Automated Information System and Data Project Charter
Wetlands Master Geodatabase (April, 2003)

Purpose: The purpose of this document is to provide a project charter in compliance with Federal Information Resources Management Regulations.

Project Name: Wetlands Master Geodatabase

System Owner: Dr. Benjamin Tuggle, Chief, Division of Federal Program Activities, U.S. Fish and Wildlife Service, Arlington, VA

Mr. John Cooper, Chief, Branch of Habitat Assessment (or designated Geodatabase Manager).

System Manger: Geodatabase Manager

Acceptance Team Members: Benjamin Tuggle, Project Officer, FWS
Thomas Dahl, Technical Project Manager, FWS
Greg Allord, Project Officer, USGS

Project Description and Objectives:

Background: The only agency of the United States Government whose primary responsibility is conservation, the U. S. Fish and Wildlife Service has as its mission conserving, protecting, and enhancing fish, wildlife, plants, and their habitats for the continuing benefit of the American people. In the mid 1970s, the Service established the National Wetlands Inventory to develop an provide resource managers with information on the location, extent and types of wetland and deepwater habitats. The principal focus was to produce **topical wetland maps that were graphic representations of the type, size and location of all surface waters in the United States (wetlands and deepwater habitats)**. Today, however, the Service faces difficult natural resource management challenges that did not exist when the inventory was created. A new strategy has been developed to increase the availability and application of digital map information for natural resources planning and management in support of the Service's conservation programs. **The present goal of the National Wetlands Inventory is to provide the citizens of the United States and its Trust Territories with current geospatially referenced information on the status, extent, characteristics and functions of wetlands, riparian, deepwater and related aquatic habitats in priority areas to promote the understanding and conservation of these resources.**

The *Emergency Wetlands Resources Act of 1986* directs the Service to map our Nation□s wetlands and produce scientific information on their characteristics. The Service has completed digital wetlands maps for 42 percent of the Nation. The Service

will continue to refine Internet delivery of updated digital map data to keep pace with growing demand for wetlands information and support the Administrations Electronic Government initiatives to achieve operational efficiencies and enhance customer service.

Concept Development and Needs of the Service: The National Strategy that has been developed by the Service for the National Wetlands Inventory was designed to increase the availability and application of digital information for natural resource planning and management in support of the Service's conservation programs. It outlines three program goals including the strategic mapping of wetlands and aquatic habitats, completion of wetland trend analyses and assessments, and identifying and assessing threats to aquatic habitats that may be at risk.

In relation to the first goal, the challenge is to strategically update digital wetlands information and make these data available to natural resource decision makers. The Service will need to expand and improve the availability of digital wetlands data to accomplish this goal. The Service's wetlands mapping and map updating efforts will be made easier by implementing the Wetlands Master Geodatabase (MGD) model.

There also needs to be a concerted effort to analyze and assess wetlands and other aquatic habitat data at the watershed, ecosystem and national levels. The Strategy indicates these assessments should ***1) provide scientifically based applications for wetlands and water resource data already available from various resource agencies and 2) expand the capability of the Inventory to integrate digital map data with other resource information to produce timely and relevant management and decision support tools.*** The development of the MGD is in direct response to the need to upgrade digital information and improve data access and enhance analytical capability. The MGD will provide a seamless layer of digital data in geodatabase format, link Service databases and provide technologically advanced mechanisms to edit, store, distribute and archive resource inventory data.

The concept for a comprehensive Wetlands Master Geodatabase (MGD) stems from past successes in producing and distributing wetlands maps and wetlands status and trends information. With the advent of computer technologies that now allow the integration of large relational databases with spatial information and display, the Master Geodatabase provides the Service an opportunity to capitalize on years of data collection effort by developing scientifically sound, technologically relevant tools for data analysis, distribution, archiving and updating aquatic resource information.

Security Considerations: Under the definitions of the Departmental and Service Information Quality Guidelines, Data Integrity refers to the security of information - protection of the information from unauthorized access or revision, to ensure that the information is not

compromised through corruption or falsification. The wetlands MGD resides on a server which is only accessible by Service and authorized USGS personnel involved in the development and testing of system operations. The MGD Security Plan addresses standard firewall and computer security measures taken to ensure that data integrity are not compromised. To this end, the MGD Manager plays a key role in overseeing data input, conducting final data verification, granting permission for data access, maintaining data logs and status and coordinating with the appropriate system manager(s) and IT personnel.

