



US Department of Agriculture
Forest Service

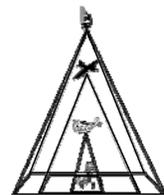
Geospatial Technology Core Competencies for Resource Management and Research

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Geospatial Service
and Technology Center



Remote Sensing
Applications Center

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1. Executive Summary

Background:

Skills in aerial photo interpretation, data analysis, and map design and production have been required of Forest Service personnel for nearly a century. These skills are necessary to collect and analyze natural resource data and to produce and communicate information to address agency objectives. In the last decade, digital methodologies and products that support remote sensing, computer based geographic information systems (GIS), global positioning systems (GPS), and digital cartography have been incorporated into Forest Service operations. Application of these digital products and technologies permits data collection, analysis, and information display, which is more accurate, timely, and cost effective.

The Forest Service has been quick to embrace the rapidly developing digital capabilities. Corporate hardware, software, and data have been acquired and installed service wide. There is now a pressing need to identify staff skills required to make optimum use of the newly acquired capabilities, and to upgrade these skills appropriately. In order to define these geospatial skills, the Geospatial Advisory Committee (GAC) chartered this working group to identify the basic geospatial knowledge and skills (core competencies) for three predetermined categories of GIS users, and to determine what level of understanding is required for a variety of geospatial sciences.

Purpose:

It is essential that management at every level within the agency recognizes and supports the acquisition and maintenance of appropriate levels of geospatial technology skills across the workforce. Considerable time and money has already been invested in geospatial hardware and software to implement geospatial databases. Technology has advanced rapidly in the past decade, and training must be adapted and intensified to keep pace with these advances. The current level of geospatial skills varies widely across the agency. The core competencies report provides the basis for developing and implementing an effective training program so every Forest Service employee can acquire and maintain appropriate geospatial skills based on his or her needs. An investment in training will pay off in a workforce that is better able to respond in a timely and cost effective manner to complex information requirements.

Understanding of skill needs will also prove useful in writing position descriptions, career development plans, and job vacancy announcements for positions requiring geospatial skills. To facilitate an effective training program, we need to identify what skills employees require to function effectively and efficiently at the various levels of GIS use.

Methodology:

The objective of this report is to identify the geospatial core competencies at three levels across the agency. To identify the appropriate skill levels, team members were selected to represent a cross section of the Forest Service personnel with day-to-day resource needs, GIS responsibilities, and knowledge of national applications (e.g., NRIS, INFRA, ALP, TIM); FS

Research needs and applications; and Human Resources needs. These individuals then identified and described the skill level and associated tasks necessary for each user category by competency area (i.e. GIS, Field Data Collection, etc.).

A description of each skill level and user category is provided below. However, this does not mean to imply that any one person has to have all the skills in every competency area. The core competency areas represent a broad range of geospatial skills based on a variety of typical GIS users. This allows flexibility when defining geospatial skill needs for a particular GIS user or manager and when incorporating these competencies into a specific job series or position description. In other words, a GIS user or manager need not possess all the skills listed in every competency area (i.e., GIS, Field Data Collection, etc.). These skills may reside in several people at one location or exist at different levels of the organization. For example, a Forest GIS Coordinator may need a different mix of geospatial core competencies than a GIS applications developer, although both would typically be defined as an “advanced GIS user.” At the same time, it is important to point out that any given individual within a particular job series may fit into a higher GIS skills category than what we have assigned below. That is to say, there are District Rangers who are very comfortable using ArcView and fall into the occasional user category rather than the manager category. Also, a wildlife biologist who uses GIS on a daily basis to enter data or perform spatial modeling very well could be an advanced user.

Today in the Forest Service, there is a trend towards more widespread use of geospatial technologies. This trend is very evident in the Natural Resource Information System (NRIS) and Automated Lands Project (ALP) national applications where ArcView is used as a front end for data entry and manipulation. The increasing use of geospatial applications will cause movement of individuals towards the occasional and advanced GIS user categories.

It should be noted that this team was directed to develop only technical competencies, not general competencies such as communications, e-mail, spreadsheets, and word processing.

GIS User Category Definitions:

Manager: Supervises personnel who are “occasional” and/or “advanced” GIS users; manages major programs that benefit from or support GIS tools and databases. The person in the organization representing this role has a vested interest in the information activity and provides an appropriate level of support to ensure its success.

Examples: Forest Supervisor, District Ranger, SO Staff Officer, WO/RO Director, Regional Forester, Research Project Leader, and FIA Program Manager

Occasional GIS User: Utilizes GIS tools and databases in their work, but not necessarily on a daily basis. GIS use or database support is not the major component of their job.

Examples: Data Steward, Resource Specialist, Scientist/Researcher, Technician, Resource Clerk, Resource Program Manager, and Engineering/Lands Personnel (including Cartographers and Surveyors)

Advanced GIS User: Utilizes GIS tools and databases in their daily work. GIS use, database support, or GIS development is the major component of their job. However, this does not mean the individual is necessarily an “expert” or knows all there is to know on that subject.

Examples: GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer, Resource Analyst/Modeler, and Information Specialist

GIS Skill Level Definitions:

Awareness: Understands the basic concepts and importance of GIS. Required concept may include equipment, cost, and training needs where appropriate. Actual application of GIS will usually require frequent assistance from more experienced GIS and related technology users.

