Photo Courtesy of Joanne Davis, 1000 Friends of Florida

In order to sustain wildlife biodiversity, it is important to develop background data on what wildlife and habitats exist locally (currently as well as historically), and then strive to ensure that the basic wildlife necessities for survival are protected or restored– food, cover, water, reasonably connected living and reproductive space, and limits on disturbances. Successful planning of a wildlife-friendly community relies heavily upon having and utilizing the best available data. This chapter provides information on data needs and analysis tools that can be utilized in planning wildlife-friendly communities.

CONDUCTING A BIRDS-EYE-VIEW ANALYSIS

As discussed throughout this manual, it is vitally important that habitat and wildlife planning decisions be made with a greater than one parcel context in mind, and that viable corridors of passage and patches for living be provided. To identify these relationships, an aerial perspective is important. Several very usable tools are available online that provide aerial views of a community from differing altitudes (scales) and perspectives (see below).

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TAKING ADVANTAGE OF GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Data for wildlife and habitat conservation purposes has relevance when it has geographic linkages and relationships. From the outset, anyone pursuing habitat and wildlife conservation should make an investment in GIS. GIS is a collection of computer hardware, software, and geographic data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. There are a variety of base GIS platforms on the market available for a relatively minimal investment. An industry standard, around which many other supporting products have been developed and marketed, is the Environmental Systems Research Institute, Inc., (ESRI) ArcGis suite of products.

A GIS is most often associated with maps. A map, however, is only one way to work with geographic data in a GIS, and only one type of product generated by a GIS. A GIS can provide a great deal more problem-solving capabilities than using a simple mapping program or adding data to an online mapping tool. A GIS can be viewed in three ways *(adapted from ESRI information): The Database View:* A GIS is a unique geographic database (geo-database), also known as an "Information System for Geography." Fundamentally, a GIS is based on a structured database that describes an area in geographic terms and allows each point to have multiple attributes. For example, a pine tree (Attribute 1) that has an eagle nest (Attribute 2), that is active (Attribute 3), that has successively produced young (Attribute 4), that is one of several in the area (Attribute 5) can be mapped.

1. The Map View — A GIS is a set of intelligent maps and other views that show features and feature relationships on the earth's surface. Maps of the underlying geographic information can be constructed and used as "windows into the database" to support queries, analysis, and editing of the information. This is called geovisualization. Thus, multiple maps of point, polygon (area shapes) or photographic imagery can be layered over one another, and then query and/or

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SCALE AND BIRDS-EYE-VIEW TOOLS

Google Earth (www.earth.google.com) – Google Earth is a platform for creating, exploring, and visualizing location-specific information. It includes detailed 3D images that can be rotated (to give side-angle perspectives), zoomed, and manipulated to suit visualization needs. *Google 3D Warehouse* provides 3D images of buildings and other 3D content created and shared by Google Sketchup users. Additionally, users can view points of interest and other useful information about localities. Advanced functionality is available for an extra cost.
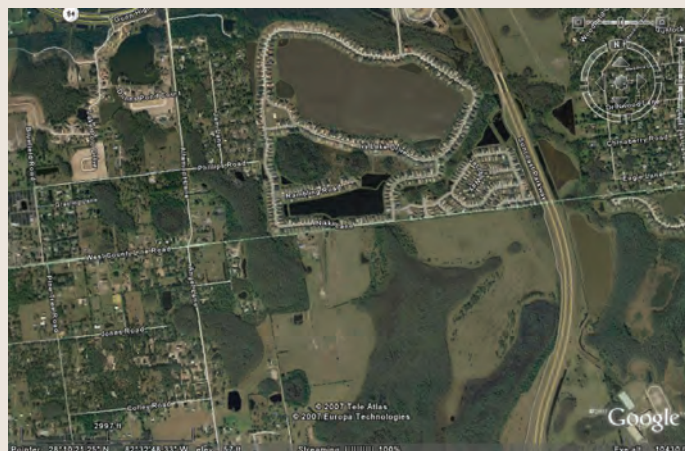
Microsoft's Virtual Earth (www.microsoft.com/ virtualearth/ default.mspx) – The Virtual Earth platform is an integrated set of services that combines unique bird's eye, aerial, and 3D imagery with mapping, location and search functionality. Advanced functionality is designed for government and development users and is available for an extra cost.

"mix and match" attribute data can be used to visualize important features.

2. The Model View – A GIS is a set of information transformation tools that derive new geographic datasets from existing datasets. These geoprocessing functions take information from existing datasets, apply analytic functions, and write results into new derived datasets. The newly derived data sets can be displayed using the GIS map and data views to improve understanding and planning functionality. In other words, by combining data and applying some analytic rules, the user can create a model that helps answer the question that has been posed.

Together, these three parts of an intelligent GIS are used at varying levels in all GIS applications. For a community or land manager involved in habitat and wildlife planning, a GIS is critical. Once in place, the next logical step is to acquire various data layers and proceed with a general landscape analysis and then an ecological inventory to measure ecological status of remaining or restorable habitats and wildlife. Basic data layers such as land cover and land use, some species data, topographic and hydro-geologic data, and aerial imagery are generally available.

