U. S. Fish and Wildlife Service
Great Lakes Basin Ecosystem Team

Geographic Information System/Decision Support System Core Group Strategic Plan for Developing Implementation Recommendations

(Revised May 17, 2002)

EXECUTIVE SUMMARY

Introduction

Effective management of the Great Lakes resources at the ecosystem level requires considerable coordination of efforts from many groups. Geospatial data that can assist management efforts are collected at many scales ranging from small, site-specific projects to basin-wide examinations. In addition to variations in scale, data are collected in many different formats, making integration of data sets difficult. Because of the fragmented nature of the data available, management decisions are often hampered by a lack of critical information that may exist but is either not immediately available or not in a useful form. Geographic Information Systems (GIS) and Decision Support Systems (DSS) are mechanisms that can be used to provide managers with the capability to integrate and analyze multiple data sources on a desktop computer.

Obstacles, real and perceived, have prevented the Service from fully or most effectively engaging in GIS on a landscape level for the benefit of Great Lakes resource conservation. Since there was no entity or opportunity to develop a pathway for effectively or efficiently engaging the Service with this important technological tool, the Great Lakes Basin Ecosystem Team (Team) formed a GIS/DSS Core Group (Core Group) to explore and determine how to advance the use of this important natural resource management tool to better serve our mission and work with partners.

Core Group membership includes representatives from the Service's Region 3 (Regional Office/Refuges, Ecological Services, Great Lakes National Program Office Liaison, Fisheries/Sea Lamprey Control), the Service's Region 5 (Regional Office/Ecological Services & Cartography and Spatial Data Services, Fisheries), and the U. S. Geological Survey (Great Lakes Science Center and Upper Midwest Environmental Science Center). Partners include the Great Lakes Commission, Michigan State University (Center for Remote Sensing and Geographic Information Science and the Water Resources Institute) and the Michigan Natural Features Inventory.

Charge

The Core Group shall examine the role that geospatial data, technologies, and analyses should play in the implementation of an ecosystem approach to management in the Great Lakes basin.

Approach

Develop a draft strategic plan for the Team by investigating capabilities and issues, conduct a pilot project to identify obstacles and opportunities, and make recommendations to implement geospatial technologies in support of Great Lakes basin resource management issues.

Summary Findings

- GIS capabilities varied widely throughout the Service with a few offices operating proficiently, but a majority having little or no GIS capability. Most field offices said that they would use GIS technologies if they had computer hardware, GIS software, available staff time, training, technical support, and regional guidance.

- Discussions with field offices revealed that most resource management issues they deal with would benefit from geospatial technologies. Most field offices were aware of GIS and its potential utility in field applications.

- We interpreted the managers' responses as strongly supporting GIS technologies, yet frustrations existed due to the lack of understanding or inability to implement the technologies.

- A pilot DSS project developed for the Islands Committee demonstrated to managers the utility of examining spatial data in a coordinated ecosystem approach.

- Currently, there is no comprehensive inventory of existing GIS datasets in either Region 3 or Region 5.

- GIS infrastructure is not in place to directly support Team efforts at the ecosystem level.

Recommendations

Support infrastructure needs within the Service to develop the expertise necessary to solve the Team management issues including:

1. Support the creation of a full time GIS Coordinator within the Service for the Great Lakes Basin. Responsibilities would include data warehousing, project implementation, technical support, and coordination within the Team. This is envisioned as a position that serves cross-program, cross-region functions for the Team in coordination with Region 3 GIS Needs Assessment Team (proposed) and Region 5 GIS Coordination Team (active).

2. Establish a GIS/DSS Committee composed of the Great Lakes GIS Coordinator and those practicing or interested in geospatial applications in the Great Lakes Basin. The Committee will lead a network of GIS users within the Great Lakes Basin to identify new geospatial technologies as they become available, evaluate the utility of those technologies to support Team objectives, recommend implementation strategies, and provide advisory GIS support for the other Team committees.

3. Support further development of GIS-related infrastructure (e.g., hardware, software) and staffing needs in the Service to effectively address ecosystem level issues. A coordinated approach will increase productivity, minimize duplication of effort, and promote communication and sharing of information among offices and partners.

4. Organize Great Lakes Basin workshops and conferences for networking and training purposes. Increase education opportunities, outreach efforts, and information exchange with the addition of a GIS/DSS component to the Team's website.

STRATEGIC PLAN

Introduction

Effective management of the Great Lakes resources at the ecosystem level requires considerable coordination of efforts from many groups. Geospatial data that can assist management efforts are collected at many scales ranging from small, site-specific projects to basin-wide examinations. In addition to variations in scale, data are collected in many different formats, making integration of data sets difficult. Because of the fragmented nature of the data available, management decisions are often hampered by a lack of critical information that may exist but is either not immediately available or not in a useful form. Geographic Information Systems (GIS) and Decision Support Systems (DSS) are mechanisms that can be used to provide managers with geospatial information needed to make sound resource management decisions. A GIS is an organized collection of computer hardware, software, geographic data, and trained personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information. A DSS is an interface that allows a novice user to easily display information through a set of packaged software tools and data giving the user an interface to ask questions and provide a way to display results. These tools can be combined to provide managers with the capability to integrate and analyze multiple data sources on a desktop computer.

Obstacles, real and perceived have prevented the Service from fully or most effectively engaging in GIS on a landscape level for the benefit of Great Lakes resource conservation. There is no organizational structure within the Service's domain of the Great Lakes Basin (Region 3 or Region 5) to develop a pathway for effectively or efficiently engaging and coordinating Service activities with this important technological tool. The Great Lakes Basin Ecosystem Team (Team) formed a GIS/DSS Core Group (Core Group) to explore the value of GIS/DSS at the ecosystem level and how to advance the use of this important natural resource management tool to better serve our mission and work with partners.