Working Knowledge: Possesses the understanding and experience necessary to function and produce within the geospatial environment. Knows how and why the skill is applied, but may need some help from peer users and/or advanced users to produce desired analyses or products. Depending on the specific skill, the actual knowledge level can vary considerably from position to position, and unit to unit.

Advanced Knowledge: Possesses the understanding and experience necessary to function and produce at a high performance level. Goes to experts or peers at the advanced level for help when needed, but has good command of terminology and methodologies. Can be consulted to explain or demonstrate a broad range of GIS and related geospatial skills and methods.

Products:

The primary product, “Core Competencies for GIS Users”, describes the core competencies and essential skills (tasks) that characterize that competency relative to geospatial technologies. Within each competency a section was developed for each category of GIS user including manager, occasional user, and advanced user. A secondary product is the “Geospatial Core Competencies Matrix for GIS Users.” This matrix identifies core competencies and the associated tasks for the three categories of GIS users. For each task minimum skill level has been assigned: awareness, working knowledge, or advanced knowledge.

Conclusions:

Skilled application of GIS and related technologies is necessary for the Forest Service to meet management objectives and facilitate effective communication with our publics. The Forest Service has made major investments in geospatial hardware and software, and in acquiring large amounts of geospatially referenced data. To effectively utilize this investment Forest Service leadership should recognize the need to provide support, in terms of time, training, and funding, to bring employees’ geospatial skills up to a minimum level in order to meet agency needs. Products from this effort will provide the basis for the continued development of geospatial skills and awareness.

2. Cartography

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Understands appropriate uses of information presented in maps.

Tasks

Cartographic Design

- Understands the skills and costs required for effective cartographic portrayal of information
- Appreciates the impact of properly designed maps for communication of forest management issues

Legality

- Understands implications of inappropriate or illegal use of data

Cartography

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Understands and applies principles of cartographic design and map composition to produce limited map products.

Tasks

Cartographic Design and Map Composition

- Produces maps from a limited variety of data sources and file structures
- Develops or selects from a library of map design templates an appropriate map design for theme being represented
- Selects appropriate scale and content density for theme and data being presented
- Applies symbols and feature labels in an artistically and cartographically sound manner

Map Production

- Produces technically sound maps for administrative and resource uses

FS Manual Specifications

- Produces maps that meet Forest Service specifications and standards

Legality

- Complies with copyright and printing laws

Geographic Name Database/Standards

- Complies with Geographic Name Database/Standards

Cartography

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Understands and applies sound principles of cartographic design and map composition to produce a wide range of map products, including maps for administrative and resource use, lithographic printing and public distribution.

Tasks

Cartographic Design and Map Composition

- Produces maps from a wide variety of available data sources and file structures
- Follows existing map standards for theme presented
- Develops appropriate map design for theme being presented
- Selects appropriate scale and content density for theme and data being presented
- Maintains topologic integrity of data being presented
- Applies symbols and feature labels in an artistically and cartographically sound manner

Map Production

- Produces technically sound maps for administrative and resource uses
- Produces technically sound maps that can be printed lithographically
- Produces technically sound maps that can be reproduced in black and white (for FOIA hardcopy requests)
- Produces technically sound maps that can be served via the Internet and/or Intranet

FS Manual Specifications

- Produces maps that meet Forest Service specifications and standards

Legality

- Complies with copyright and printing laws

Geographic Name Database/Standards

- Complies with Geographic Name Database/Standards

3. Field Data Collection Methods

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Understands value of field data gathered for GIS using traditional and newer high tech equipment and techniques. Recognizes advantages and disadvantages of each method.

Tasks

Global Positioning System (GPS)

- Understands that different types of GPS units vary in cost, accuracy, set up time, and ability to input data into GIS

Field Data Recorders

- Understands that different recorders vary in cost, storage capability, battery requirements, flexibility of data input, and ability to format and transfer files to GIS

Field Data Collection Methods

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Understands and is capable of collecting and/or using field data gathered for GIS using traditional and newer high tech equipment and techniques. Recognizes advantages and disadvantages of each method.

Tasks

Global Positioning System (GPS)

- Understands how different types of GPS units vary in accuracy, set up time, and ability to transfer data into GIS
- Collects field data using GPS
- Differentially corrects GPS data
- Creates and uses data dictionaries per data standards with GPS
- Understands what configurations and physical factors affect accuracy
- Downloads, edits, merges if necessary, and converts GPS data into GIS data

Traditional Surveying

- Understands different accuracies of various traditional methods
- Understands how these methods compare with non-traditional methods in terms of accuracy, speed, and legal necessity
- Understands how it is entered into GIS databases

Laser Data Collection

- Understands how laser field data collection works

Field Data Recorders

- Understands how different recorders vary in storage capability, battery requirements, flexibility of data input, and ability to format and transfer files to GIS
- Uses field data recorders to collect data and/or uses the data from a recorder for GIS
- Downloads, edits, merges if necessary, and transfers field recorder spatial data into GIS format
- Downloads, edits, merges if necessary, and transfers field recorder attribute data into the appropriate database

Hard Copy Mapping

- Creates hard copy maps in the field
- Converts hard copy maps into digital GIS layers

Field Data Collection Methods

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Understands and is capable of collecting and/or using field data gathered for GIS using traditional and newer high tech equipment and techniques. Recognizes advantages and disadvantages of each method.

