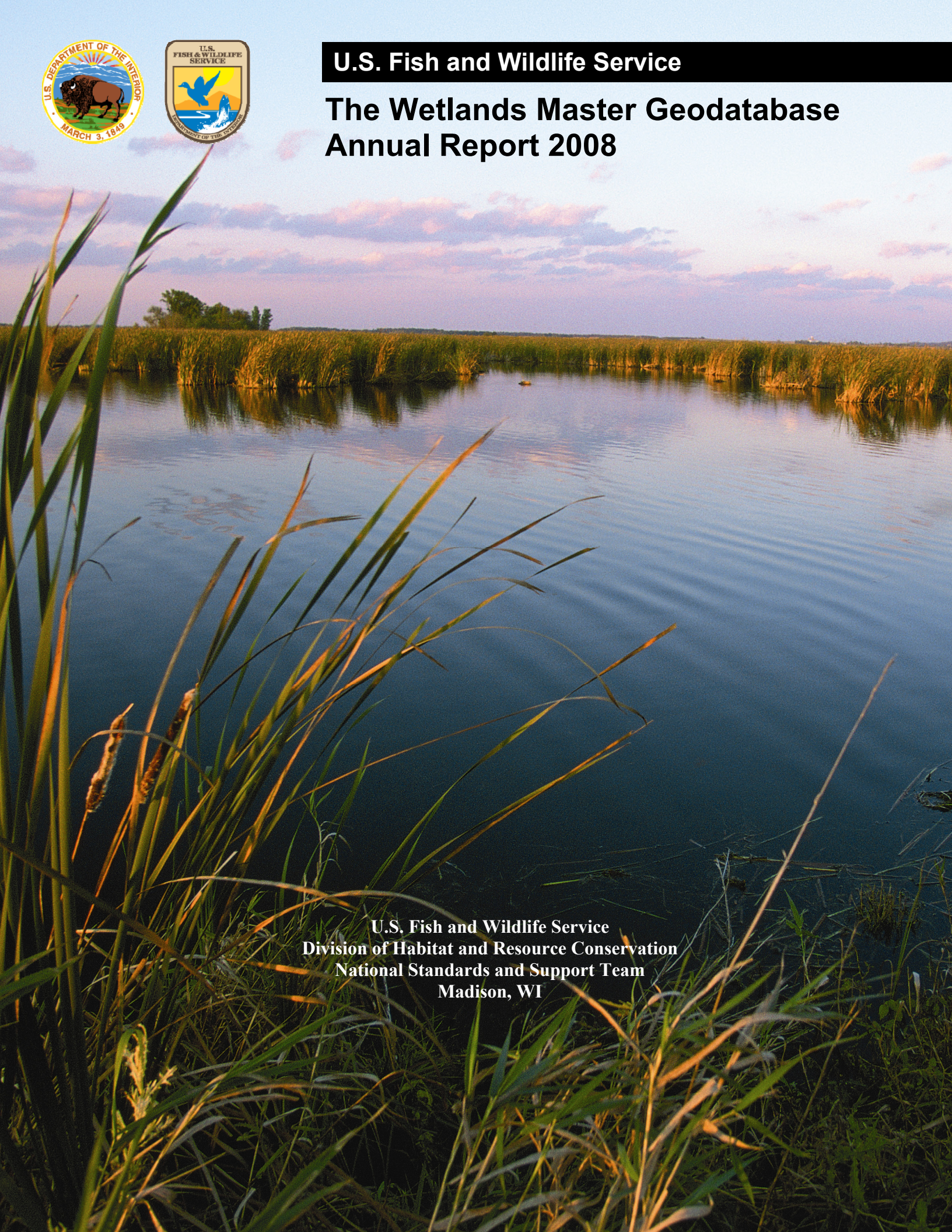

U.S. Fish and Wildlife Service

# The Wetlands Master Geodatabase Annual Report 2008

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# Annual Report 2008

## The Wetlands Master Geodatabase

Wetlands are some of the Nation's most ecologically and economically important habitats, and provide benefits for fish, wildlife, and people. Emerging conservation issues such as global warming, sea-level rise, increasing storm severity, drought, energy development, species declines, and expansion of infrastructure are driving the need for contemporary geospatial resource information.