WILDLIFE AND HABITAT INFORMATION AND ANALYSES SERVICE PROVIDERS

Many available sources of data are at hand for Florida communities.

The Florida Natural Areas Inventory (FNAI) (www.fnai.org) – FNAI is associated with Florida State University, and provides services related to ecological inventories, biodiversity analyses, Geographic Information Systems analyses, and other data related services. It provides these services to governments, developers, and other entities wishing to obtain the sorts of useful spatial and biological information that will allow for better wild-life planning. For more information, visit the website or call (850) 224-8207.

• Biodiversity Matrix (**www.fnai.org/biointro.cfm**) – The Biodiversity Matrix Map Server is an online screening tool from FNAI that provides immediate, free access to rare species occurrence information statewide. This tool allows the user to zoom to a site of interest and create a report listing documented, likely, and potential occurrences of rare species and natural communities. The FNAI Biodiversity Matrix offers built-in interpretation of the likelihood of species occurrence for each one-square-mile Matrix Unit across the state. The report includes a site map and list of species and natural communities by occurrence status: Documented, Documented-Historic, Likely, and Potential.

• Standard Data Report – FNAI provides detailed natural resource information for individual sites.   This is a site-specific report that includes an 8.5" by 11" color map of the site and surrounding area, and lists of detailed natural resource information. The report includes rare plant and animal species, high-quality natural communities, conservation lands, land acquisition projects, potential habitat for rare species, and Potential Natural Areas.   The report is available as

a paper hardcopy or an electronic PDF file. Requests are generally processed within 5 working days.

• GIS Data – FNAI maintains a variety of natural resource GIS data, including rare species occurrences, conservation lands, land acquisition projects, natural communities and other statewide natural resource data used to inform state conservation planning efforts such as the Florida Forever program and the FWC Cooperative Conser-vation Blueprint. Much of these data are available on the FNAI website; more information may be available by contacting FNAI.

• Ecological Surveys – FNAI performs ecological surveys to target specific inventory needs of local governments. Inventory scientists meet with local governments to discuss their greatest inventory needs, and select sites of highest priority based on those needs. Expert botanists, zoologists, and ecologists on staff perform field surveys for a wide range species in Florida. Surveys range from individual managed areas to comprehensive county inventories, and may include a variety of maps and data in paper and electronic format.

Geo-Facilities Planning and Information Research Center (GeoPlan) (www.geoplan.ufl. edu/project.html) – Similar to FNAI, GeoPlan was established in 1984 in the Department of Urban and Regional Planning at the University of Florida's College of Design, Construction and Planning. The Center was developed as a GIS research and development lab that has completed contracts involving the marriage of GIS and environmental data and research of varied sorts. In addition to contracting with national and state agencies, GeoPlan also contracts with local and regional governments on specialized projects.

GeoPlan's Florida Geographic Data Library (FGDL)

and map server (**www.fgdl.org**) provides a mechanism for collecting and distributing spatial Geographic Information Systems (GIS) data statewide. The database is warehoused and maintained at the University of Florida's GeoPlan Center and is organized by county and state. There are many GIS data layers in the FGDL, including data on land use, hydrology, soils, transportation, political boundaries, environmental quality, conservation, census data, and more. Data is available for download free of charge from the FGDL Metadata Explorer or FTP site. FGDL Metadata Explorer is continuously growing and new data layers are added as they become available. Data is also available for purchase on CD-ROM and DVD.

The Florida Fish and Wildlife Conservation Commission, Cooperative Conservation Blueprint (CCB) – The CCB represents an effort to combine existing conservation priority data from a range of sources into a single, agreed upon, and unified blueprint. It will unify existing terrestrial conservation modeling efforts into a single GIS application, which will be available to the public via an online searchable application. The goal of this effort is to identify important conservation areas in Florida. The database will incorporate data from FNAI, GeoPlan, FWRI and others to identify important conservation areas, working landscapes, water resources, and development areas. In addition to creating a single, unified and updated GIS database, this project seeks to more effectively incorporate social and economic factors in planning for conservation in Florida. The CCB is an ongoing process, regularly updated by local and state government, stakeholder, public, and conservation organizations as conditions change or other conservation activities are successfully completed. By continually updating the CCB, it is intended that wildlife and habitat conservation efforts be more concentrated on high

Chapter 4

Data and Analyses Development

WILDLIFE AND HABITAT INFORMATION AND ANALYSES SERVICE PROVIDERS (continued)

priority areas and be flexible in adapting to Florida's changing landscape and land use.