Tasks

Global Positioning System (GPS)

- Understands how different types of GPS units vary in cost, accuracy, set up time, and ability to transfer data into GIS
- Collects field data per data standards using GPS
- Differentially corrects GPS data
- Creates and uses data dictionaries per data standards with GPS
- Understands what configurations and physical factors affect accuracy
- Downloads, edits, merges if necessary, and enters GPS data into GIS

Traditional Surveying

- Understands different accuracies of various traditional methods
- Understands how these methods compare with non-traditional methods in terms of cost, accuracy, speed, and legal necessity
- Understands how it is entered into GIS data bases

Laser Data Collection

- Understands how laser field data collection works

Field Data Recorders

- Understands how different recorders vary in cost, storage capability, battery requirements, flexibility of data input, and ability to format and transfer files to GIS
- Uses field data recorders to collect data per data standards and/or uses the data from a recorder for populating a GIS
- Downloads, edits, merges if necessary, and transfers field recorder spatial data into GIS
- Downloads, edits, merges if necessary, and transfers field recorder attribute data into the appropriate database

Hard Copy Mapping

- Creates hard copy maps and/or overlays in the field
- Converts data from hard copy maps or overlays into digital GIS layers

4. Geodesy

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Understands the functionality of certain fundamental geodetic principles (coordinate systems, projections, and datums) to GIS data and products

Tasks

Datum

- Understands the significance of datum conversion issues and associated costs (e.g., NAD 27 vs. NAD 83)

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Understands and applies certain fundamental geodetic principles (coordinate systems, projections, and datums) to GIS data and products

Tasks

Coordinate Systems

- Selects and applies appropriate coordinate systems (e.g., UTM, Lat Long, State Plane) to data and products

Projections

- Selects appropriate projection for GIS data and products, and converts other projections as required

Datum

- Selects the correct datum based on local or national standards, and converts as required

Geodesy

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Understands and applies certain fundamental geodetic principles (coordinate systems, projections, and datums) to GIS data and products

Tasks

Coordinate Systems

- Selects and applies appropriate coordinate systems (e.g., UTM, Lat Long, State Plane) to data and products

Projections

- Selects appropriate projection for GIS data and products, and converts other projections as required

Datum

- Selects the correct datum based on local or national standards, and converts as required

5. Geographic Information System (GIS)

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Understands the general concepts of GIS and how it can be utilized effectively as a problem-solving tool for resource management decisions. Supports the integrated inventory concept of gathering data once and using it many times, across boundaries and between agencies. Recognizes the importance of adherence to standards and the implementation of quality assurance measures.

Tasks

Data Capture

- Understands the differences in data capture methods and associated costs

Spatial Analysis

- Understands the applicability of spatial analysis methods in natural resource management

Display

- Aware of GIS output products (e.g., maps, graphs, tables, charts, reports) depending on need

Data Shopping (Sources)

- Aware of available FS data libraries and external data sources (e.g., Internet)
- Employs and encourages "boundaryless behavior" in the development and use of geospatial data

Data Dissemination/Publishing

- Understands and appreciates liabilities associated with sharing data with other entities and the public

Appropriate Use of Data

- Understands limitations of data to avoid misuse and misrepresentation

Legality

- Understands and properly implements laws, FS policies, and regulations regarding the use and release of data

National Applications

- Recognizes that National Applications (e.g., INFRA, NRIS, ALP, TIM) integrate with GIS

Geographic Information System (GIS)

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Works within program goals and procedures to utilize GIS effectively as a problem-solving tool for resource management decisions. Requires skills to analyze situations, gather pertinent data, look at alternative solutions, and make informed decisions; understands and applies the many facets of a GIS to include: data collection, storage, manipulation, analysis, and display of descriptive information about features on the ground to aid decision-making in a natural resource context.

Tasks

Data Capture

- Utilizes a wide variety of data capture methods and equipment (e.g., digitize, scan, and import GPS data)
- Understands and uses manuscripting standards and techniques to prepare map information for input
- Applies appropriate file transfer and data conversion processes to digital data for input into GIS database (e.g., AutoCAD files and image files)
- Enters attribute data into appropriate data base (e.g., ORACLE, INFO, Access)

Spatial Data Editing

- Operates a variety of GIS software modules and tools to create, update, and/or edit spatial data sets per standards
- Utilizes edgematching and vertical integration processes
- Implements quality assurance measures to ensure data integrity

Spatial Analysis

- Manipulates and analyzes spatial data, utilizing attribute data, to support natural resource management
- Understands the potential uses and limitations of spatial analysis methods (vector and raster)
- Performs small-scale and/or single-resource analyses

Display

- Designs and creates output products (e.g., maps, graphs, tables, charts, reports) to effectively display geospatial data based on information needs

Data Query

- Accesses and manipulates spatial and database attributes to answer natural resource questions

Data Models

- Understands geospatial data features (e.g., vector, raster) strengths and limitations sufficient to manipulate and analyze data appropriately
- Understands and implements advanced data models such as regions and routes

Application Development

- Aware of concepts to build tools or customize procedures to enhance the efficiency of geospatial processes (e.g., editing, display, analysis)