The Fish and Wildlife Service (Service) is the principal Federal agency providing information to the public and other agencies on the extent and status of the Nation's wetlands. These types of analyses rely on digital information to provide fast, efficient and scientifically sound information for resolving resource management issues. The common structures, methods and formats used in geographic information system technologies greatly facilitate this process.

In response to these needs, the Service has modernized its geospatial services to meet demands for wetlands data. The Wetlands Geodatabase and the Wetlands Mapper, as an Internet discovery portal, provide technological tools that allow the integration of large relational databases with spatial information and map-like displays. The information is made available to an array of federal, state, tribal, and local governments and the public. The Service's wetlands data forms a layer of the National Spatial Data Infrastructure (NSDI) and is an important component of Department's geospatial line of business portfolio and actively supports the E-government initiative through the *Geospatial One-Stop* and *The National Map.*

## General Disclaimer

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# Geodatabase Characteristics and Status – 2008

The Service's Wetlands Geodatabase contains five units (map areas) that are populated with digital vector data and raster images. These units include the conterminous U.S., Alaska, Hawaii, Puerto Rico and the U.S. Virgin Islands, and the Pacific Trust Territories. Each unit of the geodatabase contains seamless digital map data in ArcSDE geodatabase format. Data are in a single standard projection (Albers Equal-Area Conic Projection), horizontal planar units in meters, horizontal planar datum is the North American Datum of 1983 (also called NAD83), and minimum coordinate precision of one centimeter. Links are available to supplemental wetland information and metadata records that are compliant with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata, Version 2.0. The Wetlands Geodatabase also contains other propriety Service datasets and developmental data, feature classes or information.

**On-line user requests for wetlands data exceeded 56.9 million during FY 2008.**

The Wetlands Geodatabase is one of the world's largest polygonal datasets (in the civilian sector). The information is increasingly popular and widely used to help identify, conserve, and restore wetland resources across the American landscape. During 2008, the number of website user requests for data exceeded 56.9 million. The Service continues to point large data users to the Web Map Service (WMS) capability. This option provides Federal and State agencies as well as large institutional users an opportunity to establish Open Geographic Consortium (OGC) linkages to ensure they are getting the latest and most complete digital data set. There were also 867 technical assistance requests in 2008.

**Geospatial Data Status - Wetlands:** In 2008, data covering 66.2 million acres were added to the Wetlands Geodatabase. These included 28.1 million acres of updated wetland map information, new data for 6.8 million acres not previously available and 31.3 million acres of data that were captured in digital format. An additional 8,245 hard copy maps (quadrangles) were added as raster image files.

Currently the Wetlands Geodatabase contains over 34,500 7.5 minute map areas in a seamless ArcSDE geodatabase format. This represents wetland map data for approximately 64 percent of the conterminous U.S., 30 percent of Alaska, 100 percent of the windward islands of Hawaii, 77 percent of Puerto Rico and the U.S. Virgin Islands and, 100 percent of Guam and Saipan in the Pacific Trust Territories. By the end of 2008 the Wetlands Geodatabase contained 67 gigabytes of data including 14.9 million polygonal features. The current status of on-line wetlands data is shown in the Figure 1.

Web accessible geospatial wetlands data can be found at: http://www.fws.gov/wetlands/
Additional web accessible Geodatabase documentation and information can be found in the Appendix on page 11.

