



United States
Department of
Agriculture

USDA Geodata Business Plan

Abstract: This document provides a business plan for achieving the vision of shared geodata for USDA and the public. The plan makes recommendations that will enable USDA agencies to partner to achieve increased efficiency and acquire additional resources for the discovery, acquisition, integration, maintenance, archive and delivery of USDA geodata.

Keywords: USDA, geodata, geospatial, GIS, NSDI, data warehouse

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CONTENTS

EXECUTIVE SUMMARY	4
1. INTRODUCTION.....	8
2. ACRONYMS	8
3. BACKGROUND.....	9
4. OBJECTIVE.....	10
5. STRATEGY TOWARD THE VISION	10
5.1. TODAY’S GEOSPATIAL DATA DISSEMINATION ACTIVITIES	12
5.2. NEAR-TERM GEOSPATIAL DATA DISSEMINATION FRAMEWORK	14
5.3. LONG-TERM GEOSPATIAL DATA DISSEMINATION FRAMEWORK	15
6. BUSINESS REQUIREMENTS.....	16
7. DATA REQUIREMENTS.....	18
7.1. DATA THEMES.....	18
7.2. CURRENT FUNDING	18
7.3. REQUIRED FUNDING	18
8. PARTNERSHIPS	19
8.1. THE FEDERAL GEOGRAPHIC DATA COMMITTEE.....	19
8.2. KEY FEDERAL AGENCY PARTNERS.....	20
8.3. KEY STATE AND LOCAL PARTNERS	24
8.4. KEY INDUSTRY PARTNERS	27
8.5. PRIVATE SECTOR.....	27
9. TRAINING, OUTREACH, AND SUPPORT SERVICES.....	28
9.1. COOPERATIVE EXTENSION SERVICE.....	28
9.2. OTHER OUTREACH AND SUPPORT SERVICES	29
10. INFORMATION TECHNOLOGY INFRASTRUCTURE	29
11. CONCLUSION.....	29

Executive Summary

The United States Department of Agriculture is one of the largest and most diverse Departments of the government. With over 100,000 employees and a wide range of programs the Department generates and requires significant amounts of data to support its varied missions.

Over the years, USDA has adopted technology tools to facilitate program development and delivery. Several key technology tools have had tremendous impact on the Department and, more importantly, have the potential to increase cooperation and efficiency among USDA agencies if managed in a uniform and collaborative manner. One of these key technology tools is geographic information systems (GIS). To be successful, GIS requires the integration of appropriate software, hardware, knowledgeable program staff, and data.

USDA has played a significant role in geospatial information science for almost twenty years. From the early Federal-wide data coordination efforts to the evolution of Presidential Executive Orders (E.O. 12906), USDA has been involved in the development of GIS policy, data, software, and standards. USDA agencies have a long history of partnerships for geodata. These include the National Aerial Photography Program, Digital Orthophotography Program and the National Cooperative Soil Survey.

USDA agencies charged with spatial data development and land management missions were early adopters of GIS technology. The U.S. Forest Service and the Natural Resources Conservation Service saw GIS as a means to automate manually intensive mapping operations. They also saw that merging data from a variety of sources improved the quality of information needed to make critical resource decisions. National Agricultural Statistics Service, the Farm Service Agency and Foreign Agricultural Service saw GIS as a Major tool in their remotes sensing programs for crop monitoring. A considerable body of research on applications of GIS and remote sensing has been accomplished at land grant colleges and universities through their partnership with the Cooperative State Research, Education, and Extension Service (CSREES). Furthermore, a recent agreement between NASA and CSREES has established a pilot program of extension specialists at land grant institutions to consider applications of GIS and remote sensing applications in agriculture.

GIS use within USDA is becoming widespread, and the need for timely, high quality data that meets specific, recognized standards is increasing. Data gaps and data duplication are becoming more apparent. However, data needs remain specific to each agency, and vary according to an agency's program mission, customer base, and data intent.

Sixty to eighty percent of the cost to implement GIS technology is in the development and maintenance of datasets. The remainder of the cost is in

hardware and software acquisition, application development, and geodata analysis training. The Department and its customers will reap the benefits many times over if USDA agencies can identify core datasets that support the majority of the program needs and cooperatively acquire or develop, integrate, archive and deliver these datasets in defined standards and formats.

The purpose of this plan is to provide strategies to achieve a common geodata vision for coordinated discovery, acquisition, integration, maintenance, long-term archiving, and delivery of geodata and information. To be successful, each agency must fully adopt the concept of a USDA-wide cooperative partnership and maintain a cooperative environment.

This plan documents the need for coordination, communication, and cooperation at all levels within individual agencies and in the Department. For this plan to be successful, agencies will need additional resources. The plan does not provide details for implementation. Much work needs to be done in this area, and agencies need to work together to identify common data themes, standards, delivery mechanisms, and the like.

In May of 1862 Abraham Lincoln established the U.S. Department of Agriculture “... **to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of the word**”. GIS provides the means for USDA to meet this requirement for the 21st Century. No other technology synthesizes and displays complex agricultural information and relationships as completely or intuitively as GIS. By making digital geographic information available to decision makers, the quality of life for Americans can and will improve.

KEY RECOMMENDATIONS

- 1. Establish a USDA Geodata Policy Advisory Board of senior USDA agency leaders to guide further development and implementation of this plan.**

Formal cooperative agreements are critical to the success of this effort and are needed to ensure that program and technical staff are empowered with the authority to make decisions. Three levels of leadership within each agency are critical to the success of a cooperative effort. They include senior leadership, program managers, and technical GIS/data staff. Lack of support in one of these areas will diffuse focus and reduce the ultimate success of this plan.

- 2. Develop formal cooperative agreements between USDA agencies, other federal and state agencies, institutions, libraries and other relevant partners, for the discovery, development, acquisition, integration, long-**

term archiving, maintenance and delivery of geospatial data and information.

USDA agencies have a vast collection of geospatial datasets that are essential to our partners and customers. USDA agencies also have a need for a variety of geospatial datasets generated by other Federal, state and local organizations. Rather than develop expensive datasets independent of one another, USDA would be well served to identify key themes needed by all agencies and to cooperatively acquire or develop these data to offset costs. Additionally, by connecting to the original authoritative sources of data, any changes will be reflected in these data thus minimizing errors and discrepancies.

- 3. Enhance, existing USDA geospatial data centers to enable better data delivery to internal and external customers. This includes staffing, bandwidth and other infrastructure.**

The APFO, GSTC, NCGC and Satellite Imagery Library lack the capacity and resources to meet current and anticipated demand for Geospatial Data. With existing processes and infrastructure it is difficult to acquire, integrate, manage and deliver data to internal customers and the public.

- 4. Develop a USDA Geodata Internet Portal to enable better access to, and use of geodata by internal and external customers.**

Provide access to USDA geodata through a common USDA Geodata Internet Portal to facilitate access to data by both USDA staff and customers. Agencies wishing to reduce data storage requirements may chose to partner on the development of data warehouses to reduce data management burdens.

- 5. Establish a USDA geodata standards workgroup or workgroups as appropriate to ensure data compatibility.**

Considerable work is still required on standards in order to ensure that geodata developed or acquired can be shared by all.