Dissemination of the information contained with the MGD must be tempered by the need for information sensitivity. For this reason, the Service may host or support ancillary data layers used for assessment and analysis, without serving those data to the public. The primary concern is for information on private lands and private property rights. Every effort will be made to protect the anonymity of land owners or the location of certain sensitive property landmarks or features.

Known Constraints: The system is dependent on ESRI software compatible digital data files.

Equipment Currently Used: Data collection and analysis is done via traditional mirror stereo scopes with registration to USGS 1:24,000 scale base maps done by zoom transfer scopes; digital transfer scopes; or P-3 stereo plotters. Data capture is done by scanning or board digitizing. Data storage and geo-processing is done on Unix work stations supported by Unix System Server(s), various unknown PCs and recently acquired Dell Precision Mini Towers.

Software Used: NWI has a long history of using various software for digital data capture and attributing. Web available digital wetland map data utilized WAMS, DLG-3, and Arc-Info 3.1;3.2 for data display and analysis.

Deficiencies and Limitations of the Current System: Technical deficiencies in the existing digital data include: Earth coordinates are NAD ‘27; digital artifacts result from conversion of older software systems to Arc; alignment and offset feature errors have resulted from the manual zoom transfer process; older digital software was not case sensitive for attribute coding. The current system does not allow rapid update and attribution of wetland map data at reasonable cost. There is no versioning system currently in use and map updates are not being fully implemented. Wetland data is static and does not support temporal comparison. The current FTP server is not optimum technology and creates potential data security concerns. At the present time, the data suffers from lack of standardization and integration into a transactional database. The current system uses quad based storage and distribution, a proprietary data format and insufficient metadata documentation.

Deficiencies in the “Wetlands Mapper” include: It provides difficult or incomplete web service and public interface, the reliability in merely accessing the site needs to be greatly improved, there are no mapper data specific metadata provided, the site provides more than one entry source - which is a problem, there are different versions of the mapper data without explanations for the different versions.

Proposed System Functional Requirements: There are two important yet distinct purposes for

the creation of the Wetlands Master Geodatabase. The first is to improve the editing, storage and distribution capability of the wetlands digital data. The second objective is to greatly enhance the Service's capability to use ancillary GIS data sets and integrate digital map data with other resource information to produce timely and relevant management and decision support tools.