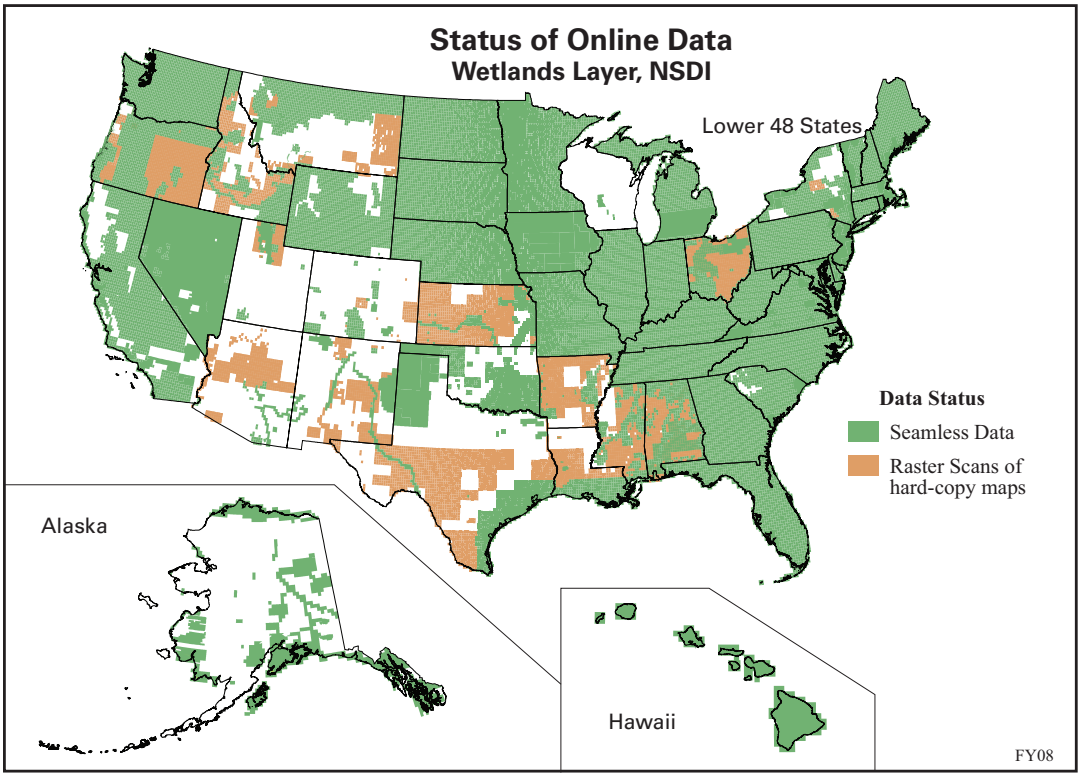



**Figure 1. Status of the geospatial wetlands data available on the Service's website as of 2008.**

The wetlands data layer is increasing in size each year primarily due to existing analog data being converted to vector or raster images. Contributed data from other Federal, State and local organizations is also increasing. More and newer data will need to come from other sources in the future to achieve the goals of producing a complete data layer for the Nation and keeping it current.

Raster images of wetland map data are also being served on the Wetlands Mapper. These images are scans of the original wetlands maps produced in hard copy by the Service with the topographic map as a backdrop (Figure 2). These scanned PDF files are served as raster images and can be accessed from the Wetlands Mapper site as an interim product until data can be captured in vector format. In 2008, the number of raster scan images available to the public has more than tripled and continues to increase as a result of cooperative funding provided by the U.S. Geological Survey (USGS) and the Environmental Protection Agency. On-line data available (both vector and raster images) provide wetland map information for 78 percent of the lower 48 states, a 20 percent increase over the previous year.