Data Shopping (Sources)

- Analyzes data needs to identify appropriate data sources based on compatibility, scale, accuracy, cost, currency, etc.
- Makes efficient use of available FS data libraries and external data sources (e.g., Internet) to locate data
- Employs and encourages "boundaryless behavior" in the development and use of geospatial data

Data Dissemination/Publishing

- Follows FS publishing standards and provides data disclaimers and metadata on data sources
- Uses established process for responding to data requests
- Understands and appreciates liabilities associated with sharing data with other entities and the public

Appropriate Use of Data

- Understands limitations of data from differing sources, taking into account critical factors such as source scale
- Recognizes and understands the differences between accuracy and precision
- Evaluates and uses geospatial and tabular data in an appropriate way to avoid misrepresentation

Legality

- Understands and properly implements laws, FS policies, and regulations regarding the use and release of data

National Applications

- Utilizes National Applications (e.g., INFRA, NRIS, ALP, TIM) which integrate with GIS

Accuracy Assessment

- Evaluates data and/or products to determine if a formal accuracy assessment is necessary

Geographic Information System (GIS)

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Understands and is capable of utilizing GIS effectively as a problem-solving tool for resource management decisions. Requires skills to analyze situations, gather pertinent data, look at alternative solutions, and make informed decisions; understands and applies the many facets of a GIS to include: data collection, storage, manipulation, analysis, and display of descriptive information about features on the ground to aid decision-making in a natural resource context.

Tasks

Data Capture

- Analyzes and recommends data capture methods based upon data type, needs, accuracy, and cost
- Utilizes a wide variety of data capture methods and equipment (e.g., digitize, scan, and import GPS data)
- Understands and uses manuscripting standards and techniques to prepare map information for input
- Applies appropriate file transfer and data conversion processes to digital data for input into GIS database (e.g., AutoCAD files and image files)
- Enters spatial attribute data into appropriate data base (e.g., ORACLE, INFO, Access)

Spatial Data Editing

- Operates and trains others in the use of a variety of GIS software modules and tools to create, update, and/or edit spatial data sets per standards
- Identifies, assesses, and resolves edgematching and vertical integration issues
- Designs and implements quality assurance measures to ensure data integrity

Spatial Analysis

- Manipulates and analyzes spatial data, utilizing attribute data, to support natural resource management
- Understands and teaches others in the potential uses and limitations of spatial analysis methods (vector and raster)
- Performs large-scale and/or multi-resource analyses

Display

- Designs, creates, recommends, and trains others to produce output products (e.g., maps, graphs, tables, charts, reports) to effectively display geospatial data based on information needs
- Uses a variety of applications to create display products (e.g., ArcView, ArcPlot, AML, Visual Basic)

Data Query

- Uses SQL and other query languages to write custom queries and/or create user interfaces for querying
- Accesses and manipulates spatial and database attributes to answer natural resource questions

Data Models

- Understands geospatial data features (e.g., vector, raster) strengths and limitations sufficient to manipulate and analyze data appropriately
- Understands and implements advanced data features such as regions and routes

Application Development

- Designs, creates, customizes, and implements AML, Avenue, and Visual Basic routines and scripts to enhance the efficiency of geospatial processes (e.g., editing, display, analysis) for local GIS users
- Understands programming concepts and how they are used to write routines and build standard toolsets and resource applications

Data Shopping (Sources)

- Analyzes data needs to identify appropriate data sources based on compatibility, scale, accuracy, cost, currency, etc.
- Makes efficient use of available FS data libraries and external data sources (e.g., Internet) to locate data
- Coordinates and encourages "boundaryless behavior" in the development and use of geospatial data
- Develops partnerships and participates with government and private entities to share GIS data and products

Data Dissemination/Publishing

- Follows FS publishing standards and provides data disclaimers and metadata on data sources
- Creates, implements, and manages a process for responding to data requests
- Understands and appreciates liabilities associated with sharing data with other entities and the public

Appropriate Use of Data

- Understands limitations of data from differing sources, taking into account critical factors such as source scale
- Recognizes and understands the differences between accuracy and precision
- Evaluates and uses geospatial and tabular data in an appropriate way to avoid misrepresentation
- Educates others on the ethical and appropriate use of data

Legality

- Understands and properly implements laws, FS policies, and regulations regarding the use and release of data

National Applications

- Coordinates and provides user support with respect to the integration of National Applications (e.g., INFRA, NRIS, ALP, TIM) with GIS

Accuracy Assessment

- Evaluates data and/or products to determine if a formal accuracy assessment is necessary, and if so, performs it

6. Geospatial Database Management

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Is aware of and supports geospatial databases used for resource management decisions. Understands and appreciates database management principles including: data administration and security, data archiving, metadata, application programming, quality assurance and quality control.

Tasks

Data Administration

- Is aware of and supports national and regional core data standards in the database
- Is aware of and supports national and regional data structure
- Is aware of and supports standards for data dictionaries

Database Administration

- Understands the benefit of having an up-to-date database
- Understands the importance of relational data to database administration

Archive/Backup/Retrieval

- Understands the need for archiving and backing up of data on a regular basis

Metadata

- Understands the importance of metadata

Data Security

- Understands FS guidelines for data security

Quality Assurance/Quality Control

- Understands the importance of database quality and adherence to standards
- Understands database quality assurance and control

Geospatial Database Management

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Understands and maintains geospatial databases used for resource management decisions. Utilizes skills to administer and maintain the databases. Understands and applies database management principles including: data administration and security, data archival, metadata, application programming, quality assurance and quality control.