- 6. Establish permanent funding mechanisms to enable agencies to acquire or develop, deliver, and maintain shared geodata.**

Currently agencies are using normal appropriated funds to support the acquisition, integration, maintenance and delivery of geodata. While agencies recognize the importance of digital geodata to their future and to the public, they are not able to make the capital investment to create this resource. At the same time agencies are unable to take advantage of benefit cost ratios that are up to 7:1. Lack of funding ensures fragmented,

uncoordinated efforts that extend over many years and provide unsatisfactory results for agencies, and more importantly their customers.

1. Introduction

The USDA has always relied on geospatial data and information to accomplish its mission. In the past 30 years, the availability of digital geospatial data and tools have improved the quality of service and provided for the capability of value added products for USDA customers. While USDA has many documented successes, the lack of widely available USDA datasets, prohibit the full potential and benefit of USDA program goals and objectives. Currently, each USDA agency with active GIS initiatives are acquiring, integrating, archiving, maintaining and delivering geospatial data and information to their employees and the public in a more or less independent manner. These data processes typically account for 60 to 80 percent of the cost of GIS implementation. Because each agency handles their data needs somewhat independently, costs are duplicative and the process is inefficient. New and increased cross-agency cooperation will definitely increase efficiency. While some duplication is necessary and even useful, opportunities for new and improved partnerships are vital to success.

2. Acronyms

AID	Acquisition, Integration and Delivery
AMS	Agricultural Marketing Service
APFO	Aerial Photography Field Office
APHIS	Animal and Plant Health Inspection Service
ARS	Agricultural Research Service
BLM	Bureau of Land Management
CD-ROM	Compact Disk Read Only Memory
CLU	Common Land Unit
CSREES	Cooperative State Research Education and Extension Service
DAI	Data Acquisition and Integration
DBMS	Data Base Management System
DEM	Digital Elevation Model
DLG	Digital Line Graph
DOQ	Digital Orthophotography Quadrangle
DOQQ	Digital Orthophotography Quarter Quadrangle
DRG	Digital Raster Graph
EDC	EROS Data Center
ERS	Economic Research Service
FAS	Foreign Agricultural Service
FEMA	Federal Emergency Management Agency
FNS	Food and Nutrition Service
FS	Forest Service
FSA	Farm Service Agency
FSIS	Food Safety Inspection Service
FTP	File Transfer Protocol
FY	Fiscal Year

GDW	Geospatial Data Warehouse
GIS	Geographic Information Systems
GPS	Global Positioning Systems
GSTC	Geospatial Service and Technology Center
IP	Internet Protocol
IT	Information Technology
LAN	Local Area Network
MDOQ	Mosaicked Digital Orthophotography Quadrangle
NAL	National Agriculture Library
NAPP	National Aerial Photography Program
NASS	National Agricultural Statistics Service
NCGC	National Cartography and Geospatial Center
NCSS	National Cooperative Soil Survey
NRCS	Natural Resources Conservation Service
NSDI	National Spatial Data Infrastructure
O&M	Operations and Maintenance
OCD	Office of Community Development
RBS	Rural Business – Cooperative Service
RHS	Rural Housing Service
RDG	Resource Data Gateway
RMA	Risk Management Agency
RSAC	Remote Sensing Applications Center
RUS	Rural Utilities Service
SCA	Service Center Agencies
USDA	United States Department of Agriculture
USFS	United States Forest Service
USGS	United States Geological Survey
WAN	Wide Area Network
WOAB	World Outlook Board
WS	Web Server
WWW	World Wide Web

3. Background

USDA recognizes that integrating Geographic Information System (GIS) technology, is beneficial and in many agencies essential to improving agency business processes and improving customer service. GIS will be an essential component of the E-Government transition of several agencies. Additionally, USDA recognizes that the public and private sector need and want USDA geospatial data and information USDA also recognizes the benefit of continuing, and strengthening and developing new partnerships for creating these datasets. Optimum implementation of GIS depends upon the ability to obtain, manage, archive and deliver geospatial data and information in an effective, efficient, and cost-effective way.

The *USDA Service Center Geographic Information System (GIS) Strategy, August 1998* identified 23 geospatial data sets that are useful to Service Center staff. The Forest Service has also identified 15 core data themes.

4. Objective

The objective of this plan is to describe a coordinated process, procedure, and infrastructure for the discovery, acquisition, integration, archive, maintenance and delivery of geospatial data and information. The ultimate vision is to create shared geodata for USDA and the public

5. Strategy Toward the Vision

As advances in spatial information technology mature USDA can achieve a vision of standardized on-line shared geodata available through a Geospatial Internet Portal. The portal is a common interface through which USDA customers can access USDA geospatial data and information from any participating agency. Four strategies should be employed to achieve the vision.

Strategy 1: Encourage Partnering to Acquire Data

USDA agencies currently work with federal, state and local agencies to acquire a variety of data sets (e.g., imagery, soil survey data, and hydrologic unit boundaries). Partnerships take many forms and may include direct financial support, in kind contributions, technical assistance, and contract data development efforts. For example, partnerships with land grant universities and colleges advance research and extension efforts on a wide range of GIS data and applications development.

A variety of other data sets are acquired through local and state partnerships, procurement from private vendors, and direct sharing with federal cooperators. Often these datasets are acquired, integrated, archived, and delivered by each agency independent of the data holdings of other USDA agencies. At each juncture, there is a potential for new opportunities to share workloads and reduce costs associated with the acquisition and management of these data, and improve access and delivery to USDA and its customers.

Strategy 2: Consolidate Geodata Integration Tasks

Data integration involves such activities as creating mosaics of DOQQ. These raw data are received from USGS. APFO in Salt Lake City performs edge matching, corrects image tone problems, removes field boundary images that are caused by differences in age of original photography, and completes other tasks before making these data available to field staff. NCGC performs similar tasks on

DRG's, Soil Surveys and numerous other data sets. They also ensure that the data are in the proper file and name format and projection and convert them to a common standard. Each of these activities are performed to ensure that software works correctly against this standard set of data and to eliminate the need for field staffs to extensively manipulate the data.

Where agencies lack a data center, individual agency staffs often perform these same tasks on the same sets of data. Staffs often work with local and state agencies to acquire and integrate data that are developed for their jurisdictions. Typically these are agency GIS or Natural Resource Specialists at the local, state or forest, regional, and national levels each working to acquire and integrate accurate data they need to perform analyses for project, field, watershed, regional and national scale activities. Significant staff time can be saved by centralizing these data integration activities at data centers where task specific expertise and a production environment exists. However, existing USDA Data Centers and research laboratories lack funding to accomplish these data management and integration tasks. Agency leaders, researchers or program managers do not have funds or staff to redirect from their existing programs to data centers even though they recognize productivity and customer service can be increased. Thus, though most agency staff would agree that partnerships are good ideas, they will continue their individual efforts unless additional funding or other incentives are provided.

Strategy 3: Develop Geodata According to Established Standards

USDA participates in varying degrees in federal standards development bodies such as Federal Geographic Data Committee (FGDC). Within the FGDC, USFS provides the federal lead for vegetation and NRCS provides the lead for soils. FSA has developed a standard for the common land unit (CLU) which is critical to the delivery of a number of USDA programs. The Forest Service has developed a standard group of attributes for their "core" data themes as a part of the Terra Project. They develop additional business themes using FGDC standards where available. NRCS in partnership with EPA, USGS, USFS and others has developed a unified federal standard for the delineation of 5th and 6th level hydrologic unit boundaries which are critical to natural resource planning and water quality monitoring efforts. CSREES is building a spatially referenced database of water quality projects and accomplishments focused on six core themes of the water quality program. Each USDA agency should be compliant with FGDC standards or other internationally recognized standards to better share data resources within the Department and to facilitate interoperability. Interoperability will facilitate data integration for better decision making.