**Web accessible data provide wetland map information for 78 percent of the lower 48 states.**

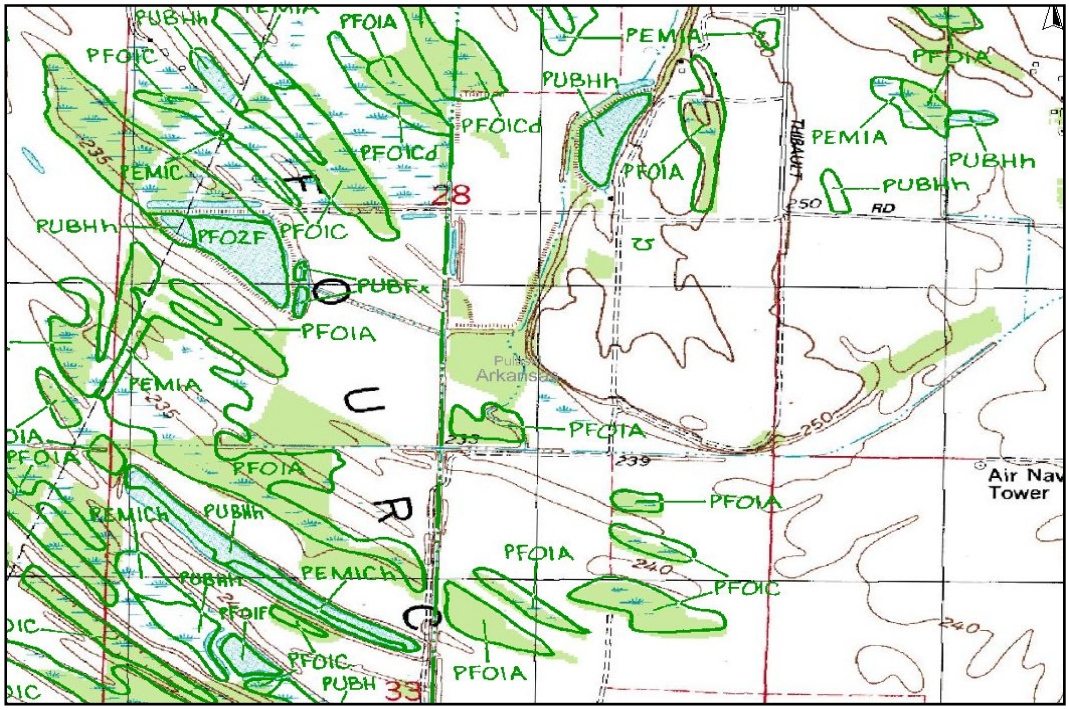


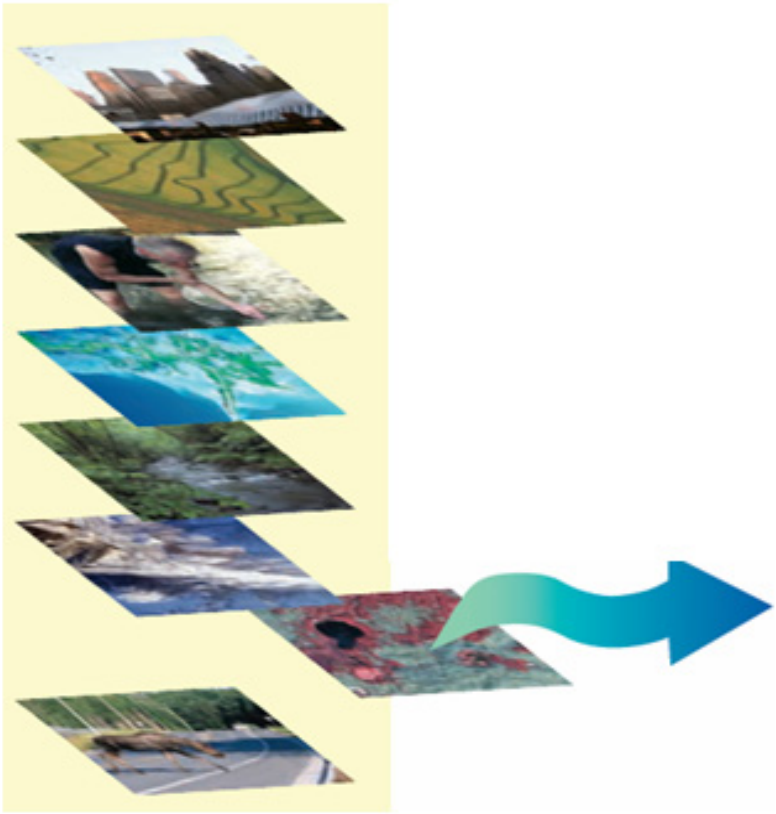

**Figure 2. Hard copy wetland map information is scanned and georeferenced to the corresponding Digital Raster Graphic (DRG). These data are served on-line as interim product raster images.**

