered to have higher endemism. Endemism (species restricted to a particular area) is spatially complimentary to the species richness layer. Values ranged from 0 to 0.039, which were converted to 0–1 scale using fuzzy logic.

Distance to Managed Lands: Euclidean distance from managed lands (acquired from FNAI) was produced in the GIS. Also, a cost distance layer was created in the GIS based on CLC land cover type (e.g., distance to cross urban area = higher cost compared to crossing natural area). Values for each layer were converted to 0–1 scale using fuzzy logic. These values were averaged for the final layer.

Disturbed Index: Disturbance weights were distributed among CLC land cover types (e.g., high intensity urban = highest weight). A 1-km moving window was employed in the GIS and the average of weighted values was computed within the window per raster cell. Values ranged from 0-100 that were converted to 0–1 scale using fuzzy logic.

Transportation (Roads): The Transportation attribute was extracted from the CLC and the value was reclassified to 0. This layer was burned onto the final model.

U.S. Fish and Wildlife Service: Landscape Conservation Cooperative (LCC)

Blueprint: Priority resources considered as the set of biological, ecological, and cultural features and ecological processes collaboratively identified as most important or most significant for the focus geography. Resources include: Coastal Uplands, High Pine and Scrub, Pine Flatwoods and Dry Prairie, Hardwood Forested

Uplands, Freshwater Forested Wetlands, Freshwater Aquatic (Rivers, Lakes, Springs), Freshwater Non-Forested Wetlands, Working Lands and Socio-Economic, Biodiversity, Surface Waters, and Landscape Connectivity. Priority values were 1 (highest) or 2, which were converted to 1 and 0.75 respectively for conversion to 0–1 scale.

Florida Natural Areas Inventory (FNAI)

All FNAI layers were categorical by priority classes (highest priority = 1). Each layer was converted to 0–1 scale by dividing each of its classes by the total number of classes to create proportional values.

Rare Species Habitat Conservation Priorities (Rare Spp): Overlap of occurrence-based habitat footprints of 281 species of plants, invertebrates, and vertebrates where scores are based on global and state rarity ranks.

Strategic Habitat Conservation Areas (SHCA): Overlap of potential habitat model footprints of 33 vertebrate species on private lands that were not adequately protected on managed lands where richness is the count of species habitat per cell of raster grid.

Priority Natural Communities (NatCom): Statewide range of 14 high priority (underrepresented) natural community types: upland glades, pine rocklands, seepage slopes, scrub, sandhill, sandhill upland lakes, upland pine, tropical hardwood hammock, upland hardwood forest, pine flatwoods, dry prairie, coastal uplands, coastal lakes, and coastal wetlands.

Florida Ecological Greenways Network (Greenway): Represents a statewide network of ecological hubs and linkages designed to maintain large landscape-scale ecological functions including focal species habitat and ecosystem services throughout the state.

Landscape Integrity Index (Integrity): Two related landscape indices combined that assess ecological integrity based on land use intensity and patch size of natural communities and semi-natural land uses (does not include large water bodies).

Sustainable Forestry (Forestry): Existing pinelands (natural and planted) and former pinelands that are potentially available for forest management. Large tracts

of natural pine on mesic soils (versus very dry or wet) that are within 50 miles of a mill receive the highest priority. Former pinelands that currently do not have trees receive the lowest priority.

Surface Water Resource (Surface Water): Comprised of Significant Surface Waters, Natural Floodplain, and Wetlands layers, and is intended to identify areas important for protecting surface water resources, especially the integrity of remaining high-quality systems.

Aquifer Recharge (Aquifer Rechg): Florida's groundwater systems, including the Floridan, Intermediate, and Surficial Aquifer systems.

Final Model

All of the above GIS layers were weighted (Table 1) and then summed (except for roads). The summed raster was classified using the Quantile method in that each class contains an equal number of features. A quantile classification is suited to linearly distributed data and assigns the same number of data values to each class. Therefore, classes do not have too few or too many values. Although widely different values could occur within the same class, this distortion can be minimized by increasing the number of classes. This issue was moderated by using 10 classes in the model and because the data are linear (Figure 1). The roads layer was then burned on top of the summed model. Therefore, the final model contained discrete units or scores from 0 (for roads) through 10 (best landscape quality). Figures 2–4 provide example maps of the final model.