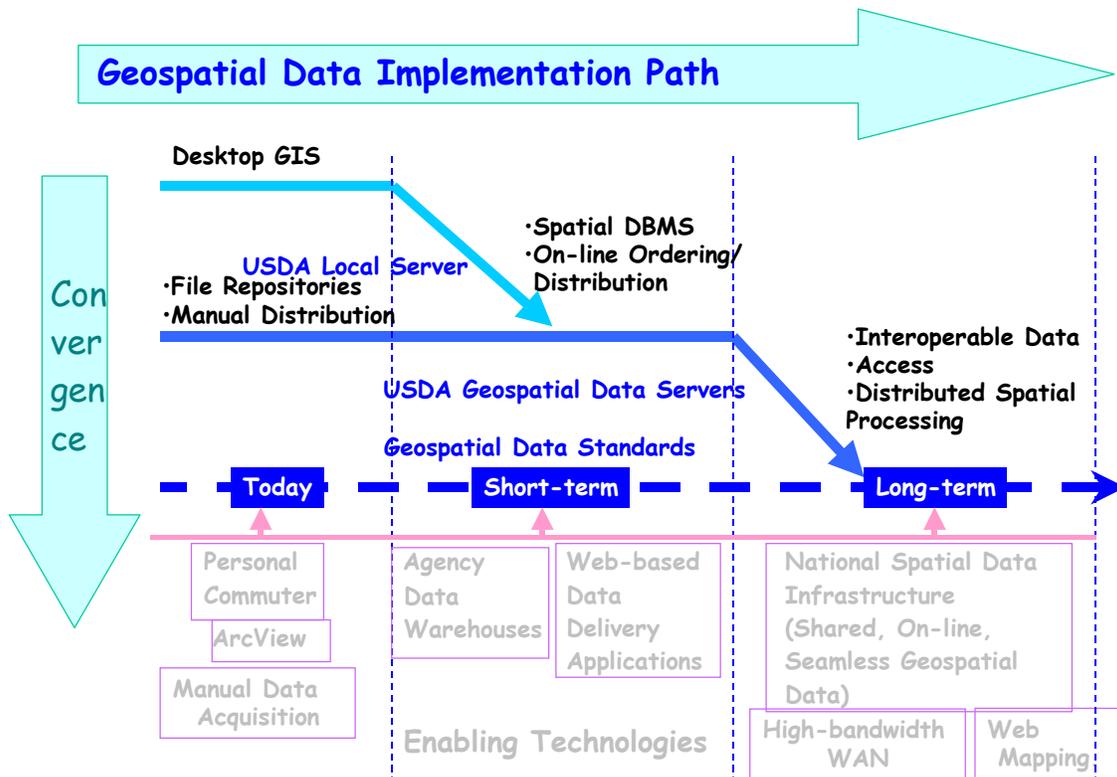
USDA agencies often develop data that do not conform to recognized standards for internal use or for limited geographic areas. These datasets have value for others and should be documented accurately for use by a wider audience. The use of standards at the inception of data collection would eliminate the need for

extra documentation, ensure greater interoperability, and promote better decision making.

Federal datasets are often collected at a scale that is not detailed enough to be used for local activities and thus local groups develop more detailed information. If these local data are collected with a common standard they can be shared with others and thus costs are reduced.

Strategy 4: Develop Methods to Deliver Geodata On-Line

This section describes how data are delivered by some USDA agencies. As mentioned earlier much data exists, however it is not easy to locate and when located it is not easy to use. In general, only the more sophisticated GIS user knows what data are available and how to make use of it. Technology is now available to provide these data to anyone. The chart below describes a forward path that will enable USDA to provide seamless, online Internet access to geodata.



5.1. Today's Geospatial Data Dissemination Activities

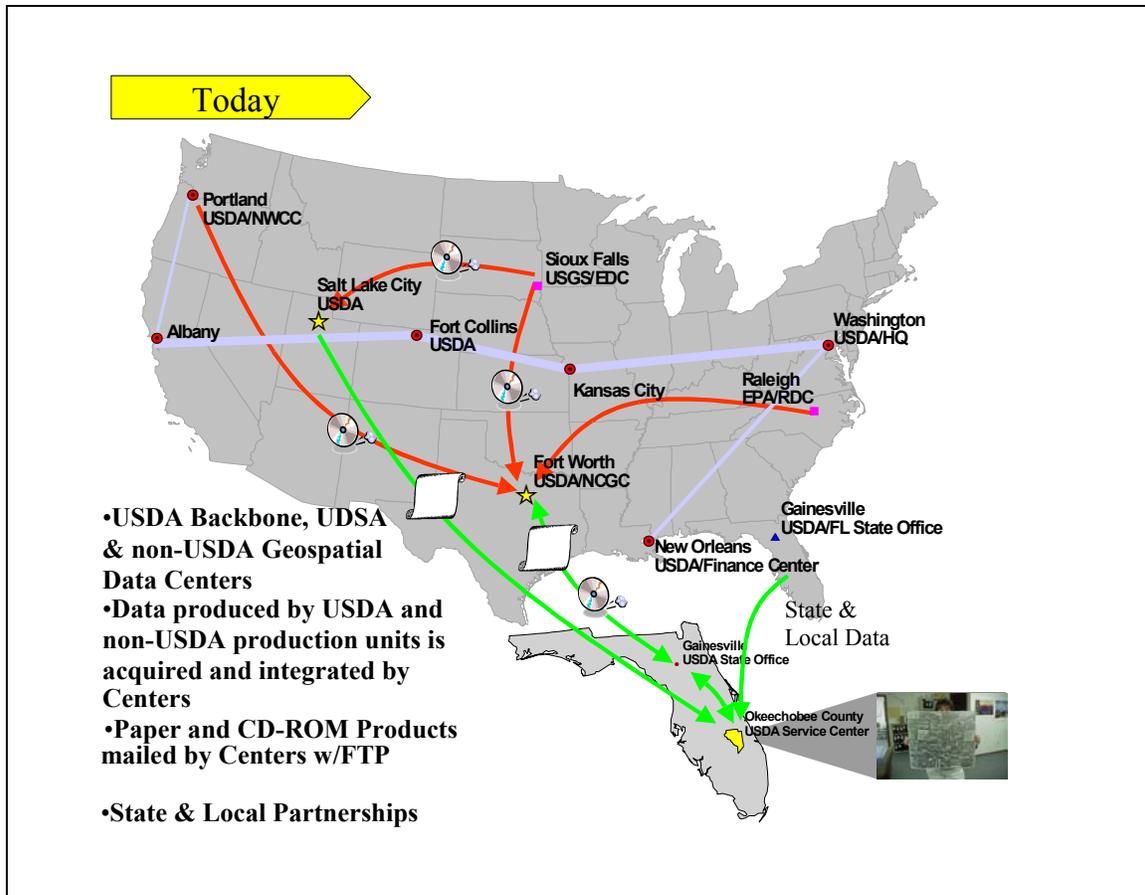
Today's geospatial data dissemination activities consist of a distributed acquisition, integration and delivery model. The SCA *Geospatial Data*

Acquisition, Integration and Delivery National Implementation Strategy Plan [A2] described how the SCA disseminate geospatial data in a widely distributed environment supported by a modest telecommunications infrastructure. As the USDA agencies work to upgrade telecommunications, USDA data production centers will continue work to prepare a common set of integrated geospatial data sets. At the national level, data dissemination is focused on 4 primary data centers.