# Wetlands Layer of the National Spatial Data Infrastructure (NSDI)

The National Spatial Data Infrastructure is a way of enhancing the accessibility, communication, and use of geospatial data to support a wide variety of decisions at all levels of society. The Office of Management and Budget (OMB) Circular A-16 enumerates 34 data themes of national significance and assigns responsibility for each of the themes to one or more Federal agencies. The OMB Circular assigns lead responsibility for coordinating the national coverage and stewardship of the wetlands data theme to the U.S. Department of Interior (DOI), Fish and Wildlife Service. The Service provides stewardship for the wetlands data that comprise the ***Wetlands Layer of the NSDI***.

A number of factors contribute to the development of a strategy to complete a national geospatial data layer as large and complex as for wetlands. A consistent means to share geographic data among all users could produce significant savings for data collection and use and enhance decision making. Much has been accomplished in recent years to further the implementation of the wetlands geospatial data layer into the NSDI, but there is still much to be done to achieve the vision of current data being readily available for the entire country.

There are two areas of focus needed to meet the FGDC requirements for the wetlands layer: 1) complete the wetlands mapping for the country and disseminate the information to users and; 2) explore ways to keep the national wetlands database populated with current data. These objectives must be accomplished within the realities of human and financial resources and any constraints thereon.



**Characteristics of the Wetlands Data Layer:**

- National in scope
- Contemporary – technology/content
- Metadata compliant (FGDC)
- Easily expanded and updated
- Consistent, standardized format
- Temporal versions - historic data
- Integrate related geospatial data themes

# Maintaining Strong Technical Partnerships

The Service has developed and maintains a close working relationship with the U.S. Geological Survey's (USGS) Office of Water Information. Through this partnership the USGS assists the Service with emerging technologies, geographic information science, database management and support. USGS continues to assist the Service with integrating updated information into the database, providing data summaries for special projects and technical assistance regarding data manipulation and verification.

**Memorandum of Understanding with USGS - *The National Map*** is a seamless, continuously maintained set of geographic base information that will serve as a foundation for integrating, sharing and using other data. Through partnerships, USGS is incorporating important information layers. The wetlands map data have been incorporated into *The National Map* http://nationalmap.gov/ as a catalog layer (Hydrography). The Service's Division of Habitat and Resource Conservation signed a

Memorandum of Understanding with the Geospatial Office of USGS - *The National Map*. Although there has been a long standing working relationship with USGS and *The National Map*, this document recognizes important ongoing work and establishes a framework for continuing cooperative efforts.

The Service also continues to work closely with other Federal partners including the Environmental Protection Agency, National Oceanic and Atmospheric Administration and the Army Corps of Engineers to incorporate, share and promote the appropriate use of the wetlands geospatial information.

# New Developments and Technologies

**Google Earth -** A Keyhole Markup Language (KML) file has been created to view the wetlands data in conjunction with Google Earth imagery (Figure 3). Google Earth provides imagery of the surface of the Earth by superimposing images from satellites and aerial photography. Most land areas, except for islands, are shown using satellite imagery with a resolution of about 15 meters per pixel or better. In this application, Google Earth imagery can be used as a backdrop for viewing the wetlands digital data.