Tasks

Data Administration

- Understands national and regional core data standards in relation to database management
- Recommends changes where necessary to meet national and regional standards
- Adheres to the data structure according to national and regional standards
- Understands and implements standards for data dictionaries
- Guarantees that all data entered into the database adheres to standards

Database Administration

- Recommends the most current information for the corporate database; includes file structure, directory content, individual files and coverages
- Aware of the importance of managing files and related coverages
- Maintains spatially generated attributes stored in relational databases such as ORACLE and PC based databases, unless assigned other data entry roles by those databases

Archive/Backup/Retrieval

- Understands archival, backup and retrieval of data

Metadata

- Inputs metadata

Data Security

- Understands FS guidelines for data security

Quality Assurance/Quality Control

- Follows database guidelines and standards
- Understands database quality assurance and control

Geospatial Database Management

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Understands and maintains geospatial databases (INFRA, NRIS, ALP, etc) used for resource management decisions. Utilizes skills to administer and maintain the databases. Understands and applies database management principles including: data administration and security, data archiving, metadata, application programming, quality assurance and quality control.

Tasks

Data Administration

- Understands and applies national and regional core data standards in the database
- Makes changes where necessary to meet the national or regional standards
- Enforces the data structure according to national and regional standards
- Enforces and educates others as to the relevance of standards for data dictionaries

Database Administration

- Manages and maintains current directories, workspaces and files in corporate database; including file structure, directory content, individual files and coverages
- Educates others about the importance of managing files and related coverages
- Analyzes, maintains and manages spatially generated attributes stored in relational databases such as Spatial Data Engine (SDE), ORACLE and Microsoft Access or PC based databases

Archive/Backup/Retrieval

- Understands and implements archival and backup of data on a regular basis
- Retrieves or restores lost or corrupted data as necessary

Metadata

- Implements and maintains standard metadata documentation

Data Security

- Understands and follow FS guidelines for data security, including electronic FOIA requests
- Selects and maintains read, write and/or execute permission appropriate for users

Quality Assurance/Quality Control

- Guarantees spatial databases and spatially supplied attributes in databases, adhere to quality standards
- Applies and maintains quality control

7. Geospatial Program Management

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Understands the Forest Service GIS implementation plan. Supports geospatial program goals and selects viable options to implement. Provides necessary resources to accomplish program goals and ensures accomplishments are met. Visualizes the big picture scheme of GIS application in the Forest Service mission.

Tasks

Organizational Structure and Resources

- Understands FS organizational structure specific to GIS implementation including hardware/software approval processes and WCF
- Assigns appropriate staff to accomplish program of work

Benefits of geospatial technology

- Understands the benefits of technology

Cost/Benefit

- Understands and accounts for startup and maintenance costs of technology implementation
- Evaluates future geospatial needs and opportunity costs

Training/Awareness Needs

- Recognizes current and future training needs for individuals within and outside the GIS unit
- Elevates training needs
- Recognizes appropriate and timely training sources.
- Communicates information about training opportunities

Contracting Skills

- Aware of contracting rules and regulations
- Aware of contractor product quality issues

Quality Assurance/Quality Control

- Understands of the importance of data quality and adherence to standards
- Understands the purpose of the data library

Geospatial Program Management

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Works within GIS program goals and follows standards and guidelines. Coordinates and develops geospatial data and product needs with GIS program manager. Follows through with budget and workforce priorities to meet program needs. Visualizes the big picture scheme of GIS application in the Forest Service mission.

Tasks

Organizational Structure and Resources

- Understands FS organizational structure specific to GIS implementation
- Plans appropriate staff to accomplish program of work

Benefits of geospatial technology

- Understands the benefits of technology and communicates to managers

Cost/Benefit

- Understands maintenance costs of technology implementation

Training/Awareness Needs

- Elevates training needs and communicates to managers and staff
- Recognizes appropriate and timely training sources.
- Communicates information about training opportunities

Contracting Skills

- Comprehends contracting rules and regulations
- Oversees contractors product quality

Quality Assurance/Quality Control

- Adheres to data guidelines and standards
- Understands data library quality assurance and control

Geospatial Program Management

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Manages GIS program. Coordinates with other program managers to develop data and product needs. Coordinates with other internal and external partners. Provides GIS program alternatives to managers for options in accomplishing program goals. Establishes budget priorities and work schedules. Follows existing standards and direction; develops local policies and guidelines pertaining to GIS as needed. Oversees compliance to standards and processes, and documents year-end accomplishments. Provides or coordinates training for users of GIS and associated geospatial sciences to integrate with GIS. Visualizes the big picture of GIS applications in the Forest Service mission and works toward achieving it.

