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LAND USES IN THE ECOSYSTEM MANAGEMENT AREAS OF FLORIDA

By
Agustín A. Sepúlveda

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INTRODUCTION

Land-use maps are used by scientists, environmentalists, and planners as a tool to determine whether to preserve or develop the land surface. Accurate and current land-use maps are basic to understanding cultural changes and to explaining temporal patterns of natural phenomena and population within Florida. Land-use maps are used in hydrologic studies to identify and explain water-quality patterns in a basin through statistical analysis. The density of streams and percentage of wetland and open water within the Ecosystem Management Areas (EMA) of Florida may also be determined based on land-use maps.

The U.S. Geological Survey (USGS) developed a land-use and land-cover classification system for use with sensor data in the mid-1970's (Anderson and others, 1976). This system, known as the Anderson classification system, used a hierarchical structure. The broadest level, Level I, divided land use into nine categories, whereas Level II subdivided each Level I category into more descriptive land uses. Subsequently, the USGS Geographic Information Retrieval and Analysis System (GIRAS) was implemented, using NASA high-altitude aerial photocoverage to produce land-use and land-cover maps for the United States (Mitchell and others, 1977).

The current procedures used to generate consistent, accurate, and current land-use and land-cover maps for intermediate scales (spatial resolution of 1 or less hectare) in the United States are based on satellite imagery (Vogelmann and others, 1998a). Typically, Landsat Thematic Mapper imagery, aerial photographs, and ancillary layers such as Digital Elevation Models, wetlands inventory maps, and other datasets are used in mapping land use. Generally, the land-use category for each pixel in an image is assigned using a relation between reflectance value and land use for locations where land use is known or determined from other ancillary datasets.

METHODOLOGY

The 1977 GIRAS land-use data was obtained from the USGS and converted into a layer in a Geographic Information System software ArcInfo, developed by Environmental Systems Research Institute. Eight major land-use categories were identified for Florida: agriculture, wetland, forest, urban, water, rangeland, mining, and transitional. These are equivalent to categories in the Anderson classification system, except that the major classifications, tundra and perennial snow or ice, are nonexistent in Florida. Transitional, a Level II land-use category in the Anderson classification system, is treated as a major land-use classification because it includes a broad range of uses from forest clearcuts to urban expansion. Minor misclassifications were corrected on the GIRAS layer. For example, photointerpreted water areas in Palm Beach and Martin Counties in southeast Florida were corrected to wetlands after they were found inconsistent with the National Wetlands Inventory and the USGS 1:100,000 scale maps. Furthermore, some areas in Hamilton County, initially photointerpreted as transitional, were known to be mining areas and were, therefore, corrected. The new version of the GIRAS layer was clipped with the areal extent of the 1:2,000,000 scale map of Florida to conform with the scale of the other Florida Water Atlas series maps. A visual comparison with recent land-cover datasets produced by the State of Florida, which use the Florida Land-Use, Cover and Forms Classification System (Kautz and others, 1993), showed consistency with the classification of wetlands and agricultural areas in the GIRAS data.

Another comparison was made between the 1977 GIRAS data and the Multi-Resolution Land Characterization Consortium's (MRLC) raster dataset (Vogelmann and others, 1998b). The areal extent of forest, agriculture, wetlands, rangelands, and mining land uses has remained fairly consistent since 1977. However, a major difference was found in the urban classification. The areal extent of urban land use has increased. The GIRAS data was intersected with (overlaid on) vectorized urban pixels from the MRLC dataset. The resulting map provides an updated distribution of the 1977 land use, which incorporates urban areas from the MRLC dataset which are as recent as 1993. As a result, the areas classified for the State as transitional, mining, rangelands, agriculture, forest, wetlands, and water were reduced by 41.3, 8.7, 7.5, 6.5, 3.5, 1.1, and 1.1 percent, respectively. The areas changing from water to urban may indicate minor misclassifications on the GIRAS dataset, where areas on the perimeter of open water were aggregated as water when they should have been classified as wetland. This effect may be seen clearly by overlaying the areas that have changed from water to urban on the USGS 1:100,000 scale hydrography.

The newly updated GIRAS land use map was overlaid on the Florida Department of Environmental Protection EMA dataset, and estimates were made of land use in square miles within each EMA (fig. 1). Data from the U.S. Department of Commerce, Bureau of the Census, also were overlaid on the EMA dataset to obtain 1990 population statistics for each EMA (table 1). The USGS 1:100,000 scale hydrographic layer was overlaid on the EMA dataset to determine the density of streams and the percentage of wetland and open-water areas within each EMA (table 1). Finally, statewide percentages and areal extent in square miles were computed for each land-use category (table 2).