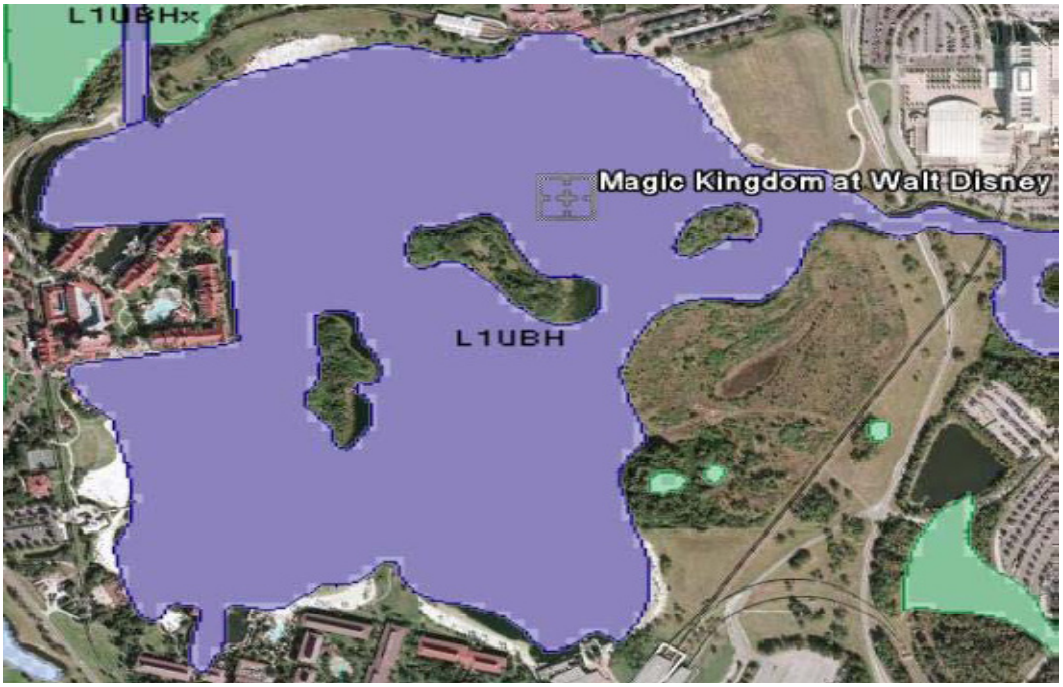
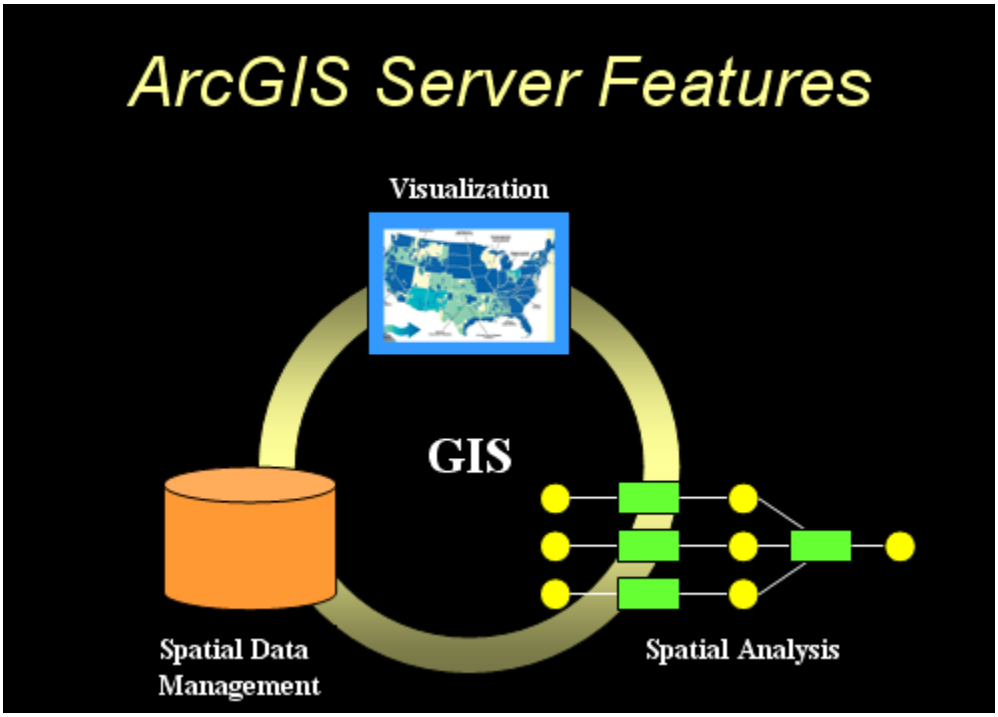