Table 1. GIS layers and their assigned weights.

GIS Layer	Weight
Species Richness	1.00
Listed Species Richness	1.00
Endemism	1.00
Distance to Managed Lands	1.00
Disturbed Index	1.00
Blueprint	1.00
Rare Spp	0.75
SHCA	0.50
NatCom	0.50
Greenway	0.50
Integrity	1.00
Forestry	0.25
Surface Water	0.75
Aquifer Rechg	0.25
Roads	1.00

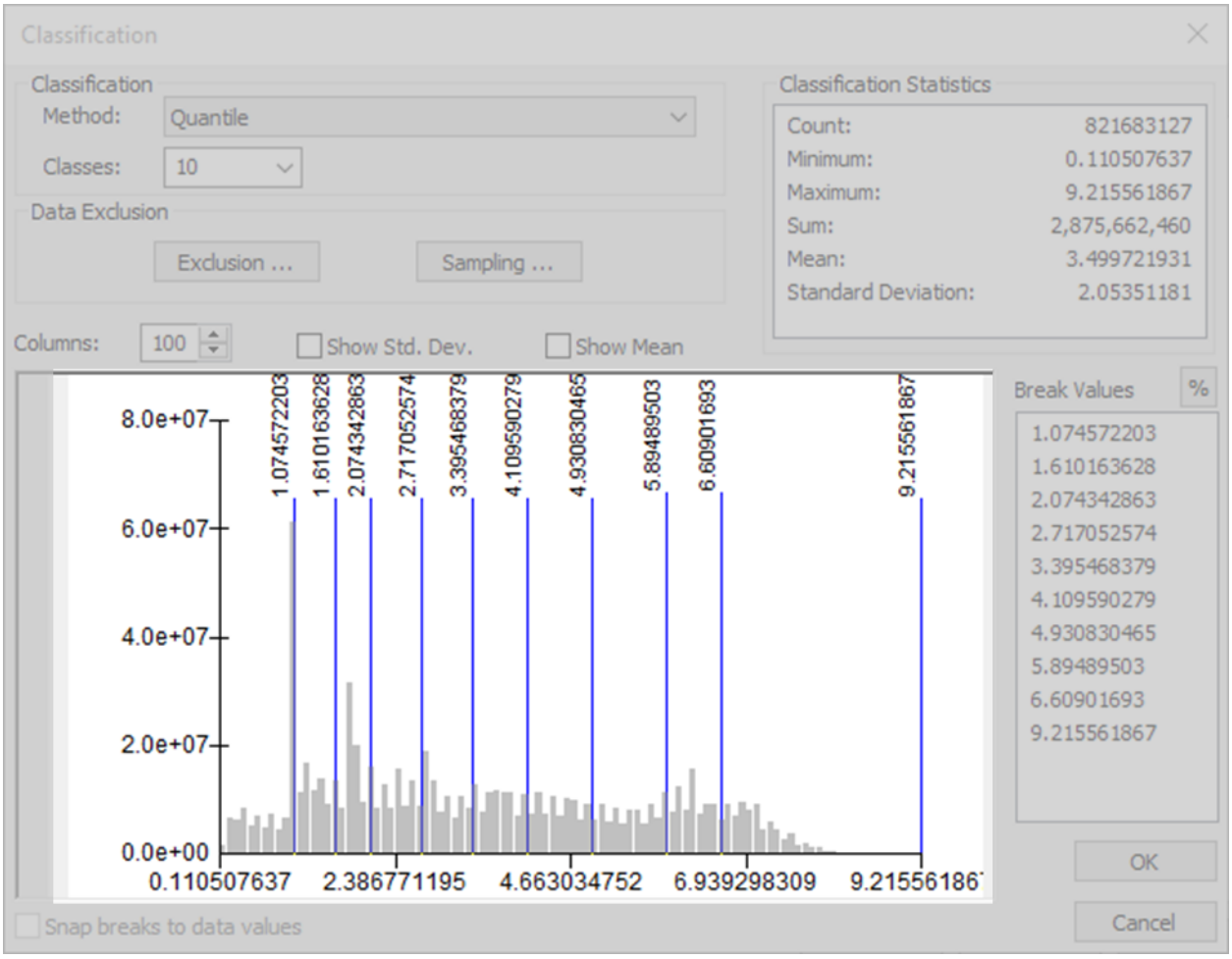

Figure 1. Classification result of FLAM data using the Quantile method. The method grouped the data into 10 classes to provide landscape quality scores where higher numbers represent better quality.