1. FSA Aerial Photography Field Office (APFO) in Salt Lake City, UT
2. FS Geospatial Service and Technology Center (GSTC) and Remote Sensing Applications Center (RSAC) in Salt Lake City, UT
3. NRCS National Cartography and Geospatial Center (NCGC) in Ft. Worth TX.
4. FAS Satellite Imagery Library in Washington, DC

Dissemination occurs from these centers after they acquire geospatial data from agency digitizing or development sites or other federal agencies and process the data to a level that meets the business requirements of the agency staff. This task is facilitated through partnerships and cooperative agreements. Once acquired, both USDA owned data sets and non-USDA data sets are integrated. Currently, the dissemination responsibility includes organizations at the regional, state and local levels. This dissemination is very labor intensive. Significant savings can be obtained through on-line processes.

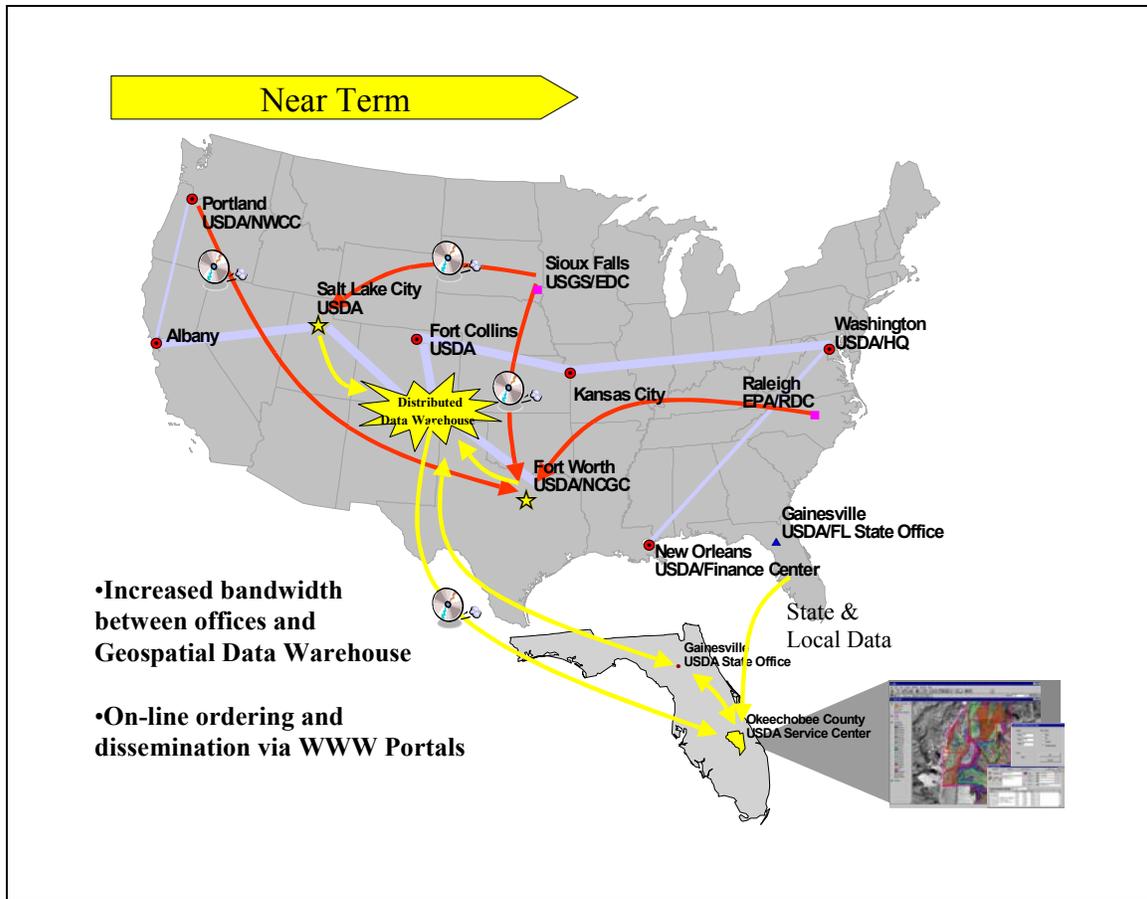
The four centers accomplish digital data delivery through a combination of mailing CD-ROM (Compact Disk Read Only Memory) and/or tape and digital download via FTP (File Transfer Protocol).



5.2. Near-term Geospatial Data Dissemination Framework

The near-term vision of geospatial data dissemination is improved significantly by the consolidation (logical and or virtual) of geospatial data sets through a unified USDA Geospatial PORTAL and the availability of increased bandwidth between the production centers and USDA agencies and customers. However, it is unlikely, in the near term that geospatial data will be transmitted via the web for real-time or even one-time data transmission. It is envisioned that the near term will facilitate on-line search, browse and ordering, and the automation of CD-ROM ordering and distribution. Agencies will pilot data streaming of a few small data layers across the web.

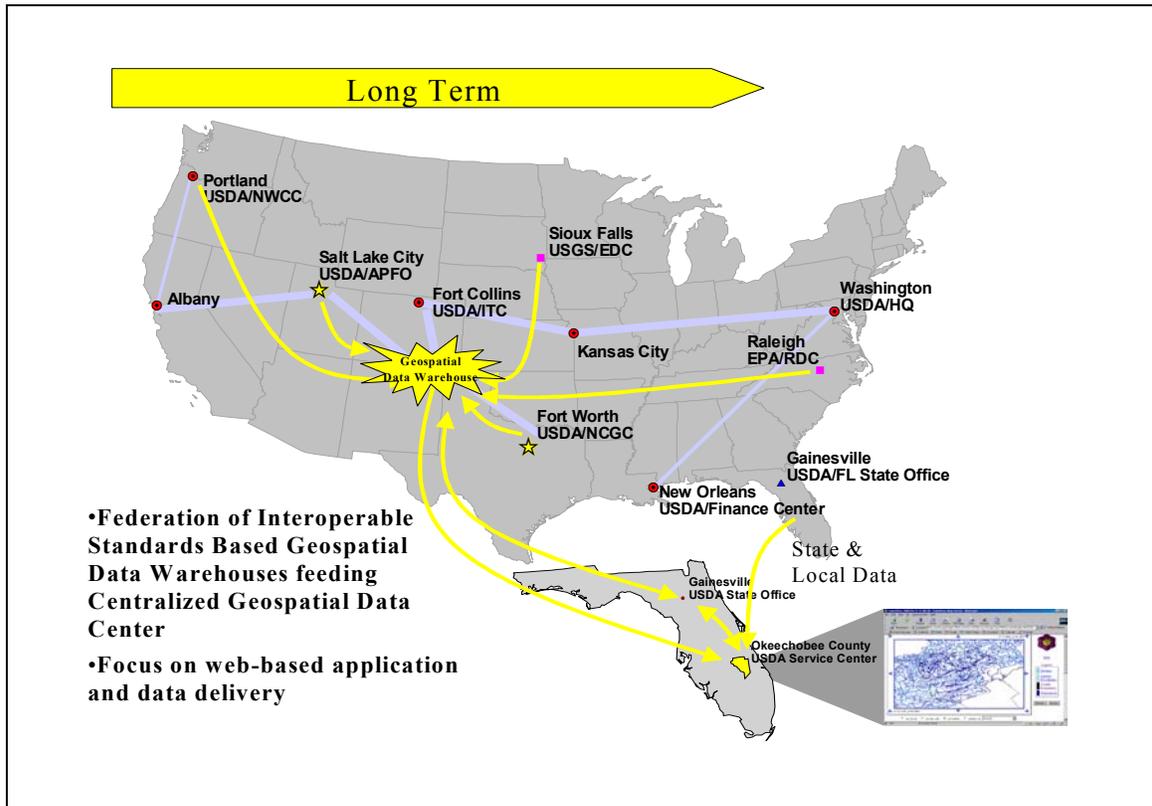
As more applications become available and technological improvements in telecommunications are realized at USDA there will be less need in many agencies for storage of geospatial data sets at the local level and more reliance on a network of distributed data repositories accessed through the USDA Intranet and the Internet.