Core Group membership includes representatives from the Service's Region 3 (Regional Office/Refuges, Ecological Services, Great Lakes National Program Office Liaison, Fisheries/Sea Lamprey Control), the Service's Region 5 (Regional Office/Ecological Services & Cartography and Spatial Data Services, Fisheries), and the U. S. Geological Survey (Great Lakes Science Center and Upper Midwest Environmental Science Center). Partners include the Great Lakes Commission, Michigan State University (Center for Remote Sensing and Geographic Information Science and the Water Resources Institute) and the Michigan Natural Features Inventory. (See Appendix 1 for Core Group membership and partner information.)

Charge

The Core Group shall examine the role that geospatial data, technologies (GIS and DSS), and analyses should play in the implementation of an ecosystem approach to management in the Great Lakes basin including:

1) Inventory existing geospatial capabilities, including hardware, software, staff time, and expertise.
2) Identify and summarize Great Lakes Basin issues that can be addressed using geogspatial technologies.
3) Develop recommendations for implementation of geospatial technologies to support Great Lakes Basin management issues.

Capabilities Assessment

The task, as identified by the Core Group, was to inventory the GIS capabilities within both Regions of the Great Lakes Basin and determine what would be needed to implement GIS/DSS technologies for the Team.

The Core Group used existing questionnaires and their experience to develop a set of questions used to ask the 28 Great Lakes Basin Service field offices in Region 3. The questionnaire (see Appendix 2) was sent to the offices in Fall 1999. Members of the field offices were subsequently interviewed by phone and queried about their current use of geospatial technologies. Because information about the geospatial capabilities in Region 5 was recently compiled, the Core Group chose to use those results.

Results

The Core Group found that 54% (15 of 28) of the offices in Region 3 had some GIS capability. It was clear that most of the refuges, ecological services field offices, and sea lamprey control offices had some level of GIS capability while the hatcheries, fishery resources offices, and law enforcement offices had little or none. All 15 of the offices with GIS capability used ArcView GIS software, but only three had advanced GIS software (e.g., ArcView Spatial Analyst, ARC/INFO, EPPL7). Most of the GIS-capable offices had computers dedicated to running the GIS software, and the other offices had computers of sufficient power to support the use of GIS.

The Core Group found that GPS hardware was in use at 86% (24 of 28) of the offices and was primarily applied to biological or habitat assessment. Navigation was the second most common application of GPS, followed by management units (e.g., burn areas) and project review locations (e.g., permits). Two refuges, one hatchery, and the Great Lakes Liaison do not have GPS hardware.

The Core Group found that 43% (12 of 28) offices had at least one staff member with GIS skills. Regardless of whether a staff member had GIS skills, 21% (6 of 28) of the offices have contracted out their GIS needs, and 29% (8 of 28) had purchased GIS data. Finally, 43% (12 of 28) of the offices had no plans to enhance their GIS capability in the year 2000.

When asked to rank a list of items in order of their ability to strengthen the implementation of GIS at their stations, survey respondents indicated that additional field staff time is their number one need. Most people were concerned about adding GIS-related responsibilities to their current duties. Specifically, most did not feel that they could afford the time required to become proficient at using GIS software. If they could use the software efficiently, many thought that they could incorporate the technology into their daily activities. Survey respondents also identified, in order of importance, the need for training, funding, regional support, hardware, software, and data.

Phone discussions with respondents revealed that additional staff time from the regional/ecoregional office level (i.e., cross-regional support) was one of the most important long-term GIS needs of field offices, assuming they had adequate hardware and software. The respondents felt that once the initial learning curve associated with GIS software was surpassed, support from a regional/ecoregional level (e.g., data acquisition, higher-level data processing, technical support) would be very helpful to fully implement GIS at their station.

Generally, most field offices said that they would use GIS technologies if they had hardware/software, staff, training, and Regional Directorate support. They could see many day-to-day issues to which they could apply GIS including regulatory mapping, CCP development, identification of problem areas or "hot spots", and ecosystem restoration.

Issues Assessment

The task, as identified by the Core Group, was to identify and summarize Great Lakes basin issues that can be addressed using geospatial technologies by querying several local-level managers and Team Committee chairs to determine if there were particular priority issues in the GL Basin that would lend themselves to GIS analysis and utilization, especially at the field level.

Results

The Core Group found that most resource management issues identified by the managers would benefit from geospatial technologies and most field office personnel were aware of GIS and its potential utility in field applications. The Core Group interpreted the managers' responses as strongly supporting GIS technologies, yet frustrations existed due to the lack of understanding or inability to implement the technologies.

To address these frustrations, the Core Group determined that a pilot DSS demonstration project would help to assess the resources, infrastructure, staffing, equipment, and funding necessary to support the GLBET with GIS technologies. This would, in turn, help the Core Group identify the value and needs of a basin-wide GIS approach and how it can most effectively and efficiently be supported.

Lake Michigan Islands GIS/DSS Pilot Project

The Core Group approached the Islands Committee Chair to discuss their group's interest and evaluate their needs. The Islands Committee had an identified need for GIS support to prioritize Great Lakes island acquisition for the Refuge system. The Core Group determined the needs of the Islands Committee were the best example to demonstrate the utility of GIS/DSS to the Team. (see Appendix 3 for complete description and status)

Recommendations

Currently there is a large, mostly unrealized potential for application of GIS in the Service in the Great Lakes Basin. Surveys of the offices have identified that most offices would use geospatial technologies (e.g., GIS, GPS, DSS) if the training, support, data, and staff time were available. All of the priority issues identified by the Team would benefit from incorporation of GIS as a visualization, decision-making, and analytical tool.