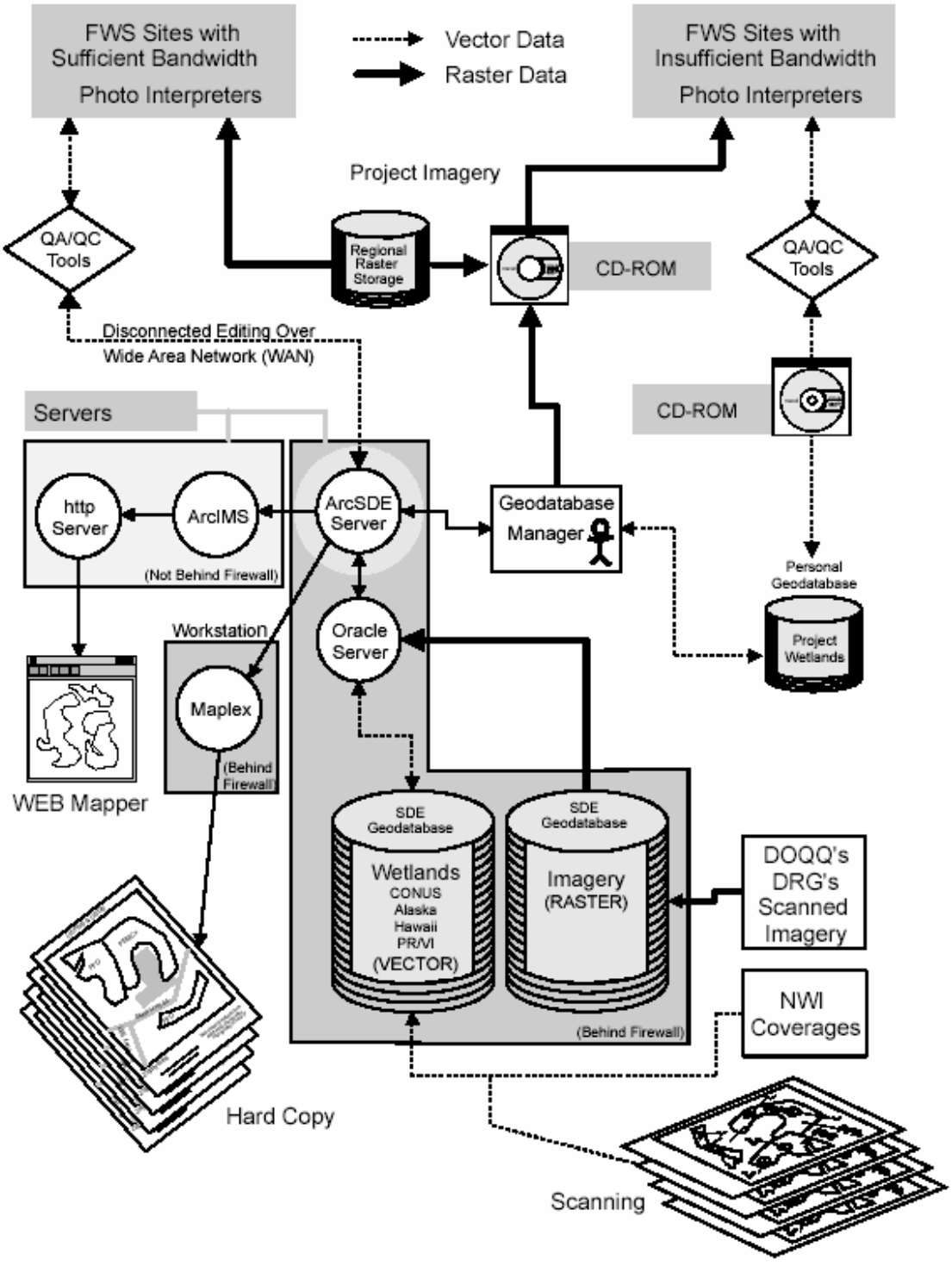
There are no fewer than 14 design steps built into the MGD planning and architecture. The MGD will provide a standardized map update process; the creation of a wetlands relational database with temporal version capability; the incorporation of non-digital data and; a true seamless data storage and retrieval system. By implementing modern database technology, the MGD permits client-server database access with greatly improved interface to the Service users as well as the public. These improved capabilities coupled with enhanced access help the Service realize the objectives of providing scientifically based applications for wetlands and water resource data.

The development of the MGD involves the conversion of existing digital map coverages to a seamless SDE Geodatabase stored on Oracle 9i RDBMS. This database would allow remote access and editing of the data by the Regional Wetland Coordinators in all Service Regions, cooperators and contractors that are granted permissions. The data will include multiple feature classes, including wetlands, uplands and riparian. The mapped features will contain wetland attributes and have related tables that include various supplemental information pertaining to who, where and when the data were updated. The data will be divided into five geographic Wetland Mapping Areas (the conterminous United States, Alaska. Hawaii, Puerto Rico and the U.S. Virgin Islands, and the Pacific Trust Territories) to improve data storage and access (see figure below).

Additional functional descriptions are provided in the following MGD technical documentation:

- Wetlands Master Geodatabase Data Model, Tables and Schema (Conus and Alaska)
- Wetlands Master Geodatabase Project Scoping
- MGD Hardware and Software Plan
- Critical Questions for Wetlands MGD Development
- Organization and Plan for Ancillary Datasets (MGD**)**

Technical Data Flow Model for the Wetlands Master Geodatabase (April, 2003)



Hardware and Software*:*

Hardware for Arc SDE/ IMS servers: The MGD requires two workstations as servers, one for an Arc SDE/Oracle server and the other for an Arc IMS server. Both systems may be the same configuration/specification and are designed for two years of service. The configuration of hardware is as follows:

> Dell PowerEdge 2500 server, Dual Pentium III processors running at 2.0 Ghz
> 2 GB of RAM, 6 SCSI hard drives with redundant power supply
> Monitor for each workstation, CD burner, DVD burner.

The hard drive needs an expandable system of a minimum of 80 gig. Geodatabases are very efficient with regard to storage space of vector data and take a much less room than their Shapefile or Coverage counterparts. The potential exists for requiring several 100 gig systems depending on the types of data being served through the MGD.

Backup Systems: A separate tape backup system should be acquired exclusively for this dataset. Once a MGD dataset is operational, it may go for extended periods of time between updates. These interim or static datasets could be archived rather than periodically backed up.