5.3. Long-term Geospatial Data Dissemination Framework

The long-term vision of geospatial data dissemination at USDA is one that is shared by many federal data providers and many commercial entities. This vision consists of a global network of shared data repositories that conform to mutually accepted open standards, follow inter-operable exchange specifications, and utilize common application services. This vision would minimize redundant applications and geospatial data sets storage and focus on web-based applications that operate off data stored at central and distributed data warehouses. This framework vision also supports the ability for USDA to concentrate on the dissemination of their owned data sets and have applications directly access data currently obtained from other federal agencies and partners. The benefit of this environment is reduced storage at the local level, access to the most current data available and more efficient and cost effective delivery and integration processes. Additionally, there will be less need to purchase and maintain GIS software on stand-alone desktop environments and more emphasis on applications and services delivered over the Intranet and Internet. However, in order to take advantage of this vision, a high-bandwidth telecommunications infrastructure must be available to support large file transactions and short

response times. This vision, although in place to some extent today, will not be fully operational at USDA for several years.



6. Business Requirements

USDA uses geospatial information for a wide range of business processes. Some agencies use geospatial information and GIS in every business process. Others use it to support a smaller number of objectives. The following table provides a listing of USDA Agencies and a summary of the uses made of geospatial information. USDA is also better able to meet the requirements of Executive Order 12906, OMB Circular A-16, and Electronic Freedom of Information Act (E-FOIA) amendments of 1996 as well as the Government Paper Work Elimination Act (GPEA) and Freedom to E-File Act through the use of GIS and shared geospatial information.

APHIS	<ul style="list-style-type: none"> - Surveillance: spatially-based disease detection - Analysis of Environmental Factors - Pattern and Population Density Analysis - Regionally-based Health Surveys - Geographic/Demographic Allocation of Resources
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	– Development of Regional or Zonal Strategies
ARS	–
CSREES	<ul style="list-style-type: none"> – Natural Resources Management – Precision Agriculture – Environmental Analysis – Water Quality Modeling – Rural Community Planning – Geographically Referenced Analysis of Agency Funding
ERS	– Economic Analysis and Support
FAS	<ul style="list-style-type: none"> – Global Crop Condition Assessment – Early Warning of Unusual Crop Conditions – Agriculture Disaster Response
FS	<ul style="list-style-type: none"> – Forest, Range, Wildlife and Recreation Planning and Management – Fire Response and Recovery – Ecosystem Restoration – Resource Inventory and Assessment – Natural Disaster Response and Recovery – Land Ownership Survey, Recordation and Administration – Facilities and Constructed Feature Management – Road and Trail Network Analysis
FSA	<ul style="list-style-type: none"> – Land Records Management for Producer Payments – Compliance – Disaster Assessment
FSIS	<ul style="list-style-type: none"> – Land use and agribusiness locations – Document and Distribution System – Environmental justice impact assessment – Epidemiological surveillance of foodborne disease – Epidemiological surveillance of foodborne hazards – Microbial risk assessment support for food safety
NASS	<ul style="list-style-type: none"> – Analysis of Agriculture Status and Trends – Provide Cropland Data Layer to Public – Provide Vegetation Condition Images
NRCS	<ul style="list-style-type: none"> – Conservation Planning and Application – Resource Inventory and Assessment – Community Development – Easement assessment and management – Disaster assessment – Range Management
OCD	<ul style="list-style-type: none"> – Economic and Community Development – Program and Policy Evaluation
RBS	<ul style="list-style-type: none"> – Customer local and regional planning – Agency strategic planning

	<ul style="list-style-type: none"> – Agency program management
RHS	<ul style="list-style-type: none"> – Customer, local and regional planning – Agency strategic planning – Agency program management – Program and Policy Evaluation
RUS	<ul style="list-style-type: none"> – Environmental Analysis – Customer local and regional planning – Agency strategic planning – Agency program management – Program and Policy Evaluation
RMA	<ul style="list-style-type: none"> – Risk Assessment – Risk Education

7. Data Requirements

7.1. Data Themes

Table 1. provides a listing of USDA geospatial data that are presently used, required or produced by agencies. Agencies listed with a P in the table produce the data theme for their own use and application. The data may be completed with internal staff and resources or by contract with private companies. Agencies listed with an R do not produce these data, but the data are required in order for the agency to complete its mission. Agencies listed with a U indicated that they found the information useful. This listing provides information that will be important as agencies establish partnerships and agreements both within USDA and with other federal, state and local agencies. To support USDA wide data development efforts, it will be critical for core data layers to be identified, schema defined, cross-agency partnerships developed, and the lead agencies assigned by theme

7.2. Current Funding

Table 2. lists current estimated funding by geospatial data theme. In most cases, these estimates are the cost of converting existing analog data to a digital georeferenced product or for acquiring new geospatial data. Dollar figures do not include program costs to collect information in the case of the data producers. For instance, it does not include the time or resources of a field scientist making a map.

7.3 Required Funding

Table 3. provides a listing of the estimated additional funding required to develop or acquire geospatial data themes within a timeframe of 5 years or less. As indicated from Table 1. many agencies share the need for specific data themes, such as hydrography. Presently, agencies are collecting hydrography information

at a variety of scales and with a variety of standards which may not facilitate the long-term integration of the data into a single national coverage or with other datasets. Hence funding is required not only to develop these data, but also to fully document the data that are being developed. Funding is also required for additional staff to coordinate between agencies and develop standards. Finally funding is required for geodata integration and distribution.

Used to its full analytic capability, geographic information systems offer a cost-benefit ratio of more than 7:1 in those instances where previous process had been solely analog. The proposed investments made in these themes have a clear cost benefit for the Department as well as secondary benefits to other federal, state, and local partners.

8. Partnerships

The broad implementation of GIS technology, such as described in this plan, cannot be successful without strong partner relationships between federal, state, and local government entities, and private sector. Partnerships promote the development of data themes common to agency business applications and program needs. By leveraging funds from several partners, data development costs that would be prohibitive to a single agency can be shared by many. The successful federal partnership for the development of digital orthophotography exemplifies the leverage capability of multiple agency participation. Partnering efforts are wide reaching and facilitate the development of data standards. Data content standards must be developed (and used where available) by various Federal agencies, in cooperation with state and local partners, to foster joint funding and data sharing. Information technology interoperability standards must be developed (and used where available) to facilitate geospatial data sharing among information systems. This plan assumes that partnerships and working agreements will be developed within USDA and existing internal partnerships will be strengthened. Additionally, numerous federal state and local entities have and will continue to develop agreements with USDA. For example NASS has recently partnered with seven states on a cropland data layer. Some of the historically significant organizations are identified below.

8.1. The Federal Geographic Data Committee

The FGDC is an interagency committee that promotes the coordinated use, sharing, and dissemination of geospatial information on a national basis. OMB established the FGDC in 1990 to coordinate the Federal Government's development of the mapping sciences and expanded that role in 1994 to include the National Spatial Data Infrastructure (NSDI). The FGDC is composed of representatives from 15 Cabinet-level and independent Federal agencies. The Steering Committee is the top tier within FGDC and they set high-level strategic direction. The Coordination Committee provides support to the Steering Committee, proposes focus areas and direction for FGDC steering committee review and provides a coordinated interagency review process for standards and

proposals forwarded from the working groups and subcommittees which focus on detailed technical issues. FGDC subcommittees are organized by data categories such as soils, wetlands, and base cartographic. Working groups are organized by crosscutting themes, such as standards and clearinghouse.

The USDA is an active participant in the FGDC. The Office of the Undersecretary for Natural Resources and Environment represents USDA at the Steering Committee level. Historically, USDA involvement in FGDC has been limited to those agencies with responsibility for critical national datasets and also heavily involved in GIS; consequently NRCS and FS have had the highest level of involvement. NRCS has traditionally provided staff support to the Deputy Undersecretary in matters related to FGDC and coordinates with other agencies as needed. In the absence of other USDA participation at the coordination level meetings, NRCS staff serves as the USDA contact for information and ensures that major action items effecting the agencies are conveyed to staff. NRCS, FS, and other USDA agencies are involved in many subcommittees and working groups to help develop interagency standards, foster development of collaborative programs, and promote data sharing.

The FGDC has authority to set geospatial information standards for Federal agencies. The USDA intends to follow the FGDC standards development process for the themes identified in this plan where available. USDA will also continue to coordinate with FGDC in the development of data themes for which other Federal agencies have leadership responsibility. Through the FGDC, USDA will encourage agencies to actively develop geospatial information that meets agency needs, document data to facilitate mining efforts, and make data readily accessible to partners and cooperators.

8.2. Key Federal Agency Partners

Although a number of Federal agencies are important to the success of a coordinated USDA geospatial vision, several organizations are of particular importance due to their role in data development, funding, and standards development. Each of the key Federal agency's involvement is described in the following sections.

8.2.1. Bureau of Census

The Bureau of Census develops geodata in support of its mission to provide statistics on population and other associated information. USDA uses this information to determine the equity and effectiveness of its programs. In addition the Census TIGER (streets and roads) data are often used as a reference or framework layer on which to overlay other geodata.

8.2.2. Bureau of Land Management

The BLM manages approximately 265 million acres of public lands and 300 million acres of mineral resources found under lands administered by government agencies or owned by private interest. These lands are located primarily in the 11 western states and Alaska. Each state has a state office and a number of suboffices to administer programs such as resource management planning, energy and mineral leasing, land sales and acquisition, grazing and range management, and cadastral survey. The BLM also has identified a number of geospatial themes required by their offices to effectively implement GIS technology. USDA will coordinate data theme development with BLM in order to avoid duplication and incompatibilities. USDA's coordination efforts will include ensuring that projects which cut across geographic boundaries of public and private lands have geospatial information that is compatible and in accordance with standards.

8.2.3. Department of Housing and Urban Development

HUD, in partnership with the private sector and EPA has developed an interactive website to help communities plan smarter and healthier communities using geospatial technologies. By integrating site specific government data with EPA environmental sources and demographics, HUD E-MAPS provides a one stop-shopping site for decision-makers and citizens alike. This site offers a positive example of cross agency federal cooperation and the possibilities generated by public private partnerships. HUD collects and maintains tabular datasets specific to housing loans, subsidized housing, and housing equity issues. Integration of these data with demographic distribution and other themes led to the HUD2020 project (<http://www.hud.gov/adm/2020soft.html>) which in turn has evolved into the integrated efforts now available from HUD E-MAPS (<http://www.hud.gov/emaps/>).

8.2.4. Environmental Protection Agency

"The mission of the U.S. Environmental Protection Agency is to protect human health and to safeguard the natural environment--air, water, and land--upon which life depends." EPA, in partnership with other federal agencies and private partners, collects a multitude of data. Examples of existing cooperative efforts include the development of detailed watershed boundaries, detailed hydrography, and watershed assessments for water quality. EPA has been a federal leader in the area of providing GIS products on the Internet.

8.2.5. Federal Emergency Management Agency

FEMA is charged with reducing loss of life and property and to protect the nation's critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response, and recovery. FEMA is responsible for several key datasets of interest

to USDA, including Digital Flood Insurance Rate Maps (DFIRM), Flood Insurance Rate Maps (FIRMs), Flood Insurance Study reports (FIS reports), Digital Q3 flood data, Community Status Book, and the Flood Map Status Information Service (FMSIS). FEMA and several USDA agencies have developed formal working agreements that have proven constructive for open sharing of digital data and information flow between local communities on data issues.

8.2.6. National Aeronautical and Space Administration

NASA provides satellite imagery to many USDA agencies. These agencies use these data for numerous remote sensing activities such as change detection. USDA has a cooperative agreement with NASA and maintains a satellite imagery library in the FAS. NASA researchers are major users of USDA geodata such as Soil Survey, which is used in carbon sequestration, global climate and circulation models.

8.2.7. National Oceanic and Atmospheric Administration

NOAA is a strategic partner with USDA on issues related to climate, climate modeling, and coastal marine datasets and is key to accessing several imagery related data sources. USDA agencies rely on and work closely with the National Weather Service for critical raw datasets to support climatic modeling needs. The Department of Commerce, of which NOAA is a part, also oversees the Global Disaster Information Network (GDIN). USDA participates in the GDIN efforts and is a member of the core steering body.

8.2.8. Office of Management and Budget

The Office of Management and Budget (OMB) in partnership with the Federal Geographic Data Committee (FGDC) are working with local communities to identify and overcome financial and institutional barriers to the sharing of information across all institutional entities. OMB has initiated several forums to discuss how government may improve the information it collects and minimize collection burden by maximizing the benefits of information technology. USDA has participated with OMB/FGDC/NPR in these efforts and will continue to assist in the OMB efforts at the local and state level.

8.2.9. United States Department of Defense

The Department of Defense (DoD) historically has been responsible for collection and processing of a substantial amount of topographic information, particularly for areas outside the United States. DoD has been instrumental in producing complete coverage of digital terrain models for the United States and many other countries.

The U.S. Army Corps of Engineers (USACoE) provides GIS coverage of wetlands, navigable waterways, a national inventory of dams, information on

locks on major waterways, and a variety of thematic maps that relate to commodities moved along major waterways.

8.2.10. United States Department of Energy and Nuclear Regulatory Commission

USDA Food Safety Inspection Service uses data from U.S. Nuclear Regulatory Commission (NRC) and the U.S. Department of Energy (DOE). They provide ArcView data themes for the 50-mile areas around the 75 commercial nuclear power plants located throughout the U.S. The geodata themes include information such as plant location, population, road/rail/water networks, hospital/congregate care facilities, and schools. The DOE's Federal Radiological Monitoring and Assessment Center (FRMAC) located at the DOE Las Vegas Remote Sensing Laboratory (RSL) provides exercise data during the dozen or so radiological exercises EPB participates in throughout the year. Using the previously mentioned geodata themes, FRMAC is able to produce Geographic Information System (GIS) maps that predict possible contaminated areas in which to develop food embargo and quarantine protective action recommendations (PARs) for State and local authorities. Additionally, some of the State's Emergency Management Agencies are using various GIS programs that are compatible with ArcView to develop State specific themes that include land use and agribusiness locations. Unfortunately, this is a very expensive endeavor and not all of the information has been collected and digitized. Therefore, it is not always available during exercises and, if needed, during a real-time emergency incident.

8.2.11. United States Fish and Wildlife Service

The U.S. Fish and Wildlife Service is responsible for fish, wildlife, and plant conservation. The Service helps protect a healthy environment for people, fish, and wildlife, and helps Americans conserve and enjoy the outdoors and our living treasures. The Service's major responsibilities are for migratory birds, endangered species, certain marine mammals, and freshwater and anadromous fish. The FWS collects and manages several databases to support their mission. Data sources available on-line include: Environmental Conservation Online System (ECOS), Contaminant Information Management and Analysis System (CIMAS), Habitat Conservation Plans (HCP database), Threatened and Endangered Species System (TESS), Federal Aid Information Management System (FAIMS), National Wildlife Refuge System searchable databases from the Refuge Management Information System (RMIS), Wetlands Interactive Mapper, and map status from National Wetlands Inventory (NWI) program. The NWI is commonly referenced by USDA agencies.

8.2.12. United States Geological Survey

The USGS is responsible for providing the nation with geologic, topographic, biologic, and hydrologic information. This information comprises maps,

databases, and reports containing analyses and interpretations of water, energy, mineral, and biological resources, land surfaces, marine environments, geologic structures, natural hazards, and the dynamic processes of the earth. The USGS National Mapping Division administers the National Mapping Program, which distributes maps, images, spatial data, remote sensing data, and related information. Funds are available for partnership arrangements to develop geospatial information that meets USGS and partnering agency requirements.

USGS also coordinates Federal topographic mapping and survey activities and the development of the NSDI through executive leadership of the FGDC. Besides providing Secretariat support for FGDC, they have Federal leadership for the geospatial theme categories of base cartographic (including digital orthoimagery), elevation, hydrography, and co-leadership of earth cover. The USDA will continue to work closely with USGS to foster the development of these data themes to meet its needs and coordinate FGDC activities. Presently, USDA expends vast financial resources to aggregate, integrate, and disseminate USGS datasets to field staff and analysts for use with GIS. USDA is not alone in this effort and other federal agencies and the private sector are conducting similar process on the same datasets to facilitate use by the end user. Efforts must be made with USGS and all other federal partners listed here to collectively develop a common Federal vision for the dissemination of large geospatial datasets. This will alleviate USDA from maintaining and disseminating non-USDA datasets and allow each agency and Department to focus on their area of expertise.

8.3. Key State and Local Partners

State and county level partnerships will be important to the success of the USDA agencies. Many state agencies are actively using GIS and they develop and maintain geospatial data themes useful for USDA. A number of county governments are also actively using GIS and may be developing and maintaining geospatial data themes at a better level of resolution than the state or federal agencies. USDA cost share and work-share agreements with state and county government will be very important for acquiring many of the common geospatial data themes identified in this plan. However, it is critical that coordination and standards development be successful at this level. As datasets decrease in scale and become more useful for local planning, the number of partners often increase, as does the level of complexity in aggregating the data for regional use. They increase because the user base increases – that is, the data are important to a wider user base.

At the national level, USDA will partner with several organizations representing state and county-level entities. The key organizations are: the National States Geographic Information Council (NSGIC), the National Association of Counties (NACo), the National Association of State Universities and Land Grant Colleges (NASULGC), the National Association of Conservation Districts (NACD), and the National Association of Resource Conservation and Development Councils (NARC&DC). The support and collaborative efforts of these organizations and

the local entities they represent are critical to the successful implementation of this plan.

8.3.1 National States Geographic Information Council

The NSGIC is an organization of states committed to efficient and effective government through the prudent adoption of geospatial information technology. Members of NSGIC include delegations of senior state GIS managers from across the U.S. Other members include representatives from Federal agencies, local government, the private sector, academia, and other professional organizations. The NSGIC membership includes nationally and internationally recognized experts in GIS, as well as data and information technology policy.

The NSGIC is a member of the FGDC and provides leadership and a voice for state GIS concerns and policy implications. Through a cooperative agreement with the FGDC, NSGIC provides leadership for a GIS and mapping survey of thousands of agencies at the local/county government level. The goal of the survey is to create a “snapshot” of the U.S. digital geographic data status, especially the Framework data layers from a state and local perspective. FGDC has defined core layers, which fulfil the minimum geospatial needs of most federal agencies and refers to these layers as the Framework. These layers are geodetic control, orthoimagery, elevation, transportation, hydrography, governmental units, and cadastral information. The results of this survey are useful in coordinating geospatial information development and data sharing among county, state, and Federal agencies.

8.3.2 National Association of Counties

NACo is a national organization for the 3,141 counties across the country. NACo serves as a national advocate for counties and is active in various interests such as the environment, sustainable communities, volunteerism, and information technology. County government provides most public services such as schools, hospitals, emergency 911 assistance, crime prevention, courts, roads, sanitation, parks, and recreation. To administer these and other programs, county governments have mapping programs and many have GIS capabilities and experience. The USDA agencies consider county government a critical partner in the development and sharing of geospatial information and the development of collaborative mutually beneficial GIS projects.

NACo is an active member of the FGDC. USDA will closely coordinate with NACo and counties actively involved in GIS in order to acquire needed data themes, avoid duplication, and minimize costs.

8.3.3 National Association of State Universities and Land Grant Colleges

Land grant colleges and universities have provided key research on GIS through their partnership with CSREES and others. Research on GIS conducted at

Agricultural Experiment Stations across the nation has advanced our understanding of agriculture and natural resource management. This research has led to a joint competitive research program with NASA on the use of geospatial technologies in agriculture.

Much of the research conducted at land grant colleges and universities has been transferred to the public through the efforts of state extension programs. As an example, the University of Connecticut has developed Project NEMO (Non-point Education for Municipal Officials) to provide local planners with GIS tools to evaluate impacts of land use decisions on water quality.

In cooperation with NASA, CSREES has established geospatial extension specialists at three land grant universities. These new extension specialists will promote development of GIS, GPS, and remote sensing applications for agriculture and natural resources management.

CSREES has sponsored development of an agricultural science curriculum development for GIS at land grant institutions. This curriculum integrates agricultural sciences with GIS and remote sensing techniques. Furthermore, CSREES has made efforts to reach under-served audiences through a curriculum development program established at 1890 land grant universities (Historically Black Colleges and Universities) and the 1994 Extension Indian Reservation Program. CSREES has an on-going program of training tribal governments on the use of geospatial technologies through the Rural Geospatial Innovations in America Consortium.