Implementing geospatial technologies within the ecosystem approach of the Great Lakes basin depends on the cross-programmatic coordination between Region 3 and Region 5 of the FWS. With most states and programs working independently of each other, coordination efforts have been difficult between these entities to create protocols, standards, and data sources to develop a common plan.

We find that the lack of coordination and cross-programmatic cooperation is the primary deterrent for efforts of individual offices and the Team to fully use GIS. To fully support

GIS/DSS infrastructure needs within the Service and develop the expertise necessary to solve Team management issues, the Core Group recommends that the Team:

1) Support the creation of a full time GIS Coordinator within the Service for the Great Lakes Basin. Responsibilities would include data warehousing, project implementation, technical support, and coordination within the Team. This is envisioned as a position that serves cross-program, cross-region functions for the Team in coordination with Region 3 GIS Needs Assessment Team (proposed) and Region 5 GIS Coordination Team (active).

2) Establish a GIS/DSS Committee composed of the Great Lakes GIS Coordinator and those practicing or interested in geospatial applications in the Great Lakes Basin. The Committee will lead a network of GIS users within the Great Lakes Basin to identify new geospatial technologies as they become available, evaluate the utility of those technologies to support Team objectives, recommend implementation strategies, and provide advisory GIS support for the other Team committees.

3) Support further development of GIS-related infrastructure (e.g., hardware, software) and staffing needs in the Service to effectively address ecosystem level issues. A coordinated approach will increase productivity, minimize duplication of effort, and promote communication and sharing of information among offices and partners.

4) Organize Great Lakes Basin workshops and conferences for networking and training purposes. Increase education opportunities, outreach efforts, and information exchange with the addition of a GIS/DSS component to the Team's website.

Challenges

As with any tool, GIS is not appropriate in all situations. The Core Group however, believes that geospatial technologies are effective tools for accomplishing much of the Service's mission on an ecosystem level. In developing our recommendations, the Core Group recognizes there are challenges, both real and perceived, that may prevent successful implementation of these recommendations. Those challenges that the Core Group has identified include:

- Field offices lack the time and resources to implement geospatial technologies and are unwilling or unable to do so from their existing program resources
- Need for increased support from the Regional Office to integrate GIS capabilities into program functions
- Need for leadership and coordination of technical support from a central resource
- Communication with agencies and other partners outside the Service
- Recruiting, retaining, and training qualified staff for implementing geospatial technologies

APPENDIX 1 – Contact Information

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APPENDIX 2 – GREAT LAKES BASIN GIS CAPABILITIES SURVEY

Does your station currently have GIS capability? **Y/N**

If yes, please skip to the next section titled "Hardware"

If not, do you see a need/use for GIS at your station? **Y/N**

If you perceive a need for GIS at your station, why are you not using it at this time?

Does your station have GPS capability? **Y/N**

If yes, go to GPS Capabilities Section

HARDWARE

Do you have a computer(s) specifically configured for GIS? **Y/N**

If so, please provide the following: Brand and Model:
Operating System:
Processor Speed:
RAM Size:
Video RAM:
Hard Drive Size:
Backup/File Transfer Capability:

If you do not have a specific computer for GIS, how many computers have GIS software installed on them?

Do you have any of the following hardware peripherals? (Get Brand and Model)

Digitizer
Scanner
Color Printer
Plotter
Read/Writeable CD

SOFTWARE

What GIS Software do you have?

Arcview # of copies___ Version #___
Arc/Info # of copies___ Version #___

Arcview Extensions:

Spatial Analyst
Image Analysis
3D Analyst

Other GIS Software:

_____

GPS CAPABILITIES
Does your station have any GPS Units? **Y/N**

If so, how many: _____PLGRs _____Trimbles _____Other

Are you up-to-date on support, maintenance, or keying agreements?

What type of data are you collecting with GPS units?
Facilities Management (i.e., Real Property Inventory)
Biological/Habitat Inventories and Monitoring
Navigational
Project Review Locations (i.e., Permits/Section 7 Consultations)
Management Units (i.e., burn management blocks)
Other _____

Are GPS data normally converted to a GIS format? **Y/N**

GIS DATA/APPLICATIONS
What is your major source of GIS data?

What GIS data or applications have you developed specifically for your station?

How are GIS capabilities being used (e.g., planning, public relations, map making, feature query)?

Who at your station currently has the ability to add or manipulate data in a GIS?

Have you had any GIS data or applications developed for your station by a contractor? **Y/N**

If yes, what was developed?

Have you paid for any GIS data? **Y/N**

If yes, what kind of data was purchased and how much did it cost?