Desktop Work Stations: The customized Attribution and Verification Tools are extensions to Environmental Systems Research, Incorporated's (ESRI) ArcMap desktop geographic information system (GIS) product. To run these tools, any workstation must be capable of running the ArcGIS suite, including Arc Desktop and Arc Workstation. ESRI has published system requirements for ArcGIS on their web site: www.esri.com. The following minimum hardware requirements are necessary:

- CPU with a clock speed of 2 gigahertz or faster
- 1 gigabyte of physical RAM
- AGP video card with 64 megabytes of video memory
- 10/100-base-T network adapter
- SCSI or ATA100 IDE hard drive
- 1024 x 768 resolution monitor

Software Requirements: At the heart of the Wetlands Master Geodatabase is Geographic Information Systems (GIS) software. The project focus is the storage, manipulation, and distribution of large amounts of geographic data by geographically dispersed project personnel. The computer and computer network infrastructure must meet the project requirements. Commercially available, off-the-shelf GIS and RDBMS software applications meet a large portion of the requirements for spatial data base management and spatial analysis. Additional functionality required for specific wetlands mapping tasks have been met by writing custom software using commercially available, off-the-shelf programming languages and tools.

Operating System: Microsoft Windows 2000 Server operating system optimized for

running Oracle and ArcSDE, Microsoft Windows 2000 desktop or Windows XP.

Geographic Information Systems (GIS) Requirements:

- View wetlands data.
- View ancillary geographic data in spatial registration with wetlands data.
- Manipulate symbology used to display wetlands, uplands and riparian data.
- Manipulate symbology used to display ancillary data.
- Manipulate both core data and ancillary geographic data as layers.
- Modify the location of wetlands, uplands and riparian parcels.
- Modify the shape of wetlands, uplands and riparian parcels.
- Delete wetlands, uplands and riparian parcels.
- Add wetlands, uplands and riparian parcels.
- Allow or disallow modification of wetlands, uplands and riparian parcels based on user name or status.
- Modify attributes of wetlands, uplands and riparian parcels.
- Add attributes to wetlands, uplands and riparian parcels.
- Delete attributes of wetlands, uplands and riparian parcels.
- Link attributes of wetlands parcels to tables containing other attributes.

GIS Software: ArcGIS 8.3 or later. The MGD uses customized tools that were developed using ArcGIS version 8.2 and tested using ArcGIS version 8.3.

Relational Database Management System (RDBMS) Requirements:

- Support both Local Area Network (LAN) and Wide Area Network (WAN).
- Support Client-Server database operations.
- Store geographic data in format accessible by GIS software.
- Support multiple users.
- Enforce security of data base objects at user level.
- Support linking of tables.
- Support reporting of data stored in tables.

Relational Database Management System (RDBMS): Oracle 9.i

Programming Languages and Tools Requirements:

- Support low-level, applications programming interface (API) access to wetlands, uplands and riparian parcels.
- Support low-level, applications programming interface (API) access to wetlands, uplands and riparian attributes.

Cartographic Software for Hard Copy Map Output: Maplex

Training Requirements*:* Arc GIS; Arc 8.x; Arc Map is strongly recommended**,** ORACLE

database management training recommended, ArcSDE training strongly recommended.

Operations and Maintenance Estimates*:* Operations and maintenance estimates for the update work will require acquisition of Arc upgrades and service packages as well as upgrades and service packages for Windows 2000. Improved video cards and high resolution graphics monitors would be optional. Further operations and maintenance costs may be associated with data storage, archive and dissemination.

Advantages and Disadvantages*:* There are numerous advantages provided by the MGD. Some of these include:

- Streamline data distribution.
- Streamline data update process and review
- Creation of a Wetlands relational database.
- Creation of a transactional database.
- Creation of a versioned database.
- Standardization of update process including metadata.
- Standardization of delineation and attribution protocols.
- Incorporates modern database technology.
- Seamless data storage and retrieval.
- Simplify access, use and analysis of data by the layperson.
- Client-server database access.
- Storage of data in a collection of RDBMS tables.
- Allow for the incorporation of non-digital data.
- Improve web interface to public.

Some of the disadvantages observed to date include the following:

- Requires Service staff to be GIS literate
- Deals with electronic media (preparation, storage, distribution and archiving is different)
- IT security procedures differ between Service Regions.