Florida Fish and Wildlife Conservation Commission (FWC), Fish and Wildlife Research Institute (FWRI) (www.research.myfwc.com/) – The Fish and Wildlife Research Institute's work includes assessment and restoration of ecosystems and studies of freshwater and marine fisheries, aquatic and terrestrial wildlife, and imperiled species. Additionally, it deals with spatial analysis, biostatistics and modeling, wildlife forensics, and socioeconomic research. Below are descriptions of some of the relevant datasets available from the FWRI, all of which are either available in raster or shapefile format. All data described can be obtained from the FWRI website or by sending a written request. The FWC will also respond to requests from the public to produce digital maps of the vegetation type, wildlife occurrence, SHCA, and IWHRS values. All data described can be obtained from the FWRI website (**http://research.myfwc.com/**) or by sending your request to **gisrequests@myfwc.com**.

- Strategic Habitat Conservation Areas (SHCA) (Endries et. al 2008) – SHCA are lands identified by the FWC that need some form of conservation protection to maintain viable populations of wildlife to preserve biodiversity. SHCA are areas of high ecological significance and a priority for conservation protection.

- The Integrated Wildlife Habitat Ranking System (IWHRS) (Endries et al. 2008) – The IWHRS is an assessment tool that collects a large diversity of available wildlife and landcover datasets and presents the information in an easy to interpret format. The IWHRS uses a wide variety of landcover and wildlife data (including SHCA, listed species locations and richness,

Land cover and vegetation in the Lake Apopka and Wekiva areas of Central Florida. The orange in the upper left is the sand hill pine and scrub of the Ocala National Forest; the red and brown in the lower left are cypress and hardwood wetlands of the Green Swamp; the brown in the central area of the figure the rich forested wetlands of the Wekiva system; and, the grey and white are more developed areas.

Photo Courtesy of Florida Fish and Wildlife Conservation Commission

roadless patch size, habitat connectivity, and more) to rank the landscape of Florida based upon the habitat needs of wildlife. By simply overlaying a property boundary on the IWHRS map, one can visually identify any lands of significance. For those with full GIS capabilities, one can obtain an average property value, query the individual layers to identify how the individual components of the IWHRS rank in and around a site, and recalculate the IWHRS by adding or removing layers the user feels should or should not be included in the assessment.

- The FWC 2003 Landcover Map (Stys et al. 2004) – The FWC 2003 landcover map can be used to identify and estimate vegetative cover by category. The landcover map contains 43 vegetation and land cover types, including 26 natural and semi-natural vegetation types, 16 types of disturbed lands (such as agriculture, urban, and mining), and one water class.

- Wildlife Potential Habitat Maps – If individual wildlife species are of concern, the FWC maintains individual species potential habitat maps that could be used to identify if any potential habitat is associated with an area of interest.

- Biodiversity Hotspots – A measure of biodiversity created by overlaying all potential habitat maps over one another to create an additive calculation, also newly created and released in 2007.

- Species Location Records – Includes panther and bear telemetry and road kill data, nuisance bear data, bald eagle nests, and others

- Rare Fish Species Locations – Locations of rare and imperiled freshwater fish species populations are provided.

- Priority Wetlands – Provides identification of priority wetlands based on the number of wetland dependent and associated species.

- Quick Maps – Quick Maps are Google Earth files that contain FWRI data layers. They represent data layers that are the most requested from the public.

- Florida's Imperiled Species (**www.myfwc.com/imperiled species/**) – Florida Fish and Wildlife Conservation Commission's Imperiled Species page includes management plans, lists of imperiled species,

permitting information, etc. This source offers information for only a certain limited number of species that have been identified as imperiled in the State of Florida.

Florida Department of Environmental Protection (DEP) (www.dep.state.fl.us/gis/) – The DEP has online collections of spatial data that can be useful in the planning process. Two of the more pertinent available databases include the GeoData Directory and the Geospatial Resource Index.

• GeoData (GIS) Directory (**www.dep.state.fl.us/ gis/ datadir.htm**) – The GeoData Directory is an online database of GIS layers available from DEP. This includes land use/ land cover layers as well as myriad other resources including data on habitat, water bodies, mines, geology, elevation, and brown-fields. More generalized GIS information is available at: **www.dep.state.fl.us/gis/**

• Geospatial Resource Index (**www.ca.dep.state.fl. us/GRISearch/ index.jsp**) – The Geospatial Resource Index is the Department's central database for searchable maps and spatial data. The site offers a wide selection of maps ranging from interactive scientific watershed data to identifying recreational canoe trails throughout the state. Searching by title, program area or keyword, the Index provides easy, hands-on access to detailed Department-related maps.

• Land Boundary Information System (LABINS) (**www.data.labins.org/2003/**) – The Land Boundary Information System (LABINS) began in 1984 as a means for distributing survey-related data that is maintained by federal and state agencies to the general surveying community. Today LABINS is a store-house for survey data and provides access to County level GIS data, National Wetland Inventory maps, and Digital Orthographic Quarter-Quads

(DOQQ), and allows the user to search for data by location. LABINS is sponsored by the Florida Department of Environmental Protection, Division of State Lands, Bureau of Survey and Mapping.

Florida Department of Transportation (DOT) (www.dot.state.fl.us/planning/statistics/gis/ default.htm) – Florida's system of roads and highways has a significant impact on where and how we plan for wildlife. New roads may encourage development and perhaps sprawl in areas that were once natural. Therefore it is important not only to know what roads exist in an area, but also what roads are scheduled for maintenance, widening, and/or creation. The web site includes significant amounts of transportation related data.

Water Management Districts – Florida's five Water Management Districts each have data of varying degrees of usefulness to planners and citizens interested in wildlife-friendly communities. Below is a breakdown of some of the more pertinent data sources available online. Additional information can be obtained by contacting the Districts.

• Southwest Florida Water Management District (SWFWMD)

◆ GIS Catalog, District maps, etc. (**www.swfwmd. state.fl.us/ data/**) – Check out the "Physical Dense" option which includes land use/ land cover layers, wetlands, soils, and topography layers.

• St. Johns River Water Management District (SJRWMD) (**www.sjrwmd.com/programs/plan_monitor/ gis/gis.html**) – Index of downloadable GIS data.

• South Florida Water Management District (SFWMD) – GIS and Maps catalog **www.spatial1.sfwmd. gov/sfwmdxwebdc/dataview.asp**

• Northwest Florida Water Management District

Photo Courtesy of David Moynahan Photography

(NWFWMD) (**www.nwfwmd.state.fl.us/ pubsdata.html**) – For more information, contact the NWFWMD at (850) 539-5999.

• Suwannee River Water Management District (SRWMD) (**www.srwmd.state.fl.us/**) – For specific information regarding available data, contact the SRWMD at (386) 362-1001.

Natural Resources Conservation Service – Soil data is available from the below sites.

• US General Soil Map (STATSGO) – **www.ncgc. nrcs.usda.gov/products/datasets/statsgo/**

• Soil Survey Geographic (SSURGO) Database – **www.ncgc.nrcs.usda.gov/products/datasets/ ssurgo/**

National Wetlands Inventory (www.fws.gov/nwi/) – Provides geospatially referenced information on the status, extent, characteristics and functions of wetland, riparian, deepwater and related aquatic habitats in priority areas to promote the understanding and conservation of these resources.

The mission of The Florida Natural Areas Inventory (FNAI) is to collect, interpret, and disseminate ecological information critical to the conservation of Florida's biological diversity. FNAI continually builds and maintains a comprehensive database of the biological resources of Florida, which includes more than 28,000 Element Occurrences of rare plants and animals, and high-quality natural communities.

PERFORMING AN ECOLOGICAL INVENTORY

One of the most important steps in planning for a wildlife-friendly community is to conduct an inventory and to create a baseline data set of existing and potentially restorable habitats and wildlife. Such a wildlife and habitat study should seek to identify and map landscapes and habitat characteristics, species occurrence and extent as well as basic topographic, drainage and general hydrogeologic characteristics. The following general steps may be used as a guide for conducting an ecological inventory.

Query the databases of the Florida Natural Area Inventory – The mission of The Florida Natural Areas Inventory (FNAI) is to collect, interpret, and disseminate ecological information critical to the conservation of Florida's biological diversity. FNAI continually builds and maintains a comprehensive database of the biological resources of Florida, which includes more than 28,000 Element Occurrences of rare plants and animals, and high-quality natural communities. For each occurrence, FNAI documents information on location, observation date, habitat description, details about the condition of the occurrence, and source information.

FNAI can develop lists, maps and assessments of species that occur or are likely to occur in a community. FNAI will generate a list of potential rare species occurring in a jurisdiction or on a parcel of land, and will recognize exemplary natural areas or rare species locations. FNAI can develop predictive range maps for various species that incorporate assumptions about possible restorative scenarios or different land development options. The Florida Natural Areas Inventory is a non-profit organization administered by Florida State University; it is part of The Florida Resources and Environmental Analysis Center (go to FREAC at: **www.freac.fsu.edu/**).

Identify significant natural areas – Significant natural areas in a community can be identified and digitized using 2004 Digital Ortho Quarter Quads (DOQQs) or other imagery, FNAI's Potential Natural Area data layer, and the Water Management District Florida Land Use Cover Class System (FLUCCS).

The definition of a significant natural area may vary from community to community. Expertise from qualified biologist/ecologists is recommended to help define, identify and interpret significant natural areas. The following is an example of how such areas might be identified within a county. Using ArcGIS, delineate and digitize any site greater than 40 acres that appears natural on the aerial photographs. Additionally, designate smaller sites if they contain an Element Occurrence (EO) from the FNAI Database, and if the site appears to provide habitat for the element. Include Managed Areas (MA), according to the FNAI Conservation Lands Database, as significant natural areas.

Prepare a natural community map – A natural community is defined as a distinct and reoccurring assemblage of populations of plants, animals, fungi and microorganisms naturally associated with each other and their physical environment. For practical purposes these may be thought of as habitat types. A guide to the natural communities of Florida may be found on the FNAI website at (**www.fnai.org/PDF/ Natural_Communities_Guide.pdf**).