Do you have a local/state/federal GIS contact(s) with whom you share GIS data or hardware? **Y/N**

If yes, get name, agency and phone number

FUTURE PLANS FOR GIS

What enhancements to GIS do you plan for your station in the next year? (Hardware/software purchases, data development, training)

Rate the following in order of their ability to strengthen the implementation of GIS at your station:

_____Training
_____Additional staff time (at field station)
_____Additional staff time (at Ecosystem/Regional Level)
_____Data (specify type of data)
_____Hardware (specify)
_____Software (specify)
_____Funding
_____Other (specify)

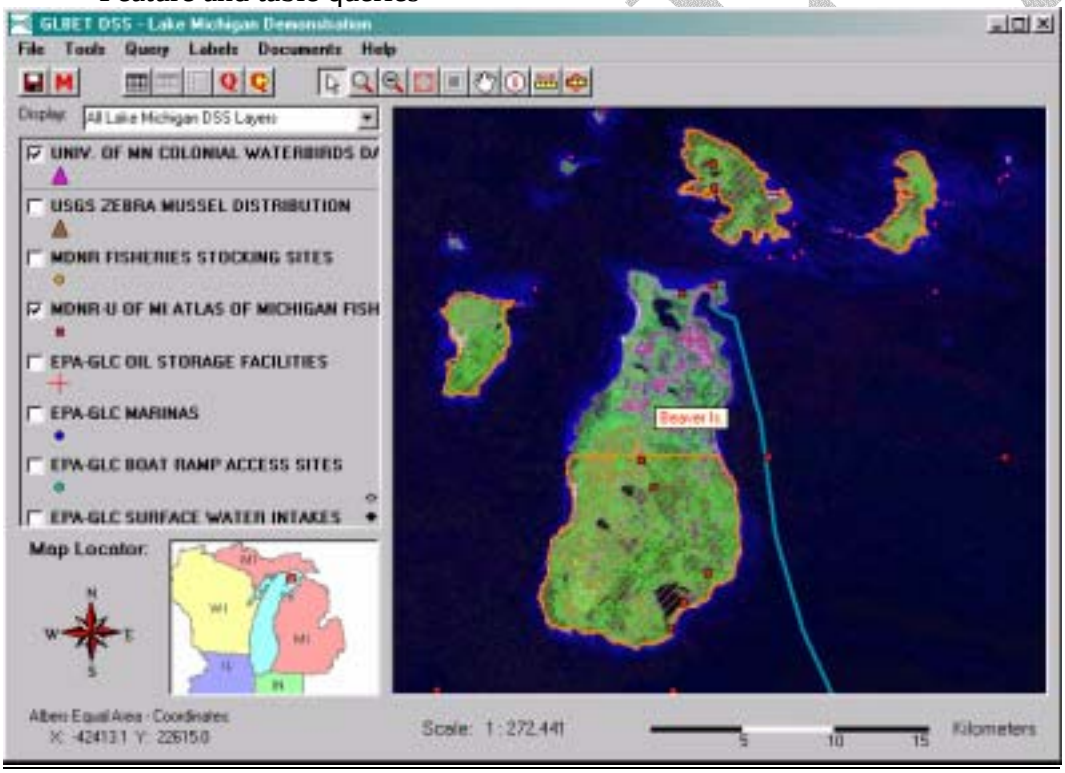
APPENDIX 3 – Lake Michigan Islands DSS

Great Lakes Basin Ecosystem Team
Geographic Information System/Decision Support System

The Great Lakes Basin Ecosystem Team (GLBET) Geographic Information System (GIS)/Decision Support System (DSS) provides refuge personnel and other interested parties the ability to answer questions related to islands within the Great Lakes basin using spatial and non-spatial data.

Features:

- Spatial data viewing
- Map export
- Table Export
- Length and area measurement tools
- Feature and table queries
- Metadata viewer
- Links to Great Lakes islands documents
- Feature labeling and identification
- Links to textual island summaries



Purpose:

The GLBET GIS/DSS is a tool, which helps the user answer simple questions concerning Great Lakes islands and the Great Lakes basin as a whole. The GIS/DSS facilitates decision-making for land acquisition, environmental review, management planning, and provides a valuable tool for communication and outreach. The GIS/DSS will be available from the desktop of all USFWS field stations that manage resources within the Great Lakes Basin. Managers will be able to review Great Lakes islands within the GIS/DSS for natural resource values and threats and for their potential for acquisition by the National Wildlife Refuge System.

Background:
The Great Lakes contain about 30,000 islands, ranging in size from small boulders to over a hundred thousand acres. These islands form the world's largest freshwater island system and are a unique natural resource. A large number of rare natural features are located on the islands of the Great Lakes, including several species of plants endemic solely to Great Lakes islands, and many U.S. Fish and Wildlife Service trust resources such as rare and endangered species, neotropical migrants, interjurisdictional fishes, colonial water birds, and waterfowl. The extensive island shoreline epitomizes the Great Lakes coastal ecology. The issue of Great Lakes island protection is timely in that pressure from invasive species and humans continue to increase.

The Great Lakes Basin Ecosystem Team island committee collaborated with the USGS Upper Midwest Environmental Sciences Center (UMESC) and the USGS Great Lakes Science Center to gather spatial and non-spatial data relating to Great Lakes islands and their watershed. The Decision Support System was created by the UMESC to guide future management and protection of islands and surrounding areas at many scales ranging from small, site-specific projects to basin-wide examinations. The GIS/DSS presently in use on the Upper Mississippi River was used as a model for the project. The tool was created using Microsoft Visual Basic 6.0 and Environmental Systems Research Institute (ESRI) MapObjects LT2.

Current Status:
The GLBET GIS/DSS is currently available as a demonstration project for the Lake Michigan watershed.

Future Actions:
The GLBET GIS/DSS will be expanded in the future to include the remaining Great Lake basins. Each individual lake basin will have its own application, which the user can install on his/her computer.