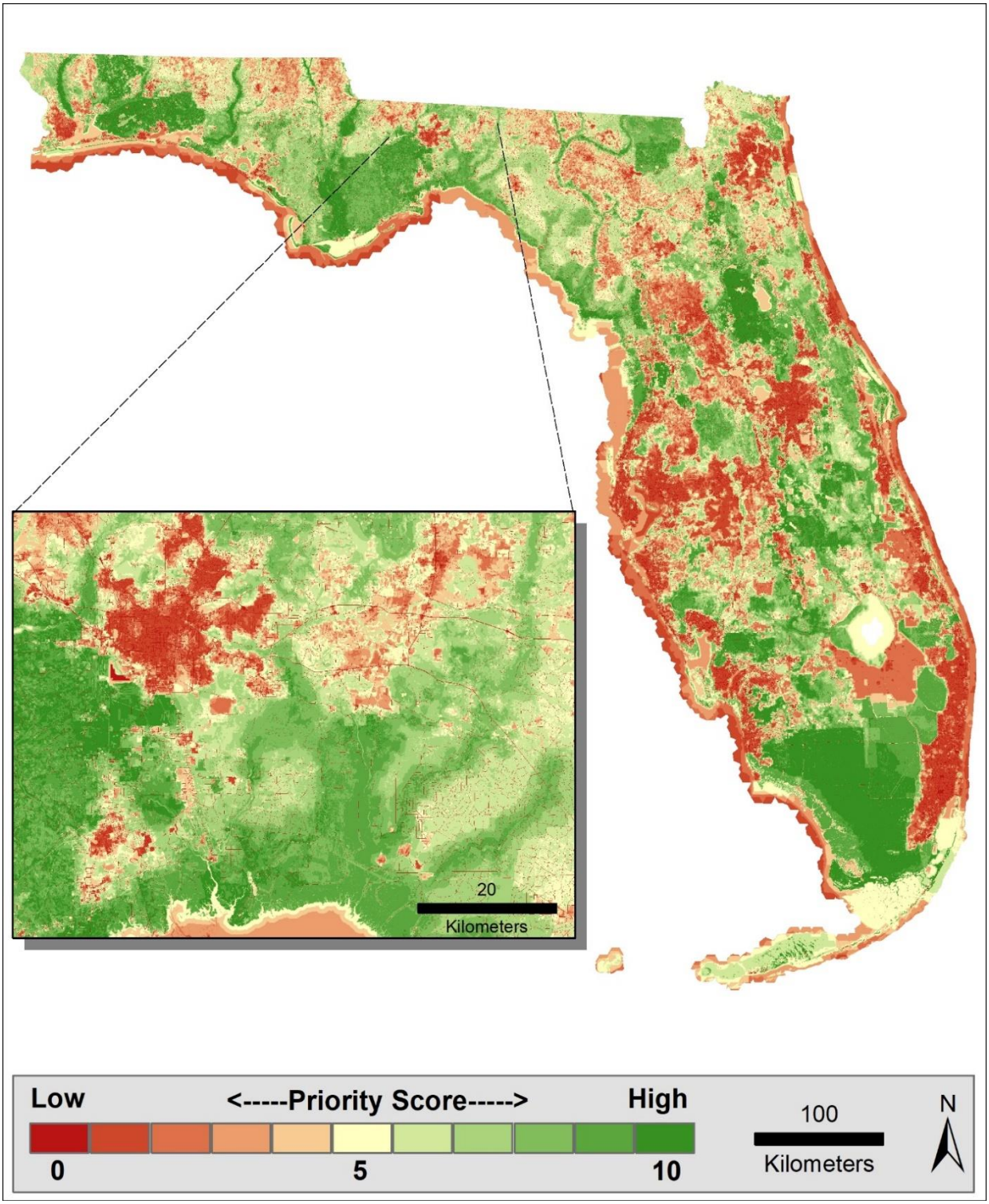

Figure 2. Map of the FLAM indicating priority scores from lowest quality (dark red; value = 0) to highest quality (dark green; value = 10) landscapes. The inset map zooms in to the Big Bend area for better visual detail.