8.3.4 Conservation Districts

Conservation districts are local units of government responsible for the soil and water conservation work within their boundary of approximately 778 million acres of private land. The districts' role is to increase voluntary conservation practices among farmers, ranchers, and other land users. USDA has agreed to work with conservation districts in the procurement and use of a common computing environment and shared information system.

The conservation districts are represented by a national organization called the National Association of Conservation Districts (NACD). Districts also work with various other organizations such as the National Association of State Conservation Agencies and the National Association of Resource Conservation and Development Councils (NARC&DC).

8.3.5 Resource Conservation and Development Councils

Resource Conservation and Development (RC&D) Councils are local units of government that encourage land conservation and utilization, accelerated economic development, and improvement of social conditions where needed to foster a sound local economy. Councils hold community meetings to identify concerns, needs, and problems within a community. The Council's resource committees, with assistance from Federal, state, and local agencies, collect

information about identified problems, develop alternatives, and recommend solutions to achieve goals and objectives.

The National Association of Resource Conservation and Development Councils (NARC&DC) has recently been formed to represent the interests of local and state Councils at the national level. The USDA RC&D Working Group and the NRCS RC&D staff works closely with NARC&DC to assure good communication and cooperation of all program activities. RC&D Councils recently entered into an agreement with a major private sector vendor to acquire GIS software for all offices. They will require many of the same USDA geospatial data themes identified in this plan.

8.4 Key Industry Partners

Successful GIS implementation will require the efforts of several private industry partners. Industry partners will work together within the bounds of the Open GIS Consortium (OGC) to foster development of an open systems approach to geoprocessing.

8.4.1 Open GIS Consortium

The need for the OGC grew out of widespread recognition that geographic information was very difficult to share between different software systems and hardware configurations. To help resolve this problem, geoprocessing specifications have been, and are being, developed through a consensus building process, open to the entire geospatial information industry. All major GIS, database, and information technology (IT) vendors are members of OGC. As specifications are adopted, industry develops software in compliance with these specifications and subsequently achieves a new level of interoperability. USDA agencies are supportive of these geoprocessing interoperability goals and will continue to participate with OGC and industry representatives at various levels.

8.5 Private Sector

As USDA strives to coordinate internal geospatial data needs with private sector companies and may be requested to play a larger role in defining the future direction. USDA will also share data with private sector vendors upon request at cost recovery. For example some agricultural companies are interested in acquiring the Common Land Unit, Soil Survey, Climate, and other geospatial data that are being developed by USDA. USDA will develop privacy and security policies and practices that are relevant to each data theme. USDA will encourage the private sector to develop data according to standards and contribute appropriate data to the National Spatial Data Infrastructure (NSDI).

To adequately address the privacy, data distribution, maintenance and archiving issues that will arise as data are more widely shared considerable focus must be

placed on the development of data management policies. USDA data management policies for geospatial data and subsequent agency policies must be developed, coordinated and maintained.

8.6 Role of the National Agricultural Library

While USDA has several centers (NCGC, APFO, GTSC) for the traditional Geodata, a Center for the archiving of geospatial data obtained through research activities has not been funded. These data are maintained by the locations that are responsible for the associated research in ARS, CSREES, Forest Service and NRCS. They are very difficult if not impossible to obtain electronically. ARS has acknowledged the long-term benefits that these data provide to scientific community and to the public. The NRCS has begun to provide its National Soil Characterization Database on-line. CSREES has been designated to organize and coordinate efforts of REE agencies and their state and private partners in planning, designing, developing, and implementing a comprehensive Research, Education, and Economics Information System (REEIS). Other federal efforts such as the Long Term Ecological Research (LTER) system are also ongoing. These are all very important efforts, but they lack a single access point.

The National Agriculture Library, in its appropriate role within the Department, has begun development of AGROS, envisioned as a “portal” or entry point for information, services and applications that may be made available on the web by USDA. The portal is a gateway or one-stop-shop to a collection of information, services, and applications relevant to researchers, extension agents, agriculture producers, agro-consultants and the public. AGROS portal will be a virtual warehouse connected by the Internet, with capability to browse, access, manipulate, related and manage disparate data and information.

NAL should serve as the steward of this portal on behalf USDA agencies and be the responsible organization for the Departments web portal or “My USDA”.

9. Training, Outreach, and Support Services

Several USDA agencies have developed GIS training packages, courses, and facilities. USDA agencies have shared these critical resources in the past and will continue to do so wherever possible. New training opportunities, both within USDA and with other agencies, will also be explored.

9.1. Cooperative Extension Service

CSREES has a longstanding partnership with land grant universities and colleges to develop outreach programs for agriculture and natural resources management that apply GIS technology. This partnership includes the original 1862 land grant colleges and universities, 1890 institutions (Historically black colleges and universities), and 1994 institutions (Native American colleges). This extension network provides outreach education programs on topics such as

precision agriculture, GIS, and natural resources management to many of the nation's rural and under-served areas.

9.2. Other Outreach and Support Services

Hardware and software support for GIS tools and data are critical to successful implementation. USDA will develop means to partner through data centers to provide employee and customer support for use of agencies geospatial data.

10. Information Technology Infrastructure

A critical component for the eventual success of this plan is sufficient telecommunications bandwidth to support agency geospatial data transmission and on-line application processing needs. Bandwidth requirements will continue to grow as agencies move more business process to the Intranet and Internet. Geospatial data requirements have the potential to overload this system if the GIS computing environment, data warehouse design, and telecommunications infrastructure are not designed correctly. The major challenge is with digital imagery, because of the large file sizes. Cost savings, improved customer service, and data quality are potential benefits of creating geospatial data warehouses, a trade-off is the increased cost for bandwidth to serve these data from the warehouses to WWW application servers, local offices, and the public.

11. Conclusion

This plan serves as a starting point for the coordination amongst USDA agencies to identify the issues and solutions for a long-term program for the management and dissemination of geospatial data and related information. Though not fully implemented within all USDA agencies, it is fair to say that most USDA agencies have critical applications and strategic issues, which could be supported by the use of GIS technology. One intended goal of this plan is to facilitate communication among the relevant agencies involved in GIS technology or those which would benefit from such technology in the near future. By facilitating internal USDA coordination at this time, a greater level of efficiency and cooperation will be realized in the future.

USDA has a variety of missions. Though often viewed as solely providing support to agriculture, staff focuses on areas of food safety in the onset of nuclear attack, economic food distribution corridors, rural access to cellular phone networks, soil erosion, crop disaster mitigation - both domestic and foreign, water quality, and feeding the nations less fortunate. This diversity presents several challenges as well as several advantages. Developing a common vision by which to support the geospatial data needs of the Department is an important and difficult challenge. Management support must be provided for cross-agency collaboration from the top agency leadership to program managers. Lacking wide and accepted support for selfless collaboration, little progress will be made. Agencies must be willing to

allocate staff to help identify critical data sources, scales, and attributes of each, needed standards, funding sources, archiving, and maintenance strategies, as well as hardware and software tools.

Over the last year, USDA has become the single largest Federal user of GIS technology within the government. With thousands of GIS software licenses nationwide and most of them at the local office level, USDA will have the greatest number of knowledgeable GIS users, and therefore the greatest need for data in the nation. It is essential to coordinate all activities across agencies for more effective and efficient use of these geospatial data and information.