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Revised April 30, 2002

APPENDIX 4 – Milestones

ExCom identified the importance of engaging in GIS to enhance Service activities in the Great Lakes basin (1999)
GLBET approved the formation of a committee to examine potential implementation of geospatial technologies to provide an integrated approach to ecosystem management and decision making (November 1999)
ExCom gave concurrence and approval of Core Group's understanding of Charge and proposed implementation plan (January 2000)
Core Group reported results of surveys and interviews conducted to determine existing geospatial capabilities/needs and priority management issues that would benefit from these technologies (May 2000)
GLBET identified an Islands GIS/DSS data collection pilot project as its top priority for kitty funds (May 2000)
GIS/DSS pilot project expanded to a basin-wide focus on islands and lake sturgeon, reflecting GLBET's two newly designated resource priorities (November 2000)
The Service's R3 and R5 selected GL Flex Funding Program proposals to conduct Great Lakes Islands and lake sturgeon GIS activities. (December 2000)
Core Group presented preliminary findings and recommendations to GLBET and solicit feedback (November 2001)
Core Group will present findings and recommendations to GLBET and solicit feedback (May 2002)
Core Group will brief Regional Directorates and Programmatic Leaders and solicit feedback (Summer 2002)
Core Group will present findings related to effectiveness of pilot projects for incorporating GIS to the ecosystem approach; hands on training/workshop for Team and Programmatic Leaders and Staff (Summer/Fall 2002)
Core group will present final recommendations to GLBET, thereby fulfilling duties as charged (Summer/Fall 2002)

APPENDIX 5 – Challenges

Information management, funds, staff, time, training, infrastructure, standards, updates, etc.

Questions:

- What level of basemap detail will they provide...the state/province level, county level, section level? Will the level of detail they provide meet your needs?

- Will they be collecting information for the Canadian provinces in the Great Lakes Basin?

- There are often ongoing GIS projects that are collecting data. How can we ensure we are not duplicating efforts? What other private and public inititiatives are already underway in the Great Lakes Basin to collect/create GIS datasets? For example, the Great Lakes Commission is already processing USGS DRGs and DLGs into a Basin dataset that they will provide to agencies within the Great Lakes Basin free of charge. Also, the USFWS East Lansing Field Office has been given a $25,000 grant from USEPA to collect and process GIS data for Lake Michigan.

- When it comes to collecting the biological inventory data, are they going to assess how and when it is appropriate to use? Collection of any biological inventory data needs to include an assessment of data quality, source integrity, age, etc. I would recommend a copy of the research study or program report under which it was collected accompany all biological data.

- How are you going to determine what data you need in a GIS system to serve your purposes? Does it exist and will Carl be able to provide it? If you determine a certain piece of data, for instance endangered species or conservation priority species range maps are critical in your DSS, does he have the resources to review the literature and create this dataset?

- How do you plan to support this GIS system after it is developed? If the plan for this dataset is to produce it on CDs and send it to Basin field stations for their use in planning, I think you will only realize a small portion of the power of this dataset. I believe you need a person dedicated to the use and maintenance of this GIS system for the following reasons:

- This product is only a tool and someone with the time and experience to use this tool is the only way to maximize its usefulness.

- The minute you receive this dataset, it will already be out of date. New data is being created everyday and research is ongoing. As time goes by, the dataset will become outdated and weak in its ability to provide decision support unless someone is constantly maintaining it.

- In your need for this tool to support decisions, you will soon outgrow the initial analysis capabilities of the application and will want different analysis and queries done. You will need someone familiar with the dataset to do that.

- You will also want to develop maps for meetings, summarize data for reports and start creating new data layers to add to the dataset. You will need someone to do that.

Costs:

Information from Region 1's GIS web pages indicate the following potential costs for a support node:

Fixed Costs and Yearly Recurring Costs

Staff: GS 9/11/12 GIS Analyst $65k
Hardware/software maintenance $3k
GS 7/9 GIS Tech $55k (optional for GLBET unless workload requires)
Training $5 k
Hardware: 1 Workstation (NT) $4k
Travel $5 k
Color Plotter $5k
Data Acquisition $10 k
Laser Printer $1k
10-20 Gigabytes disk space $.5k
Digitizer $10k
Software: Arc/Info $5k, ArcView $1k

APPENDIX 6 – Context of Core Group's Work

Opportunities

As geospatial technologies, computer hardware, and infrastructure capabilities improve, the opportunities to develop and implement an ecosystem wide Geographic Information System and Decision Support System increase. The Service has begun supporting many GIS initiatives on a national, regional, ecosystem, and field station level.

Under the coordination of a National GIS coordinator, the Service is expanding their involvement in GIS activities by coordinating metadata efforts, assisting offices by locating free or low cost spatial data, providing general evaluations on the quality of that data, providing a platform for sharing metadata and spatial data, and serving as a clearinghouse for other GIS topics such as data standards, training, the A-16 process, global positioning systems, contract information, and technical notes. Sharing of this information is accomplished through the National Geographic Information System and Spatial Data Homepage (http://www.fws.gov) and National listservers for GIS (fws-gis), data (fws-data), system architecture (fws-system), and Information Resource Management technical support (fws-irm-tech). Training courses and National GIS workshops have been conducted through the National Conservation Training Center (http://training.fws.gov) and provide a good source of information for the beginner through the advanced user. Additional automated information systems, reporting systems, and map servers are available including the Budget Allocation System, Corporate Master Table, Engineering Facilities Management Information System (EFMIS), Fisheries Information System, Law Enforcement Management Information System II, National Wetlands Inventory Maps Metadata Database, Real Property Management Information Systems (RPMIS), Refuge Management Information System (RMIS), Service Permit Issuance and Tracking System (SPITS), Environmental Conservation Online System (ECOS) with Wetlands Interactive Mapper, Regional Accomplishment Reporting Systems, and the Interactive Map and Data Server.