A basic natural community map can be generated in GIS with minimal effort using Florida Land Use, Cover, and Forms Classification System (FLUCCS) polygons or the FWC vegetation layer. For a more detailed and accurate assessment of natural communities, additional steps requiring ecological expertise are recommended:

1. Digitize preliminary natural community polygon boundaries using Florida Land Use, Cover, and Forms Classification System (FLUCCS) polygons overlaying 1995, 1999, and/or 2004 infra-red Digital Ortho Quarter Quads (DOQQs), high resolution aerial photography, USGS 7.5 minute topographic quadrangles, and Soil Conservation Service soil maps.

2. Ground-truth the polygons drawn in the preliminary natural community maps and collect data within representative areas of the polygons describing community structure, species composition, threats, management concerns, and landscape context. Correct the preliminary natural community polygons based on field observations.

Conduct additional field surveys for rare species and invasive exotic species – An essential component of protecting Florida's unique biodiversity is knowing where those species and habitats are located. A systematic survey for rare plants and animals will help fill in gaps, update old records, and put natural areas in context relative to each other. Examples of data recorded at rare species occurrences are size of population, phenology, threats, condition, landscape context, and associated species. It is also important to map and control invasive non-native plants that displace native plants and animals, change the structure of natural communities, or affect adversely the ecological functions of our ecosystems.

A comprehensive inventory is critically important for prioritizing natural areas and managing lands appropriately. These surveys should be performed by professional biologists with survey experience. The results of any species surveys should be submitted to the FNAI for entry into the statewide database.

DEVELOPING ECOLOGICAL SCORING CRITERIA AND A SCORING SYSTEM

For most purposes, (e.g., a community working to develop its green infrastructure or a landowner of a large parcel looking to develop portions of his or her property) an ecological-based approach to prioritizing significant natural areas is an important analysis to be performed. Examples of criteria could be but are not limited to, size of property, condition of natural communities present, presence of rare species, presence of exotic invasive

species, and landscape context. Each criterion may be prioritized based on importance. A scoring system (for example, very high, high, medium, low or a numerical system) can be developed and vetted prior to initiation. A variety of methodologies and related software packages are available but professional expertise should be sought to help craft these ecological scoring criteria and scoring systems.

CHOOSING FROM A GROWING LIST OF ANALYSIS AND MAPPING TOOLS

There are a number of software programs available to help communities or land owners evaluate wildlife habitat and develop a local decision support system (DSS) that integrates conservation information with land use patterns and policies to provide planners and resource managers with tools to help manage their natural resources. These tools can help to summarize the conservation value of multiple elements across the planning area, allowing identification of locations that should be conserved as well as locations that are less important for conservation. These tools can help generate a set of proposed conservation areas to help meet conservation goals.

Programs are now available that allow local users to insert, query, update, and delete geographical features and the data associated with them from standard Web browsers. As a community moves forward to identify, map and develop its green infrastructure and pursue wildlife-friendly planning and design strategies, getting professional expertise is recommended. In Florida there are numerous consulting biological/engineering firms and governmental, quasi-governmental or not-for-profit organizations that are familiar with the available data and analyses tools that can assist (e.g., the FFWCC, FNAI, TNC, local biological and land planning firms). T includes some of the planning and analysis tools that have been developed.

A comprehensive inventory is critically important for prioritizing natural areas and managing lands appropriately. These surveys should be performed by professional biologists with survey experience. The results of any species surveys should be submitted to the FNAI for entry into the statewide database.

MAPPING AND ANALYSIS TOOLS

Ecosystem-Based Management (EBM) (www.ebmtools.org/) – The EBM Tools Network is an alliance of EBM tool developers, practitioners, and training providers to develop EBM tools and support their use. EBM tools are software or other highly documented methods that can help communities implement an ecosystem services and green infrastructure planning approach by:

• Providing models of ecosystems or key ecosystem processes.

• Generating scenarios illustrating the consequences of different management decisions on natural resources and the economy.

• Facilitating stakeholder involvement in planning processes.

EBM tools include data collection and management tools; data processing tools; conceptual modeling tools; modeling and analysis tools (such as watershed models, marine ecosystem models, dispersal models, habitat models, socioeconomic models, and model development tools); scenario visualization tools; decision support tools (such as coastal zone management tools, fisheries management tools, conservation and restoration site selection tools, land use planning tools, and hazard assessment and resilience planning tools); project management tools; stakeholder communication and engagement tools; and monitoring and assessment tools.

Nature Serve Vista – This is a grouping of software products that integrates conservation planning with socioeconomic factors such as current and proposed land use, management practices, and threats, allowing an evaluation of the compatibility of various land use plans or management practices with the elements that needing conservation. It also facilitates evaluating whether or not adequate policies are in place to ensure that compatible land uses or management practices remain compatible over time. The program will help access site-level information and generate development planning and mitigation plans that result in alternative land use and management plans that better meet a community's conservation goals.