Tasks

Organizational Structure and Resources

- Understands FS organizational structure specific to GIS implementation including hardware/software approval processes and WCF
- Establishes budget priorities and program of work based on needs and direction
- Identifies and recommends appropriate staff or alternate methods to accomplish program of work
- Reports accomplishments
- Provides program management expertise
- Coordinates with other program managers and internal/external partners
- Oversees adherence to standards and direction
- Establishes local interim standards if necessary

Benefits of geospatial technology

- Understands the benefits of technology and communicates this to managers

Cost/Benefit

- Understands startup and maintenance costs of technology implementation and communicates to managers
- Foresees, identifies, and evaluates future geospatial needs and opportunity costs
- Establishes cost and work plan alternatives to maintain data

Training/Awareness Needs

- Evaluates and determines current and future training needs for individuals within and outside the GIS unit
- Elevates training needs and communicates to managers and staff
- Recognizes and identifies appropriate and timely training sources.
- Communicates and disseminates information about training opportunities

Contracting Skills

- Comprehends contracting rules and regulations with regard to geospatial data and products
- Oversees contractors product quality as applicable to geospatial data and products

Quality Assurance/Quality Control

- Ensures data quality and adherence to standards
- Oversees maintenance of geospatial data library

8. Geospatial Project Management

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Is aware of the concepts of information needs assessments and project management principles. Supports the use of GIS and geospatial tools in accomplishing project goals.

Tasks

Project Design and Implementation

- Promotes the use of information needs assessment (INA) to determine data requirements for specific projects
- Understands why the data should be consistent with national and/or regional standards
- Provides oversight to cost/benefit and risk assessments

Contracting Skills

- Aware of cost issues related to contracting rules and regulations
- Aware of contractor product quality issues

Quality Assurance/Quality Control

- Understands and supports the importance of data quality and adherence to standards
- Understands the purpose of standardized and consistent data sets in the data library and enforces their use

Geospatial Project Management

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Understands, manages and implements project level geospatial data according to recommendations and standards.

Tasks

Project Design and Implementation

- Schedules and participates in information needs assessment with GIS program manager to determine data requirements for a specific project
- Ensures data is consistent with national and/or regional standards so it can be collected once and used multiple times
- Helps to develop and follows interim data standards
- Conducts project cost/benefit analysis and risk analysis alternatives
- Follows corporate project record filing and archiving standards

Contracting Skills

- Comprehends contracting rules and regulations
- Inspects contractors product quality

Quality Assurance/Quality Control

- Follows data quality procedures and adherence to standards
- Follows project documentation procedures
- Implements project data library establishment and coordinates updates to master data sets

Geospatial Project Management

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Recommends geospatial project management procedures. Assists others with project needs development. Understands, manages and implements project level geospatial data. Provides quality checks and balances to ensure consistent data and data products.

Tasks

Project Design and Implementation

- Coordinates and leads information needs assessment with project leader to determine data requirements and work plan for a specific project
- Ensures data is consistent with national and/or regional standards so it can be collected once and used multiple times
- Establishes local interim data standards if necessary
- Assists with project cost/benefit analysis and risk analysis alternatives
- Follows corporate project record filing and archiving standards

Contracting Skills

- Understands and applies contracting rules and regulations
- Supervises contractors product quality

Quality Assurance/Quality Control

- Recommends and follows data quality procedures and adherence to standards
- Recommends and follows project documentation procedures
- Assists project leader with project data library establishment and master data set updates

9. Hardware/System Components

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Aware of differences in hardware configurations and issues related to compatibility and integration. Supports resource commitments unique to GIS activities. Supports the corporate computer environment concept.

Tasks

Servers/PC/Workstations

- Understands basic architecture and specific requirements of PC/Workstation/server network system used for GIS application.
- Assists in acquiring systems with adequate resources to do GIS work.

Operational Speed

- Is aware of limitations of equipment that affect system speed and data transfer rates.
- Ensures appropriate use of media and methods recommended for import, export, and exchange GIS data and information.

Telecommunication Networks

- Assists in acquiring recommended telecommunications technologies in support of GIS work.

Hardware/System Components

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Understands basic computer system (PC/ Workstation) and network (client/server) architecture and function, and can use systems appropriately equipped with respect to memory, disk space, network and server capabilities, printers, plotters, scanners, digitizers, and other peripheral equipment to do GIS work. Supports the corporate computer environment concept.

Tasks

Servers/PC/Workstations

- Understands basic architecture and specific requirements of PC/Workstation/server network system used for GIS application.
- Appropriately uses systems with adequate resources to do GIS work.

Fundamental Digital Concepts

- Is aware of the fundamental concepts of digital computer function, how digital data is acquired, organized, manipulated, and stored, and what forces and events can alter, damage, or destroy digital data in/on different media.

Memory Sizes

- Is aware of computer memory, swap space, file space, etc. requirements of GIS software and geospatial data, and appropriately uses adequately equipped systems to import data, do GIS manipulations, and output needed products.

Operational Speed

- Is aware of limitations of equipment that affect system speed and data transfer rates.
- Appropriately uses media and methods recommended to import, export, and exchange GIS data and information.

Telecommunication Networks

- Appropriately utilizes recommended telecommunications technologies to conduct and support GIS work.

Monitor

- Is aware that computer monitor resolution, color pallet, screen size, etc. affect work organization. Uses appropriately configured systems to do GIS work.

Storage Options

- Utilizes recommended storage options (on-line, off-line) to store data and information as needed.