Currently, both Region 3 and Region 5 have a designated Regional GIS Coordinator as collateral duty within their programs. The Region 3 Coordinator is Mary Mitchell within the Division of Refuges, and Region 5 Coordinator is Linda Shaffer within the Cartography and Spatial Data Services (Refuges and Realty).

In addition to a regional coordinator, Region 5 has established a GIS Coordination Team consisting of volunteer members from multiple programs and field stations across the region. The purpose of this team is to increase the coordination of GIS activities, increase the awareness and recognition of GIS, and provide regular workshops/meetings for the GIS community. Information for the Coordination Team and Region 5 GIS activities can be found through the Cartography and Spatial Data Services GIS Homepage at http://www.fws.gov/R5gis.

Outside of the U. S. Fish & Wildlife Service, there are many opportunities for partnerships and collaboration from other federal government agencies, state and local governments, ngo's, and private organizations. Current partnerships and involvement in the Great Lakes Basin Ecosystem Team include core group members from the U. S. Geological Survey – Great Lakes Science Center and U. S. Geological Survey – Upper Midwest Environmental Sciences Center. Other sources of data, technical support, and project

collaboration are Great Lakes Commission, Great Lakes Fishery Commission, Great Lakes Sea Grant Network (http://www.seagrant.wisc.edu/greatlakes/glnetwork), International Joint Commission, The Nature Conservancy Great Lakes Program (http://www.tnc.org/greatlakes), U.S. Environmental Protection Agency (EPA)-Great Lakes National Program Office (GLNPO), Great Lakes Information Network (http://www.great-lakes.net), Michigan State University – Center for Remote Sensing and Geographic Information Science & US-Canada Great Lakes Islands Project, Michigan Natural Features Inventory – MSU extension, and Environment Canada.

APPENDIX 7 **– Core Group Reference Resources and Potential Partners**

Great Lakes Basin Ecosystem Team GIS/DSS Web Page:
http://www.glc.org/GIS/GLBET/index.html

Region 5 GIS Coordination Team Web Page: http://164.159.102.219/gisteam/giscoordteam.html

ECOS: http://sii.fws.gov/r9es/ (see description below).

USFS Great Lakes Ecological Assessment GIS: http://econ.usfs.msu.edu/gla/index.htm

NRCS/Sea Grant/NASA GIS for Minnesota, Wisconsin, and Michigan: http://resac.gis.umn.edu/

Great Lakes Commission's Great Lakes Information Network, Great Lakes GIS Online:
http://www.great-lakes.net/gis/glgis.html

State of the Lakes Ecosystem Conference (SOLEC) Indicators Initiative:
http://www.epa.gov/glnpo/solec/

National Academy of Public Administration's Executive Summary of: "Geographic Information for the 21st Century: Building a Strategy for the Nation":
http://38.217.229.6/NAPA/NAPAPubs.nsf/00a36275d19681118525651d0
0620a03/229b79ae768d77e48525658c0061a3bd?OpenDocument

"Announcing Conservation/Geography, a new website": http://www.gisday.com

Conservation/Geography, a new website where you can find out about hundreds of organizations using GIS to protect nature and promote social justice. The URL is:
http://www.esri.com/conservation
You'll find:

- New GIS Status Reports
- World maps of Conservation GIS

U.S. EPA Region 5 Critical Ecosystem Team GIS Database

APPENDIX 8 – Presentations

Slides from the GLBET Meeting (February 2000)

Charge for GIS Capabilities Team

- Determine GIS and GPS capabilities of USFWS offices in the Great Lakes basin

Region 5

! 3 of 67 offices are in the Great Lakes basin

⇒The Lower Great Lakes Fishery Research Office in Amherst, NY is a dedicated GIS office

⇒Montezuma NWR and Iroquois NWR are active users of ArcView

Questionnaire

! Distributed to 28 offices in Region 3 and followed up with phone conversation

! Are you GIS capable?

⇒Hardware and software

! What are your current GIS applications?

! Are you GIS capable?

! How are you using your GPS resources?

! Future plans for GIS and/or GPS

Are you GIS capable? (General Results)

! 15 of 28 (54%) offices have GIS capabilities at some level

⇒YES: most Refuges, ES Field Offices, and Sea Lamprey Control offices

⇒NO: Hatcheries, FROs, and Law Enforcement Offices

Are you GIS capable? (Software Results)

! Software

⇒15 of 28 (54%) have ArcView

⇒Advanced capabilities

3 of 28 (11%) have ArcView Spatial Analyst

3 of 28 (11%) have ArcInfo or other GIS software

Are you GIS capable? (Hardware Results)

! Hardware

⇒Generally, those with GIS software have dedicated computers

⇒Those without GIS capability have computers of sufficient power to support the use of GIS

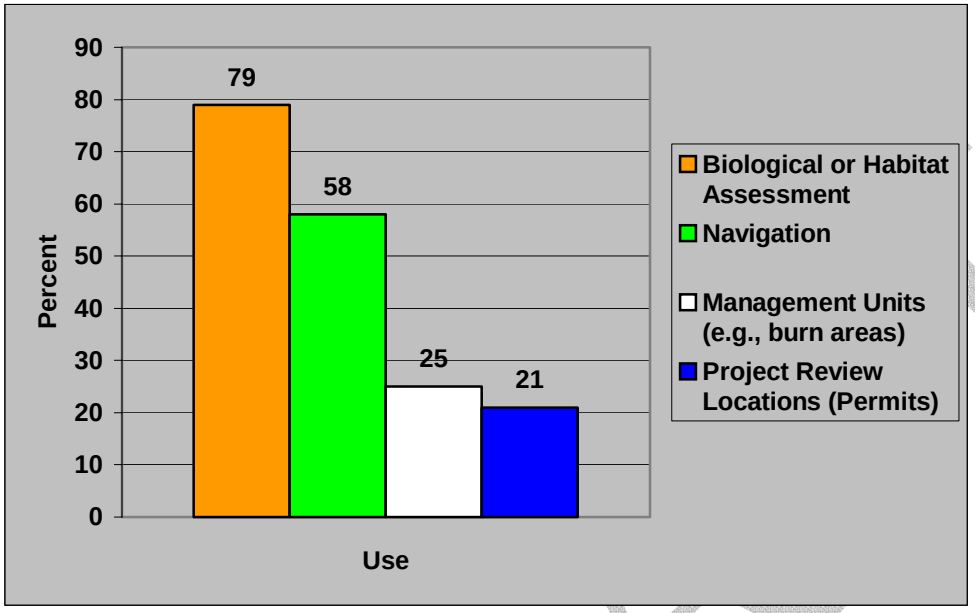
Are you GPS capable? (General Results)