For example, NatureServe Vista could assist with evaluating the compatibility of various land use scenarios or management regimes for species, ecological systems, and places needing conservation. The programs help manage projects and planned development for an area through including initial analysis, planning, implementation, and monitoring. FNAI is a member of NatureServe and is the primary contact for NatureServe Vista users in Florida.

Marxan – This program provides decision support to conservation planners and local experts identifying efficient portfolios of planning areas that combine to satisfy a number of ecological, social and economic goals. It is readily available via the Internet at no cost. It is a stand-alone program that requires no other software to run, although a GIS is required to prepare the data, make the input files, and view the results. It is designed to help automate the planning process so that a team of planners can offer many different conservation plan scenarios. It can be used to offer planning scenarios that are alternatives to pre-conceived patterns of reserve or conservation area networks. It can also be used to offer alternatives and solutions where the input of local stakeholders is highly valued and a compromise with prospects for achievable results is sought. A pattern of priority sites that satisfy explicit quantitative biodiversity goals can be identified that are of low political or social pressure, or where resources necessary to implement conservation strategies or threat abatement are forecast to be lower.

Conservation Land-Use Zoning software (CLUZ) – CLUZ is an ArcView GIS interface that allows users to design protected area networks and conservation landscapes. It can be used for on-screen planning and also acts as a link for the Marxan conservation planning software. It was developed at Durrell Institute of Conservation and Ecology (DICE) and is funded by the British Government. CLUZ allows ArcView to import, analyze and display Marxan data. It also allows the user to explore the spatial data and interactively modify the conservation landscape plan. The three main ways that CLUZ can be used to develop these conservation land use plans are:

• Using Marxan to identify near-optimal combinations of planning units that meet specified conservation targets and attributes.

• Using Marxan to record the number of times that each unit is selected in each of the different runs. This number acts as an "irreplaceability" score, so that units that are selected in every run could be considered irreplaceable or of particularly high wildlife value. CLUZ can display these scores and the resultant maps are valuable for conservation planning because they give a value for each unit, rather than showing a unit as either being part or not part of the most efficient solution.

PANDA is a stand-alone application developed to provide a user-friendly framework for systematic protected areas network design for ArcGIS users.

• Using CLUZ to interactively create and modify existing conservation plans by interactively adding and removing units. These interactive functions automatically update information on how the selected units meet the conservation targets. CLUZ can also be used to display the distribution of each biodiversity element and to identify suitable units for swapping with selected units that are in unsuitable locations.

Protected Areas Network Design Application for ArcGIS (PANDA) – PANDA is a stand-alone application developed to provide a user-friendly framework for systematic protected areas network design for ArcGIS users. Through the use of PANDA, different hypothetical configurations of a system of protected areas in the planning landscape can be explored. Conservation goals and associated costs of each scenario are based on the available data and knowledge. The designer can edit the scenario by interactively modifying the status of the planning units among four managed area categories (Included, Protected, Available and, Excluded). A target table is provided to see the resulting changes in conservation goals of a particular scenario and the associated costs. PANDA allows interacting with the software Marxan. The user can use PANDA main interface to refine Marxan solutions. Conservation features distribution, the cost, and the Marxan irreplaceability score can be easily mapped. Auxiliary tools involved in systematic conservation network design, including a tool to generate a grid of management units of the desired shape and size and an easy interface to add new conservation features and targets, can be employed.

The Habitat Priority Planner (HPP) – A new tool from the National Oceanic and Atmospheric Administration, Coastal Services Center was designed with the local planner, coastal conservation group, and coastal manager in mind. HPP is

a spatial decision support tool designed to assist users in prioritizing important areas in the landscape or seascape for conservation or restoration action. The Habitat Priority Planner (HPP) is a toolbar for the Environmental Systems Research Institute's ArcGIS. What makes this tool unique is the ease with which the scenarios can be displayed and changed, making this a helpful companion when working with a group. In addition to the scenarios, the tool also generates pertinent reports, maps, and data tables.

HPP is composed of three modules: Habitat Classification, Habitat Analysis, and Data Exploration. The tool calculates basic ecological statistics that are used to examine how habitats function within a landscape. The tool pre-packages several useful ecological metrics into a user friendly interface to serve intermediate GIS users. In addition, HPP allows the user to interactively build queries using a graphical interface to demonstrate criteria selections quickly in a visual manner that is useful in stakeholder interactions. Possible applications include:

• Screening-level assessments of habitat for habitat restoration, land conservation, and general resource planning.

• Assessing and inventorying site-specific issues and conditions.

• Utilizing interactive mapping and prioritization.

• Providing spatial support to natural resource strategic planning efforts.

• Identifying and ranking potential restoration and conservation sites.

• Analyzing "what if" scenarios for proposed changes in land use or land cover.

• Creating maps, reports, and data tables.