Documentation Requirements: A technical MGD Data Model and Entity Relationship Diagram have been generated for the Conus and Alaska portions of the MGD. These data models breakdown the components of the dataset and establish the relationships of each component. This was done based on user needs assessments as defined by the Service in structuring the overall MGD architecture. These and other technical documentation for the MGD are included in a series "Technical Documentation Reports" generated as part of this plan. Topics covered by these reports or documents include the following:

- Wetlands Master Geodatabase Data Model, Tables and Schema (Conus and Alaska)

- Technical Entity Relationship Diagram (Conus and Alaska)

- Wetlands Master Geodatabase Project Scoping
- Technical Data Flow Model for the MGD
- MGD Hardware and Software Plan
- Critical Questions for Wetlands MGD Development
- Organization and Plan for Ancillary Datasets (MGD)
- Plan for Web design and Public Interface of the MGD
- Wetlands Master Geodatabase Security Plan
- Automated Information and Data Project Charter
- Addressing Information Quality Guidelines: Wetlands Master Geodatabase

Schedule and Plans for Implementation: As part of an Interagency Agreement with USGS, the Service funded a task in late summer 2002 that was entitled "Enabling Tasks for Wetlands Geodatabase Configuration". Work that was undertaken had two major elements: (1) Develop the architecture for the Master Geodatabase (MGD) for wetlands data and (2) conduct coordination and peer review to further develop a technically sound implementation plan. The time line below provides a summary of some major tasks, products and interactions that have been developed and identifies upcoming milestones.

July, 2002	Non-spatial data tied to polygons categorized for links within the MGD.
	MGD ancillary data layer strategy developed.
August, 2002	Hardware and software requirements, outlining spatial specifics of the MGD, developing draft database schema and work on user interface, accessing data, and analytical interface(s) were addressed.
	MGD parameters drafted.
	MGD Software requirements drafted.
	Workstation and MGD hardware configuration drafted.
September, 2002	Development and testing of the Verification Tool(s) version 2.0 for use in updating and verifying wetland maps.

	Coordination and peer review was underway and involved participation at various levels of technical expertise.
October, 2002	The technical and architectural design for the Master Geodatabase (MGD) for wetlands data was developed.
	Training provided to Service personnel on use of the Verification Tool(s) version 2.0.
	Draft documents and development schemes were developed in coordination with USGS. Issues of data quality, database design and administration, data storage and web serving, client-server interactions, map output, meta data tracking, security and compliance with data standards were being studied.
	Teleconference calls with the Arc/GIS development team at Environmental Science and Research, Inc. (ESRI) regarding the Master Geodatabase for Wetlands Project.
	ESRI agrees to peer review the products and dubbed the effort a "Development Project". This enables the Service and USGS to have access to core development staff at ESRI. ESRI also agrees to provide review of geodatabase design and processes, use of advanced software functionality not yet released, technical feedback and interaction.
November, 2002	Meeting with ESRI in Redlands, CA to discuss MGD project.
	Project scoping document drafted.
	Oracle database license acquired by USGS.
	ArcSDE software evaluation copy provided by ESRI.
	Software and hardware configured and installed to serve wetlands data.
December, 2002	Critical questions developed to help structure MGD.
	New MGD Data Model and Entity Relationship developed.
January, 2003	NWI revised dataset (Ft. Collins version) received.

	MGD Data Flow Model developed.
	MGD for Alaska initiated.
February, 2003	Ancillary data content and structure for AK
	Service Management Plan for MGD implementation developed.
March, 2003	Complete MGD work for AK.
	Training for Service personnel on the Verification Tool(s) version 2.0.
	Begin work on standards and conventions document.
April, 2003	Implement and test client-server database access.
	Integrate non-digital data into MGD.
	Develop MGD demonstration for MN, SD, AK.
	Work on ancillary data MGD Conus.
	Develop strategies for MGD database management.
May, 2003	Alaska prototype MGD scheme and personal geodatabase available to Region 7 in preparation for field work.
June, 2003	Operational version of the MGD ready with seamless digital wetland data where it is available for the lower 48 states. Verify and correct old code problems using Verification program tools. No action on meta data to this point.
July, 2003	Start Development of improved web interface.

August, 2003	Benchmark testing of the operational MGD and disconnected editing functions. MGD deployment.
September, 2003	Finalize MGD - Computer Systems Security Plan MGD public web interface operational internally and running concurrent with the existing Wetlands Mapper.
October 30, 2003	Sunset date for the existing Wetlands Mapper.
FY 2004	Selection and training of Service's MGD Database Manager, technical training for Regions.

IRM Review: