The South Florida Ecosystem Portfolio Model (EPM) Web Tool

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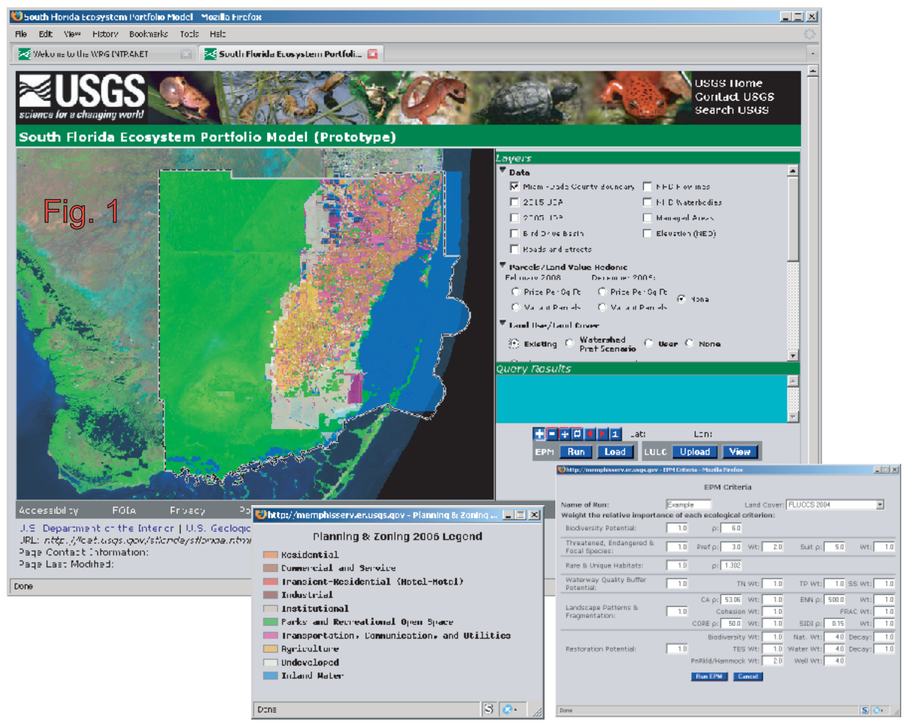
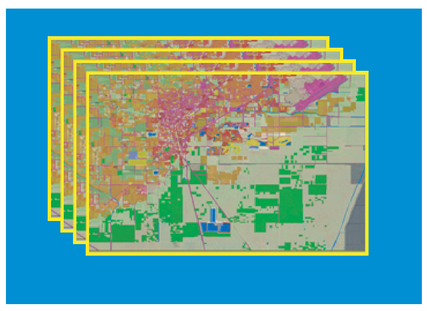
A. The South Florida Ecosystem Portfolio Model (EPM) is a regional land use planning web tool that integrates ecological, economic, and social information relevant to decision-makers and stakeholders (Fig 1). There are many participants involved in land use decision-making in South Florida, including local, regional, state, and Federal agencies, developers, environmental groups, agricultural groups, and other stakeholders. The EPM is designed as a land use screening tool that provides regional scale information that cuts across the objectives and knowledge bases of all of these participants. In short, the EPM is intended to widen the perspectives of its users by integrating information and objectives representing the diversity of land use stakeholders in South Florida.

While the EPM prototype is currently implemented for Miami-Dade County, it will be extended to other parts of South Florida.



B. How the EPM works:

1. Multiple land use plans considered

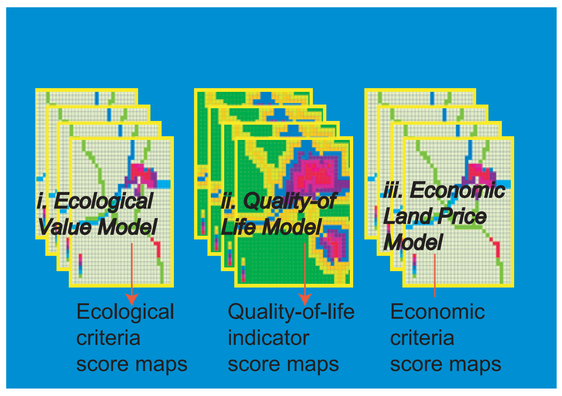


Data, models

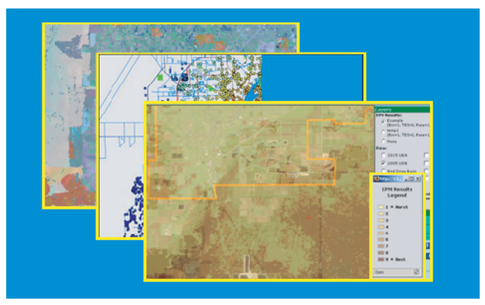
The EPM consists of three main sub-models: i) the ecological value model, ii) the community quality-of-life model, and iii) the economic land price (hedonic) model. These models are linked through shared variables (e.g., land cover, road density, etc.), but focus on different aspects of human-ascribed value. The ecological value model uses various criteria relevant to ecosystem services at the local and regional scales. The market land price model uses various parcel and community attributes to predict land price, which is relevant to future development pressure. The community quality-of-life model consists of a set of indicators that reflect current land uses and their influence on community services, flood and hurricane-evacuation risks, open and green spaces, "community character", etc. Table 1 lists and describes the criteria and varibles used by each sub-model.

2. Plans are scored against multiple model-based spatially-explicit criteria

The EPM evaluates proposed land use patterns in terms of model-based scores that combine information about probable outcomes (land use consequences), as well as value judgments (preferences) elicited from users. Outcomes are characterized based on the available data, transparent models, and expertise. Preferences are characterized based on previously held stakeholder interviews, as well as real-time input from the user.



3. Value maps combines user-elicited value judgments and criteria scores



User-specific inputs

Table 1. Criteria and variables used by EPM sub-models

Ecological Value Model

Criterion	Model or Method Used	Source	Description
Biodiversity potential	Florida GAP model	USGS Florida GAP Analysis Project	Simple habitat preference models for all the terrestrial mammal, bird, reptile, amphibian, butterfly and ant species in the State.
Threatened and endangered species	Multi-species Recovery Plan model	US Fish and Wildlife Service	Simple habitat preference models focusing on 23 T&E species
Rare and unique habitats	Florida Natural Areas Inventory	Florida State University	Habitat rarity ranking based on state and global inventories
Water quality buffer potential	Relative loading potential for nutrients and sediment	Literature review	Relative loading potential model based on land use, soil type, and distance to water
Ecological restoration potential	Parcel attribute-based ranking Model	USGS & Everglades National Park	Scores parcels based on proximity to natural areas and water sources, soil qualities, biodiversity potential of the restored habitat, etc.
Landscape Fragmentation and Pattern	FRAGSTATS	University of Massachusetts, Amherst	Computes landscape metrics for categorical map patterns, e.g., habitat cohesion, habitat core area, etc.

Economic Land Price (Hedonic) Model

Variable (subset shown, 34 variables total)	Description
Winter	Real estate transaction occurred during the winter months, =1 if transacted in winter months
year_X	A parcel sale occurs in a specific year, =1 if transaction occurs in the given year
Recreational	Recreational encompasses all parcels designated as zoned "recreational" in the Miami-Dade County Land Use map, =1 if zoned "recreational"
Agricultural	Agricultural encompasses all parcels designated as zoned "agricultural" in the Miami-Dade County Land Use map, =1 if zoned "agricultural"
EEL_Private	A parcel is designated as an Environmentally Endangered Land if it has ecologically desirable characteristics that the landowner and the county have agreed to not develop, =1 if parcel is private EEL purchase
Dist_CBD	Distance to CBD is the linear distance in miles from the Miami Central Business District to the parcel using a GIS
Dist_Canal	Distance to Canal is a parcel's distance in miles to the nearest canal
Dist_Biscayne	Distance to Biscayne National Park is a parcel's distance in miles to Biscayne National Park
Dist_Everglades	Distance to Everglades National Park is a parcel's distance in miles to Everglades National Park
Dist_UDB	Distance to UDB is a parcel's distance in miles to the Urban Development Boundary
UDB_Qtr_Mi	Parcels identified to be within ¼ mile of the Urban Development Boundary
Dist_Ocean	Distance to Ocean is a parcel's distance in miles to the Atlantic Ocean
Dist_MjrRd	Distance to Major Road is a parcel's distance in miles to the nearest major local road
UDB	Parcel is designated as inside the Miami-Dade County's Urban Development Boundary, =1 if parcel is within Urban Development Boundary
Contiguous	A parcel is designated as contiguous for development if it is located to an existing developed parcel, =1 if parcel is contiguous to development
Flood_zone	=1 if coastal flood zone

Community Quality-of-Life Model (draft)

Variable (draft model, subject to revision, subset shown)	Description
Hurricance evacuation time	Traffic model based on population and road sizes and locations and evacuation routes
Commute time	Traffic model based on population and road sizes and locations
Flood risk	Overlay of elevation-dependent flood zones and assets at risk
Greenspace	Location and extent of greenspace
Development density	Zoned development density map
Water and wastewater connections	Location and service areas for water and waste water
Distance of residential areas to community center	Calculated distances
Road density	Statistical relationships between land use, development densities, and road densities
Population change	Calculated from zoned development densities

C. Need for the tool:

Urban development pressures in the remaining agricultural and undeveloped lands in Miami-Dade County, Florida (Fig 2a) are increasingly intense. Decisions to develop, preserve, or restore individual parcels can cumulatively affect regional ecological, environmental, and socioeconomic endpoints in complex ways. These decisions will result in changes in land use/cover, hydrology, nutrient loadings, etc., with expected impacts for both the Everglades and Biscayne National Parks (Fig 2b), as well as other protected areas.

Figure 2a. South Miami-Dade County land use (2006)

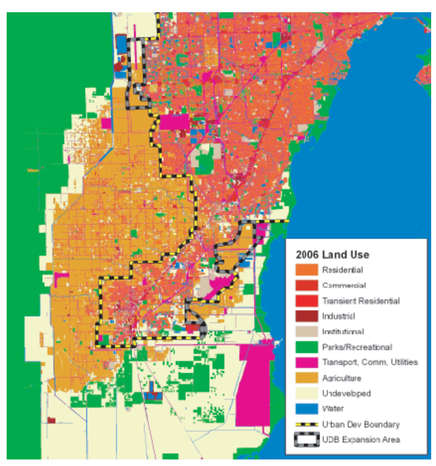
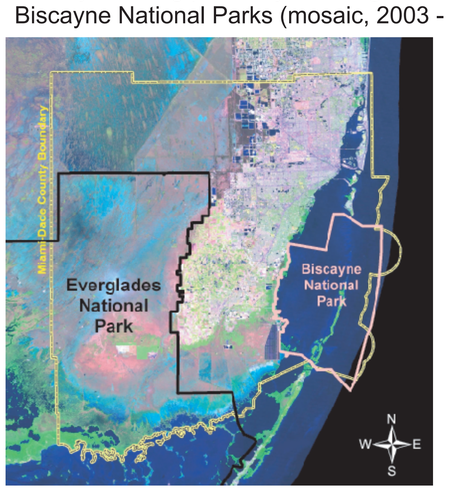


Figure 2b. Landsat 7 image of Miami-Dade County showing proximity to Everglades and Biscayne National Parks (mosaic, 2003 - 2004)



EPM Website http://lcat.usgs.gov/sflorida/sflorida.html

For website password or more information, e-mail Bill Labiosa at blabiosa@usgs.gov