CLIP is sponsored by the Century Commission for a Sustainable Florida. CLIP is a cooperative effort of the Florida Natural Areas Inventory, Florida State University; GeoPlan Center, University of Florida; and, the Florida Fish and Wildlife Conservation Commission to develop a scientifically-sound and transparent process to identify Florida's "must save" environmental treasures and critical green infrastructure. The goal of CLIP is to develop, with a broad technical advisory group and through phases, the best available planning tool to inform the state's decision-making in envisioning – and ensuring – a sustainable future.

Photo Courtesy of David Moynahan Photography

CONSULTING ADDITIONAL STATE AND REGIONAL WILDLIFE AND HABITAT DATA SOURCES

In addition to obtaining data related to habitat and wildlife in an area, there are always other sorts of information that are needed in the planning process. In the X box are some examples of important ancillary data sets that should be consulted to obtain a complete picture of the area being planned.

ADDITIONAL STATE AND REGIONAL WILDLIFE AND HABITAT DATA SOURCES

Archbold Biological Station (www.archbold-station.org/abs/index.htm) – This independent, non-profit research facility in Lake Placid, Florida, is devoted to long-term ecological research and conservation. The station fosters long-term ecological research on native plants and animals of central Florida, especially along the Lake Wales Ridge.

Critical Lands/Waters Identification Project (CLIP) – CLIP is sponsored by the Century Commission for a Sustainable Florida. CLIP is a cooperative effort of the Florida Natural Areas Inventory, Florida State University; GeoPlan Center, University of Florida; and, the Florida Fish and Wildlife Conservation Commission to develop a scientifically-sound and transparent process to identify Florida's "must save" environmental treasures and critical green infrastructure. The goal of CLIP is to develop, with a broad technical advisory group and through phases, the best available planning tool to inform the state's decision-making in envisioning – and ensuring – a sustainable future. CLIP follows a combined approach of layering and assessing differing resource data in a rules-based geographic overlay environment. CLIP offers a decision support tool linked to a spatial database that can help to identify important areas for conservation, biodiversity, landscapes, water, and valuable ecosystem services.

East Gulf of Mexico Coastal Conservation Corridor Project (www.egmccc.org) – The East Gulf of Mexico Coastal Conservation Corridor Project is a partnership of local, regional, state, and federal government agencies as well as non-profit groups working together to establish a comprehensive natural resource and planning GIS data-

base. This database will be used to help identify, create, and manage a conservation corridor system of various habitats in peninsular Florida to maximize the effectiveness of conservation lands in the region. The U.S. Fish and Wildlife Service provided funding for the project and The Nature Conservancy was contracted to coordinate the project.

EPA Southeastern Ecological Framework Project (www.geoplan.ufl.edu/epa/index.html) – The Southeastern Ecological Framework Project is a GIS-based analysis project to identify ecologically significant areas and connectivity in the southeast region of the U.S. The states included in the project are Florida, Georgia, Alabama, Mississippi, South Carolina, North Carolina, Tennessee and Kentucky. The resulting product of the study can be utilized by state, local and private entities in addressing regional ecological connectivity and other environmental resource allocation issues.

Florida Biotic Information Consortium (www.palmm.fcla.edu/ lfnh/related/fbic/ FBICdatabases.html) – This is an integrated statewide environmental database on Florida animals, plants, habitats and ecosystems that accesses bibliographic information from the state university libraries, bibliographic information from a customized bibliography created from comprehensive reference sources, full text database comprising 200 publications, and specimen information from the Florida Museum of Natural History records.

Florida Coastal Everglades (FCE) Program (www.fce.lternet.edu/) – The FCE is part of the Long Term Ecological Research (LTER) Network established by the National Science Foundation in 1980. The FCE LTER program was established in May of 2000 in south Florida, where a rapidly growing population of over 6 million people live in close proximity to–and in dependence upon – the Florida Everglades.

Florida Geological Survey (FGS) (www.dep.state.fl.us/ geology/) – Established in 1907, the FGS provides information and interpretive data dissemination for geology and earth science related information to governmental agencies, land-use planners, environmental and engineering consultants, mineral owners and exploration companies, industry, and the public. Program outreach related to earth science education and the prehistoric development of our state is also provided to the public and educators.

Florida Museum of Natural History Collections/ Databases (www.flmnh.ufl.edu/sitemap.htm) – Located at the University of Florida in Gainesville, the Florida Museum of Natural History is Florida's state museum of natural history, dedicated to understanding, preserving and interpreting biological diversity and cultural heritage. A variety of biological data bases and species specimen collections are available.

Forest Inventory and Analysis National Program (www.fia.fs.fed.us/) – The Forest Inventory and Analysis (FIA) Program of the U.S. Department of Agriculture (USDA) Forest Service provides the information needed to assess America's forests. The Forest Inventory Data Online (FIDO) and the FIA Program collects, analyzes, and reports information on the status and trends of America's forests: how much forest exists, where it exists, who owns it, and how it is changing, as well as how the trees and other forest vegetation are growing and how much has died or has been removed in recent years.