Table 1.—*Map number, total area with available land-use data, total population, population per square mile, density of streams, and wetland and open-water surface area expressed as a percentage of total area for each Ecosystem Management Area (EMA).*

MAP NO	ECOSYSTEM MANAGEMENT AREA (EMA)	AREA, IN SQUARE MILES	1990 POPULATION	POPULATION, PER SQUARE MILE	STREAM DENSITY[1]	PERCENTAGE, WETLAND AND OPEN-WATER
1	Perdido River and Bay	346	87,076	251	1.08	5
2	Greater Pensacola Bay	2,339	302,661	129	1.06	6
3	Choctawhatchee Bay and River	2,088	134,413	64	1.10	10
4	St. Andrew Bay	1,149	118,151	102	0.67	13
5	Greater Apalachicola	2,850	69,839	24	0.81	25
6	Ochlockonee-St. Marks	2,354	248,695	105	0.76	16
7	Nature Coast	3,742	60,864	16	0.46	36
8	Greater Suwannee	3,939	160,573	40	0.32	11
9	St. Marys-Nassau	1,320	70,914	53	0.77	19
10	Lower St. Johns River	2,769	835,014	301	0.87	16
11	Northeast coast lagoons	639	252,220	394	1.13	22
12	Oklawaha River	2,698	455,454	168	0.29	18
13	Upper St. Johns River	3,946	976,028	247	1.14	27
14	Withlacoochee River	2,044	221,431	108	0.29	23
15	Springs Coast	947	430,845	454	0.40	19
16	Indian River Lagoon	780	377,118	483	1.80	15
17	South Florida (Kissimmee River)	2,537	384,298	151	1.07	24
18	Lake Wales Ridge	589	105,941	179	0.30	20
19	Greater Tampa Bay	2,314	1,717,661	742	0.89	9
20	Greater Charlotte Harbor	3,183	421,648	132	1.20	10
21	Sarasota Bay	261	299,985	1,147	1.47	7
22	South Florida (Allapattah Flats)	843	131,071	155	4.69	9
23	South Florida (Fisheating Creek)	826	3,938	4	1.63	12
24	South Florida (Taylor Creek)	173	20,854	120	1.98	6
25	South Florida (Loxahatchee/Hungryland Slough)	711	328,112	461	1.85	32
26	South Florida (Lake Okeechobee)	725	3,279	4	0.22	95
27	South Florida (Everglades Agricultural Area)	1,059	49,826	47	3.08	19
28	Caloosahatchee to Lee Coast	1,458	278,437	190	1.77	12
29	South Florida (Lower East Coast)	1,328	3,611,739	2,720	1.77	10
30	South Florida (Central Everglades)	2,708	9,671	3	0.51	93
31	Southwest Coast	3,437	207,500	60	1.21	60
32	Florida Keys	122	52,048	427	1.08	49

[1] Based upon USGS 1:100,000 scale hydrography which includes canals and other man-made features not necessarily evident at 1:2,000,000 scale. Units are linear miles per square mile.

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Table 2.—*Total area for each land-use classification expressed in square miles and as a percent of the State total.*

LAND-USE CLASSIFICATION	AREA, IN SQUARE MILES	PERCENTAGE OF STATE
Mining	198	0.4
Urban	5,669	10.1
Agriculture	12,175	21.6
Forest	18,173	32.3
Open Water	2,081	3.7
Transitional	601	1.1
Wetland	12,158	21.5
Range	5,237	9.3

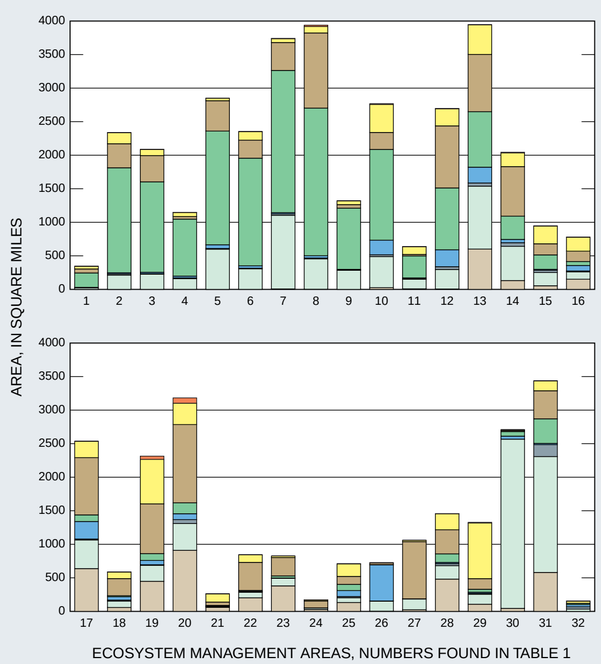

Figure 1.—Land use for the 32 Ecosystem Management Areas, by category.

Base from U.S. Geological Survey digital data
map scale 1:2,000,000, Albers Equal-Area conic projection
standard parallels 29°30′ and 45°30′, central meridian –83°00′