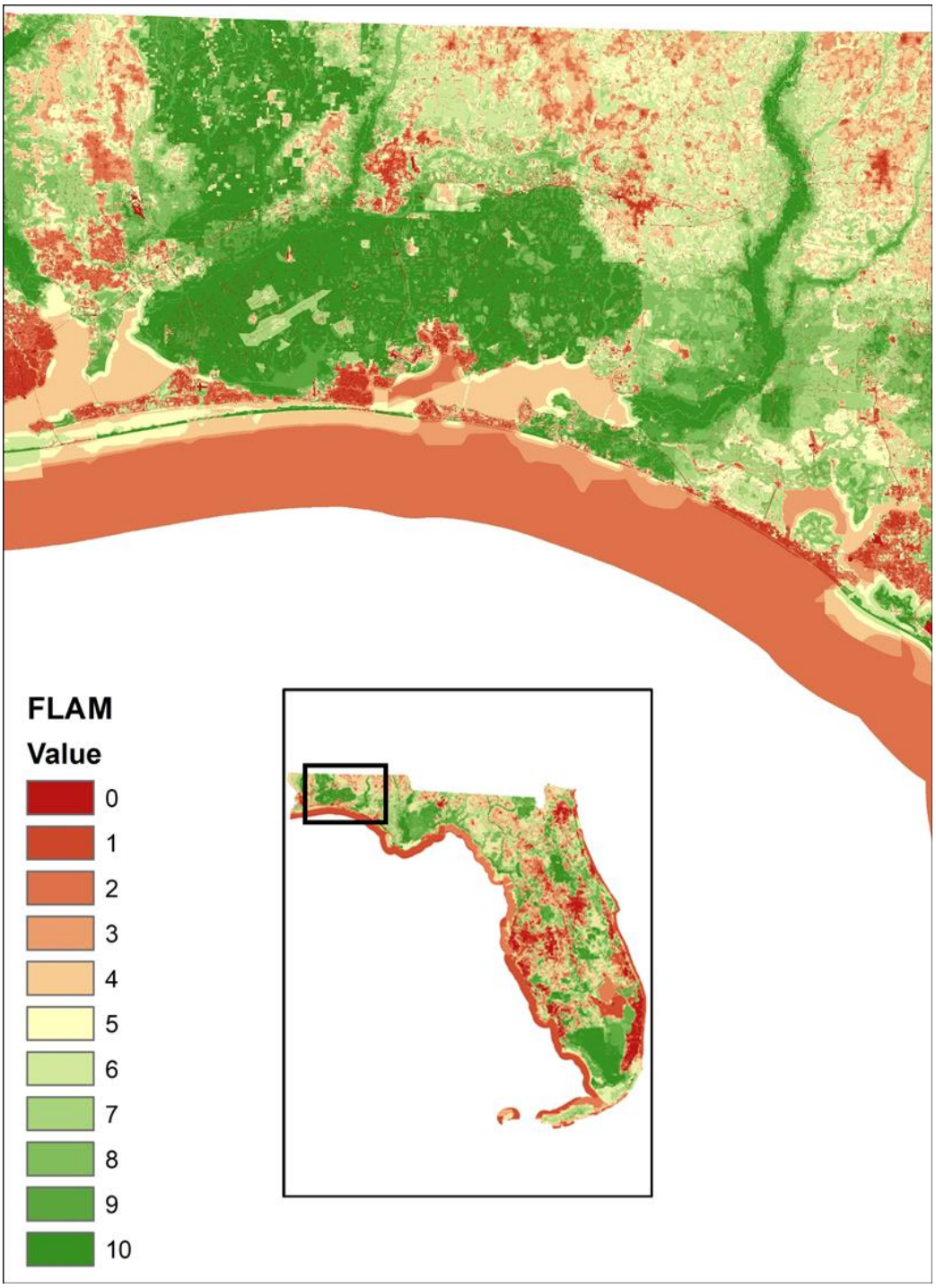

Figure 3. Map of the FLAM indicating priority scores from lowest quality (dark red; value = 0) to highest quality (dark green; value = 10) landscapes zoomed in to the western panhandle area for better visual detail. The black box in the inset map indicates the area of focus.