Input/Output

- Understands Input/Output (I/O) devices and system constraints. Uses recommended I/O media to execute GIS work.
- Operates, and when necessary, adjusts equipment including scanners, digitizers, printers, plotters, and other I/O devices to achieve desired product specifications.

Hardware/System Components

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Understands basic computer system (PC/ Workstation) and network (client/server) architecture and function, and can recommend specific system requirements for memory, disk space, network and server capabilities, printers, plotters, scanners, digitizers and other peripheral equipment attendant to the requirements of GIS. Can participate with the System Specialist to trouble shoot system problems attendant to general requirements of raster and vector GIS or to requirements of specific GIS projects. Supports the corporate computer environment concept.

Tasks

Servers/PC/Workstations

- Understands basic architecture and specific requirements of PC/Workstation/server network system used for GIS application.

Fundamental Digital Concepts

- Is aware of the fundamental concepts of digital computer function, how digital data is acquired, organized, manipulated, and stored, and what forces and events can alter, damage, or destroy digital data in/on different media.

Memory Sizes

- Understands hardware requirements of various GIS software and geospatial data for computer memory, swap space, file space, etc.
- Specifies memory and disk space requirements to utilize the GIS software and geospatial data in the work environment.

Operational Speed

- Understands concepts and limitations of equipment components that affect system speed and data transfer rates.
- Selects appropriate media and methods to import, export, and exchange GIS data and information.

Telecommunication Networks

- Keeps abreast of capabilities of telecommunications networks and utilizes telecommunications technologies as needed to conduct and support GIS work.

Monitor

- Understands computer monitor resolution, color pallet, effect of screen size, etc. on work organization, and uses appropriate display, system, multimedia, and other controls to provide optimum desktop space for GIS work.

Storage Options

- Understands storage options (on-line, off-line) and selects appropriate media and methods to store data and information.

Input/Output

- Understands Input/Output (I/O) devices and system constraints.
- Selects appropriate I/O media to execute GIS work.
- Operates, adjusts, and when necessary, trouble shoots equipment including scanners, digitizers, printers, plotters, and other I/O devices to achieve desired product specifications.

10. Modeling/Analysis

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Understands certain fundamental principles associated with modeling and analysis procedures related to GIS data and products. Cognizant that the use of spatial statistical tools for modeling geospatial data and simulating natural processes provides powerful means for estimation, interpolation, and prediction with insight to variability and reliability of the results. Aware that specific analysis tools also allows insight to the structure and appearance of landscapes.

Tasks

Geospatial Modeling

- Is aware of and supports geospatial modeling techniques which allow interpolation from existing data

Simulation Modeling

- Is aware of and supports techniques to provide predictions of future values from current data (simulation)

Statistics/Sampling

- Is aware of and supports data sampling techniques and basic statistical analyses of GIS data

Landscape Analysis

- Is aware of and supports techniques which analyze the structure and character of landscapes from GIS data

Visualization

- Is aware of and supports GIS processes which allow visual examination of characteristics through computer methodologies (visualization)

Expert Systems

- Is aware of and supports computer programs that contain stored knowledge (expert systems) and may solve problems in a specific field

Modeling/Analysis

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Understands fundamental principles and applies selected techniques associated with modeling and analysis procedures related to GIS data and products. Understands that the use of spatial statistical tools for modeling geospatial data and simulating natural processes provides powerful means for estimation, interpolation, and prediction with insight to variability and reliability of the results. Cognizant that applying specific analysis tools also allows insight to the structure and appearance of landscapes.

Tasks

Geospatial Modeling

- Has knowledge of geospatial modeling techniques which allow interpolation from existing data

Simulation Modeling

- Has knowledge of techniques to provide predictions of future values from current data (simulation)

Statistics/Sampling

- Evaluates and applies appropriate data sampling techniques and basic statistical analyses on GIS data

Landscape Analysis

- Assesses and applies appropriate techniques to analyze the structure and character of landscapes from GIS data

Visualization

- Has knowledge of GIS processes which allow visual examination of characteristics through computer methodologies (visualization)

Expert Systems

- Has knowledge of computer programs that contain stored knowledge (expert systems) and may solve problems in a specific field

Modeling/Analysis

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Understands and applies fundamental principles associated with modeling and analysis procedures related to GIS data and products. Understands that the use of spatial statistical tools for modeling geospatial data and simulating natural processes provides powerful means for estimation, interpolation, and prediction with insight to variability and reliability of the results. Applies specific analysis tools allowing insight to the structure and appearance of landscapes.

Tasks

Geospatial Modeling

- Selects and applies appropriate geospatial modeling techniques to allow interpolation from existing data

Simulation Modeling

- Has knowledge of techniques to provide predictions of future values from current data (simulation)

Statistics/Sampling

- Evaluates and applies appropriate data sampling techniques and basic statistical analyses on GIS data

Landscape Analysis

- Assesses and applies appropriate techniques to analyze the structure and character of landscapes from GIS data

Visualization

- Selects and applies appropriate GIS processes to allow visual examination of characteristics through computer methodologies (visualization)

Expert Systems

- Has knowledge of computer programs that contain stored knowledge (expert systems) and may solve problems in a specific field

11. Remote Sensing

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Aware that remotely sensed data are important to GIS work

Tasks

Aerial Photo Utilization

- Aware that aerial photographs can provide data for input to GIS products and to support inferences made with GIS data

Orthophotos/DOQ

- Aware that orthophotos and DOQs can provide data for input to GIS products and can be accurately registered to other GIS data to provide backdrop detail

Satellite Imagery

- Aware that satellite image derived products are used as input to GIS
- Aware of the corporate image processing software used to classify digital imagery and products needed as input to GIS

Resolution

- Aware of resolution and scale concepts
- Aware of temporal resolution concepts

Remote Sensing

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Aware that remotely sensed data are often vital to GIS work and appropriately applies remote sensing tools with digital imagery to produce GIS information.