GeoCommunicator (www.geocommunicator.gov/GeoComm/ index.shtm) – GeoCommunicator is sponsored by the Bureau of Land Management and the US Forest Service. As an integral part of the National Integrated Land System (NILS), GeoCommunicator is designed to provide geospatial data and products from NILS to the public. GeoCommunicator facilitates the sharing of geographic data among federal, state, local, and private individuals and organizations interested in providing the public with national data sets including: Land and Mineral Use Records, Federal Land Stewardship and Land Survey Information System.

Habitat Management Plans for Existing Conservation Lands – Habitat Management Plans are prepared by federal, state, regional, or local agencies that own or manage natural areas such as forests, parks, and conservation easements. State land management plans are guided by Section 253.034, F.S. The purpose of these documents is to prescribe a plan for the management and stewardship of the natural resources associated with that property. Habitat Management Plans may list what land uses are allowed (i.e. logging, agriculture, etc.); identify management mechanisms for the land (i.e. prescribed burning, etc.); and/or prescribe restoration measures that are needed on the land amongst other considerations.

Habitat Management Plans may be useful in the decision-making process and typically include information on habitats, species, approved and prohibited uses, and other various information depending on the purpose for which the plan was developed. As an example, planners and affected citizens could determine if a protected area

ADDITIONAL STATE AND REGIONAL WILDLIFE AND HABITAT DATA SOURCES (continued)

in the vicinity is managed with prescribed fire, which could have a bearing on where certain sorts of infrastructure, such as airports or hospitals, are built. Below is information on how to locate some of these plans.

• DEP-Division of State Lands — The Division of State Lands is a repository for management plans developed for state lands that are managed by a wide range of agencies and entities. They are particularly responsible for Management Plans for lands managed or owned by the Board of Trustees of the Internal Improvement Trust Fund. It should be noted that all lands under State lease have to do a management plan, but they may not all have a conservation purpose in mind. Currently these plans are not available online, but copies can be requested from the Division of State Lands at (850) 245-2784.

• Florida Fish and Wildlife Conservation Commission (www.myfwc.com/wma-planning/) — FWC refers to their Plans as Conceptual Management Plans which are created for FWC's Wildlife Management Areas.

• Department of Agriculture and Consumer Services, Division of Forestry — The Division of Forestry produces ten-year Resource Management Plans for their lands. Currently these plans are not available online. To obtain a copy one must submit a Request for Duplication of Records to DOACS. For questions call the Forest Management Bureau at (850) 488-6611.

• Water Management Districts — The Districts produce Land Management Plans for their properties. They often have good biological background information. Management plans may be obtained by contacting the respective Districts.

National Biological Information Infrastructure (www.nbii.gov) — The NBII links diverse, high-quality biological databases, information products, and analytical tools maintained by NBII partners and other contributors in government agencies, academic institutions, non-government organizations, and private industry.

Non-indigenous Aquatic Species Data Set (www.nas.er.usgs.gov/) — This site has been established as a central repository for accurate and spatially referenced biogeographic accounts of non-indigenous aquatic species.

Ordway-Swisher Biological Station (www.flmnh.ufl.edu/herbarium/) — The station is a year-round biological field station established for the long-term study and conservation of unique ecosystems through management, research, and education. It is managed for the University of Florida by the UF/IFAS Department of Wildlife Ecology & Conservation.

Statewide Endangered and Threatened Plant Conservation Program (www.fl-dof.com/forest_management/plant_conservation_index.html) — The Florida Plant Conservation Program works to restore and maintain existing populations of listed plants on public and private lands managed for conservation.

Tall Timbers Research Station and Land Conservancy (www.talltimbers.org/mandph.htm) — The mission of Tall Timbers is to foster exemplary land stewardship through research, conservation and education. Its primary research focus is the ecology of fire and natural resource management.

UF/IFAS Center for Aquatic and Invasive Plants (www.aquat1.ifas.ufl.edu/) — This multidisciplinary research, teaching and extension unit focuses on management of aquatic and natural area weed species and coordinating aquatic plant research activities within the State of Florida.

University of Florida Herbarium (FLAS) (www.flmnh.ufl.edu/herbarium/) — The University of Florida Herbarium is a unit of the Department of Natural History of the Florida Museum of Natural History. The UF Herbarium's collection databases and image galleries provide interactive, virtual access to fragile collections. The specimen based images are associated with label information in the collection catalog with data on habitat, flowering and fruiting period, frequency, and distribution. A common name search tool provides a walkway to the scientific names used in the catalogs.

U.S. Geological Survey operates the Biological Resources Discipline (BRD) and works with others to provide the scientific understanding and technologies needed to support the sound management and conservation of our Nation's biological resources. The Survey also offers the Florida Integrated Science Center (*FISC* at: **http://fisc.er.usgs.gov/**) which has a special mission to provide USGS science to Florida, the Southeastern States, the U.S. Caribbean, and elsewhere in the world. Some of the resources include:

• Earth Resources Observation and Science (EROS) **http://edc.usgs.gov/**

• Earth Resources Observation and Science (EROS), Seamless Data Distribution System **http://seamless.usgs.gov/**