**Figure 3. Wetland digital data displays with Google Earth imagery as a backdrop using the KML provided to users on the Wetlands Mapper Website in 2008.**

**ArcGIS Server Implementation -** In 2008, the Service acquired ArcGIS Server with the intention of working toward enhancing the spatial analysis capabilities delivered to high end users.



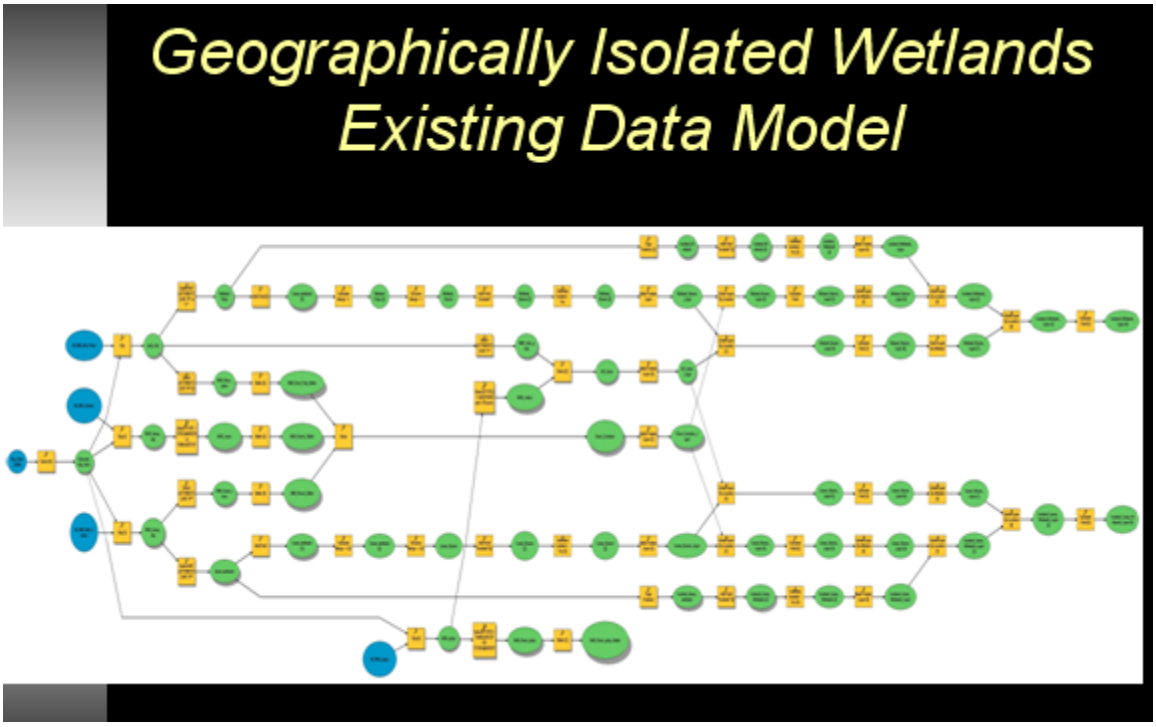

There is increasing demand for geoprocessing tools that will provide advanced users with additional ecological or geospatial information on a watershed or regional level. Tools that address common user needs can be developed and made available through ArcGIS Server.