! 24 of 28 offices have GPS capabilities

⇒Two refuges, one hatchery and the Great Lakes Liaison office do not have GPS

⇒All other offices have at least one GPS receiver

How are you using GPS? (Specific Results)



GIS Applications? (General Results)

! 12 of 28 (43%) of offices have at least one person with GIS skills
! 6 of 28 (21%) of offices have contracted out their GIS needs
! 8 of 28 (29%) of offices have purchased GIS data
! 12 of 28 (43%) have no plans for GIS in the next year

GIS Priorities? (General Results)

! 16 of 28 (57%) of offices ranked their requirements to implement GIS in their core duties
! Results (in order of importance)
⇛Need additional field staff time
⇛Need training and funding
⇛Need additional staff time from the regional/ecoregional office level * * *
⇛Need hardware, software, and data

<u>Slides from the GLBET Meeting (May 2000)</u>

The Charge for GLBET GIS/DSS Group GIS Capabilities Team

What did we do?

! Team contacted 31 FWS offices within Great Lakes Basin:
⇒28 in Region 3
⇒3 in Region 5
! Team conducted inventory of existing capabilities - hardware, software, time available for GIS activities, expertise

Why did we do it?

! To provide:
⇒integrated approach to ecosystem management and decision-making
⇒cross-programmatic decision-making tool for:
visualizing resource extents and patterns
integrating and analyzing multiple data sources
prioritizing ecosystem issues

What did we find?

! Summary of findings
⇒18 of the 31 offices (58%) have some GIS skills
⇒Range of levels:
13 offices have no GIS capability
15 offices have at least 1 individual with basic ArcView skills
3 offices have software packages beyond ArcView (ArcView extensions and ArcInfo)

Implication for GLBET

! FWS GIS infrastructure is not in place to directly support GLBET GIS effort

Recommendations for GLBET GIS

! Assess and prioritize GLBET needs
⇒what are the questions that need to be answered?
! Identify or establish single point of contact and direction for GLBET GIS/DSS (individual or office dedicated to GLBET GIS)
⇒contract?
⇒FWS hire?

How do we get there?

! Identify funding source
⇒expertise, training
⇒data
⇒hardware, software
! Conduct pilot project
⇒Great Lakes Islands demonstration
! Identify datasets that would best answer GLBET's questions
! Establish data collection, processing, distribution protocols

Commence database and application software construction and use

APPENDIX 9 – Minutes from USGS GIS Presentation at Marquette GLBET Meeting establishing GLBET GIS/DSS Core Group

Presentation of GIS Capability and Opportunities: Presentation - Carl Korschgen & Jason Reuters

Leslie Holland Bartels has elevated the need for Decision Support Systems (DSS). The Service's support is necessary in establishing such initiatives in order to get funding for DSS. UMESC needs to show that they are responsive to managers in the region. In the past, research has not been readily available to address current management problems. Federal and State partners are providing a legacy of scientific data and information. By inputting this data into a dynamic support system, the data can be used indefinitely and are easily accessible. The system does not make the decision but provides the right information at the right time. The DSS uses Arc View as the platform or electronic encyclopedia. On the Mississippi River, a DSS is used to make navigation decisions every day. A DSS advances a management problem from how do we get the data to how do we find a solution. DSS is beyond GIS. UMESC is working with three refuges on the Mississippi River to develop comprehensive conservation plans. The habitat needs assessments that these refuges are doing tie in very well with CCP's. The reason that the projects have been successful is that they have taken a biologist's point of view. If a technologist's point of view had been taken, the decision would have been made with a black box. In this way, the manager is in total charge of the decision-making process. There are several delivery mechanisms for information that make the DSS functional: (1) point and click; (2) visual integration and query; and (3) modeling using Arc Info or SAS. Arc View is the standard platform for DOI. The take-home message of the presentation is that the resource partners on the Upper Mississippi are communicating better than ever because of the DSS efforts. UMESC scientists are working with Upper Mississippi managers to provide 21st-century decision support and tools. DSS are the wave of the future, and managers need to get on board. The Upper Mississippi can serve as a model for other regions.

ArcView is a windows compliant point and click software. On the left-hand side of the screen is a theme list. A theme can be shown on the map by highlighting it. One example is the Lake Erie Spill Response. By hot-linking to pdf files of reports, the tool goes from GIS to DSS. Some of the information that can be retrieved includes hourly water temperatures, scaup densities, and hunter densities. The DSS displays coordinates of every location. Another DSS example is Valisneria occurrence in the Detroit River. It is also possible to overlay a photo on the map. The establishment of zebra mussels has also been incorporated into a DSS using data from Ohio State. Ottawa NWR has metadata panel for each of their themes; the metadata shows how the theme data was generated. Metadata is extremely useful, in part because it provides the information necessary to repeat a study at a later data. Other information that is available is Region 3 ortho photo; they are excellent references to geographically connect photos to topographic maps.