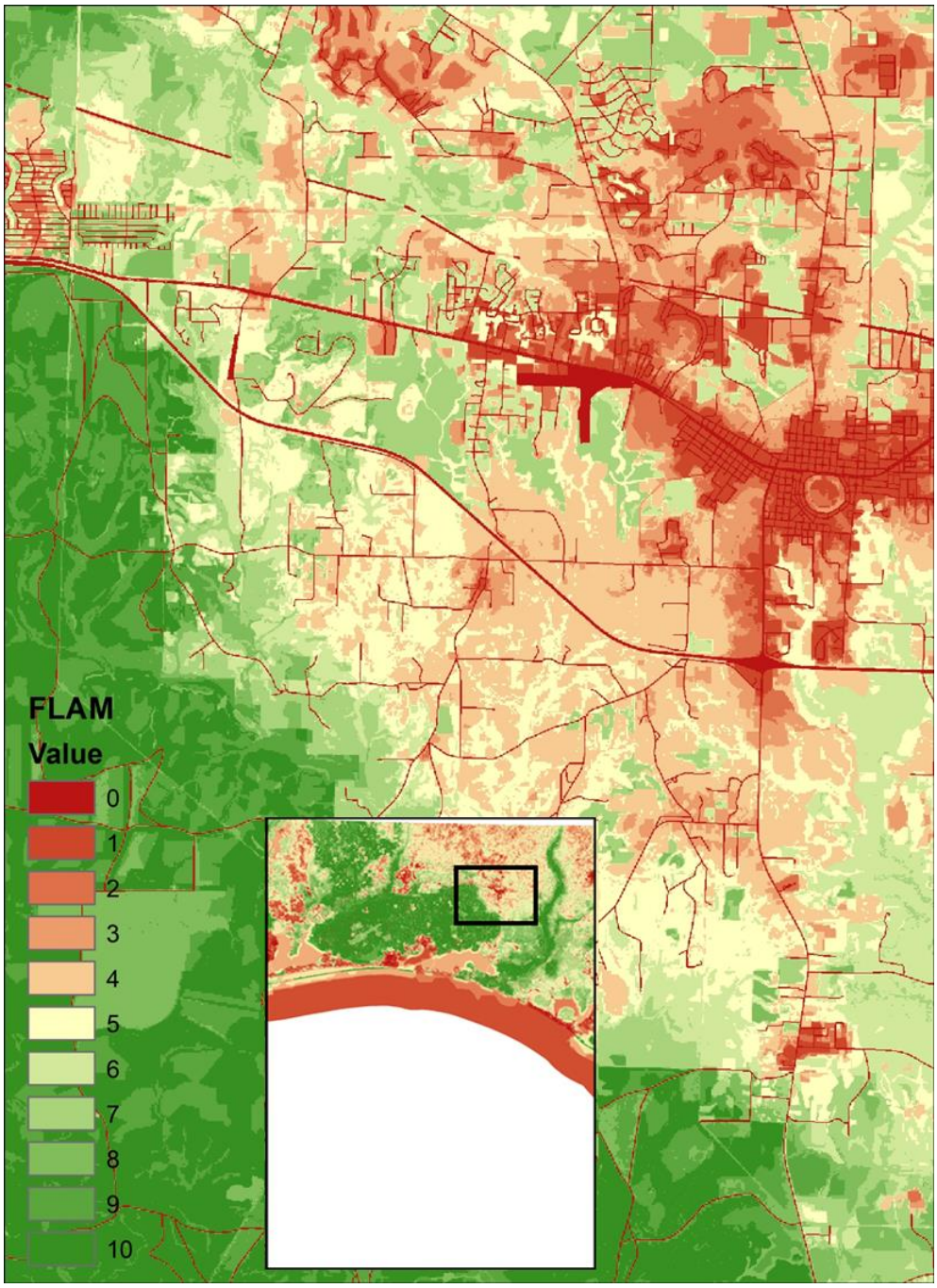

Figure 4. Map of the FLAM indicating priority scores from lowest quality (dark red; value = 0) to highest quality (dark green; value = 10) landscapes zoomed in close to the western panhandle area for better visual detail. The black box in the inset map indicates the area of focus.