Spatial analysis tools can be split into two general categories that are quite different: Geoprocessing of data including data conversion routines, Quality assurance routines and geodatabase tracking and counting of features like number of lakes in a state or watershed. These tools are primarily intended for in-house use and are not distributed to the public. Geoprocessing tool examples include translation of data from one wetland mapping system to the standardized geodatabase system to become part of the NSDI Data Layer.

Geospatial analysis tools are ecologically oriented. Some may approach predictive modeling while others are more simplistic and can address analysis questions such as separating freshwater from saltwater habitats. The Service is researching some Geospatial Analysis Tools to assist users with analysis or data applications. These are being developed by the National Standards and Support Team (Madison, WI) to ensure appropriate use and recognition of the data and their limitations.

One of the applications developed using ESRI's Model Builder will help identify geographically isolated wetlands. There are a number of geoprocessing steps involved,

including integration of ancillary data sets to help determine what wetlands may be geographically "isolated" and subject to different regulatory rules.




# Summary

The Service, in cooperation with partner organizations, continues to improve and expand contemporary spatial data management, analysis and delivery capabilities. The Service has the lead in development and stewardship of the wetlands geospatial information that forms the Wetlands Data Layer of the NSDI. That data layer continues to expand over time as 78 percent of the conterminous U.S. is now web accessible either in vector or raster image format.

There continues to be competing demands to improve data availability, quality and modernization as well as provide development and deployment of more advanced applications and data visualization methods.

The Wetlands Mapper provides a web accessible data discovery mechanism for the wetlands data to a wide range of users and applications. User requests exceeded 56.9 million in 2008. Implementation of ArcGIS Server technology will help address increasing need for geospatial analysis capabilities as the Service continues to provide state of the art geospatial tools to perform varied geospatial analyses and habitat assessments.

# Appendix: Web Accessible Wetland Geodatabase Documentation and Information:

**Wetlands Layer of the National Spatial Data Infrastructure: A Phased Approach to Completion and Modernization** http://www.fws.gov/wetlands/ The Service has prepared a nationwide data theme population plan to provide information on the development, content and availability of the wetlands data layer.

**National Standards and Quality Components for Wetlands, Deepwater and Related Habitat Mapping** http://www.fws.gov/stand/standards/dl_wetlands.html This document presents the revised mapping and data automation standards as well as the protocols for map data collection and dissemination. This will serve as an operations tool but also help fulfill requirements for updated information quality information.

**Addressing Information Quality Guidelines, U.S. Fish and Wildlife Service, Wetlands Master Geodatabase** http://www.fws.gov/wetlands/Data/Supplemental.html This report meets the requirements of Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Public Law 106-554) for Federal agencies to publish Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by a Federal agency, and to provide administrative mechanisms allowing the public to seek and obtain correction of information maintained and disseminated by the agency.

**Wetlands Master Geodatabase - Wetland Resource Attribution and Verification Tools Version 2.5.1** http://www.fws.gov/wetlands/Data/Tools.html These are customized attribution and verification tools for resource mapping using geodatabases in ArcMAP and have been developed in a cooperative effort between the U.S. Fish and Wildlife Service and the U.S. Geological Survey. The tools, installation instructions, user information and technical help are available for download at:

**Fact Sheet - Wetlands Master Geodatabase**
http://www.fws.gov/wetlands/Data/Supplemental.html Fish and Wildlife Service fact sheet that describes the Wetlands Geodatabase purpose and characteristics.

**Fact Sheet - Digital Wetlands Data - *Interagency Cooperation***
http://www.fws.gov/wetlands/Data/Supplemental.html Joint Fish and Wildlife Service and USGS fact sheet on managing and web serving digital wetlands data.

**Fact Sheet - Viewing Wetlands Data with Google Earth**
http://www.fws.gov/wetlands/Data/Supplemental.html Fish and Wildlife Service fact sheet describing the process to navigate and launch views of the wetland data in conjunction with Google Earth imagery.

U.S. Department of the Interior
Fish and Wildlife Service

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