UMESC conducts a four-day Arc View course on data from the Upper Mississippi. The UMESC provided computers to primary partners so they had no excuse not to use the DSS. In order to get the computer, the partners had to take the training. The UMESC

serves 17,000 data files on the Center's homepage.

At Cat Island in Green Bay, forage areas were determined by following cormorants with an airplane. Results can be hot-linked to the associated publication. Other work in Green Bay involves Rob Elliot's lake sturgeon work. Eighteen sturgeons were tagged to show individual sturgeon movement and location. In this way, managers can determine how many of the sturgeons were located within certain depth strata, for example.

Programmers at the UMESC developed habitat use maps of certain groups such as birds. Habitat maps can be developed for any species for which there are data by associating occurrence or abundance data with habitat types. Results can easily be transferred from Arc View to Powerpoint for presentations. The same type of data is available for channel catfish in the Upper Mississippi NWR. Each data point has collection information associated with it.

Team Discussion: Course of Action regarding GIS DSS

UMESC could provide training for up to 24 people at a time, as long as computers are available. The training usually takes four days, but it could be less. As long as travel is paid and each individual has a computer, training for FWS employees would be at no cost. The training could be conducted either at the UMESC or elsewhere. A training session could also be held at the USGS - GLSC. Overall, the presentation was very informative; DSS has a variety of potential uses including invasives on refuges. Some states already have data available for gap analysis that can be inputted into DSS. It is unrealistic to have a support person at every refuge. How can DSS efforts be coordinated across the basin? The Great Lakes Commission is already gathering information for a geographically based system. Once the DSS package is developed, a support person isn't necessary. It's true that data in a DSS are immediately outdated, but the capability is better than nothing. Internet connections to this type of data will soon be available; however, currently it is primarily on CD's. Arc View will also be able to run off the web in the future. Previously, the ExCom suggested querying committees as to what type of analyses were needed. There are probably twenty themes are necessary to start an effective geospatial context. These twenty themes are currently available for the Great Lakes. The Great Lakes Commission has been pulling together geospatial data; this data may be the kind that is needed. Managers still need to determine what the basic data layers are needed for aquatic habitats. Where do team members want to go with DSS? Although we don't need to decide immediately, this is an extremely useful tool that we should embrace now, or we will be forced to later. One possible course of action would be to form a committee that develops recommendations for the entire team, to open up discussion with partners, and to consider costs. There is a DSS person in Ohio sponsored by the three pertinent Regions. This route may a possibility for the GLBE as well. It will be necessary to inventory the field station capabilities. There is some capability at the field stations currently. Perhaps, the first step is for team members to decide if a DSS is what they want. The team may need chew on it for a while and think about who could be the support person. We may need to choose a site with some DSS capabilities and get someone who spends 100% of their time on it. Also, we need to identify the time frame for implementation. It may be possible to support someone with kitty money.

Alternatively, Mary Mitchell could possibly be a partial-support person. The DSS priority of the GLBET should be raised at the Region 3 meeting in mid-October. We may need to look at all current sources of funding and get a portion of the funding from a variety of sources. One approach that may work is to have a group ten people or so meet and take a day of training. A core group to address DSS potential would be a good idea. Another viewpoint is that of the devil's advocate. There already are geospatial capabilities at many different organizations. Why should the Team have DSS capabilities? We still haven't identified any questions that need to be answered. Is it possible we already have what we need? A DSS may be useful for Island Committee. The committee first needed to find out about the islands before any action can be taken to purchase them. At the Horicon NWR, a DSS would be useful, but the Refuge doesn't have the manpower to support a DSS. The cormorant committee has a ton of questions to answer; we just need to figure out which ones are the most important to ask. The Lake Sturgeon Committee hasn't addressed the questions pertinent to DSS yet, but will at this meeting's breakout session. There will probably be uses for a DSS. It may be possible to apply data from the Ottawa NWR to the Shiawassee NWR, if the Shiawassee had the capabilities for DSS. The recommendation to form a core group will be pursued, and committees can identify priority questions. Even if a core group is formed, it doesn't necessarily mean that the team will pursue as DSS, but there does seem to be general support for the effort. One effective strategy is to identify the ideal way to address the issue, such as employing a full-time DSS person, and work from that point.

Action item: Group agreed to establish a DSS core group. Core group members:
Mary Mitchell (tentative)
Linda Schafer (tentative)
Nancy Milton
ELFO representative
Carl Korschgeon
Joe Dowhan
Rich Greenwood (chair)
Mike Fodale
The group was charged with the following action items:
- Follow the charge previously given to ExCom - Inventory existing capabilities
- Identify the resources needed: staff, equipment, training, funding etc. (at both the field station and team level)
- Query committee chairs as to questions that could be addressed with DSS at the committee level
- Describe optimum DSS for the GLBET - Link to R3 RRCP's
- Describe geographic scope to be addressed e.g., watershed, lakes, refuges, all of the above
- Meet within thirty days
- Report of DSS recommendations by next GLBET meeting

The core group will have conference call within 30 days and will report at the next GLBE meeting about progress on action items. This priority should be relayed to Center Directors and GARDS and put as priority for USGS in next few funding cycles.

1) Identify and summarize Great Lakes basin issues that can be addressed using geospatial technologies.

2) Inventory existing geospatial capabilities, including hardware, software, staff time, and expertise