Tasks

Aerial Photo Utilization

- Uses aerial photographs as needed to acquire data for input to GIS products, and to support inferences made from GIS data
- Accurately interprets aerial photo images
- Understands basic photogrammetry to support GIS work
- Aware that GIS data can be accurately registered to imagery

Orthophotos/DOQ

- Uses orthophotos and DOQs to accurately register GIS data to provide backdrop detail or to create a base on which to accurately register other image data
- Uses appropriate image processing technology to mosaic, enhance and extract information from orthophotos

Satellite Imagery

- Uses satellite images derived products as input to GIS.
- Aware of capabilities of corporate image processing software to classify digital imagery and to produce products needed as input to GIS.

Thermal Infrared Imagery

- Aware of thermal infrared imagery and its applications

Resolution

- Uses concepts of resolution and scale to detect, identify, and analyze selected features over specified areas in relation to GIS data
- Uses concepts of temporal resolution to select image scenes to facilitate separation of features or phenomena from each other based on their phenology, appearance, disappearance, movement, or change over time

Remote Sensing

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Understands the scientific and technological basis of remote sensing and image processing. Selects appropriate processing and data sources including aerial photography, videography, satellite imagery and GIS data to derive the required information.

Tasks

Aerial Photo Utilization

- Uses aerial photographs as needed to acquire data for input to GIS products, and to support inferences made from GIS data
- Accurately interprets aerial photo images
- Understands basic photogrammetry to support GIS work
- Accurately registers GIS data to digital imagery

Orthophotos/DOQ

- Uses orthophotos and DOQs to accurately register GIS data to provide backdrop detail or to create a base on which to accurately register other image data
- Uses appropriate image processing technology to mosaic, enhance and extract information from orthophotos

Satellite Imagery

- Uses satellite image data to provide products for input to GIS data
- Uses corporate image processing software to classify digital imagery and to produce needed products for GIS

Thermal Infrared Imagery

- Aware of thermal infrared imagery and its applications

Resolution

- Uses concepts of resolution and scale to detect, identify, and analyze selected features over specified areas in relation to GIS data
- Uses concepts of temporal resolution to select image scenes to facilitate separation of features or phenomena from each other based on their phenology, appearance, disappearance, movement, or change over time

12. Serving Data

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Understands, supports, and authorizes resources to support Congressional E-FOIA mandate to provide on-line information and products, and to improve customer information services. Is aware of the Government Paperwork Elimination Act (GPEA) requirements in relation to serving data more efficiently internally and externally.

Tasks

Internet/Intranet (FSWEB)

- Supports the data clearinghouse concept to publish geospatial data, analysis results, maps, and other products on-line

Serving Data

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Supports a variety of methods to meet geospatial information requests. Understands data characteristics and file formats sufficiently to employ a variety of media and methods to disseminate data. Works within national standards and guidelines to support Congressional E-FOIA mandate to provide on-line information and products.

Tasks

Internet/Intranet (FSWEB)

- Utilizes a data clearinghouse to publish geospatial data and products on-line

File Transfer Protocol (FTP)

- Posts and retrieves geospatial files and associated text files to and from FTP sites
- Manages data on FTP sites

E-Mailing Data

- Understands file size limitations and formats to ensure successful transfer of geospatial data sets

File Compression/Formats

- Utilizes various compression techniques to decrease file size as appropriate
- Selects and converts data to appropriate file format based on needs, data characteristics, and degree of acceptable data loss
- Determines suitable media for data distribution (e.g., CD-ROM, tape, Zip)

Serving Data

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Evaluates, recommends and supports a variety of methods to meet geospatial information requests. Understands data characteristics and file formats sufficiently to employ a variety of media and methods to disseminate data. Provides local recommendations and works within national standards and guidelines to support Congressional E-FOIA mandate to provide on-line information and products.

Tasks

Internet/Intranet (FSWEB)

- Provides recommendations for inter/intranet site design and implementation.
- Assists with or manages local site to publish geospatial data and products on-line
- Coordinates with a data clearinghouse to publish geospatial data and products on-line
- Provides coordination and recommendations to assist other Forest Service users in posting and maintaining geospatial data and associated metadata

File Transfer Protocol (FTP)

- Posts and retrieves geospatial files and associated text files to and from FTP sites
- Manages data on FTP sites

E-Mailing Data

- Understands file size limitations and formats to ensure successful transfer of geospatial data sets

File Compression/Formats

- Utilizes various compression techniques to decrease file size as appropriate
- Selects and converts data to appropriate file format based on needs, data characteristics, and degree of acceptable data loss
- Determines suitable media for data distribution (e.g., CD-ROM, tape, Zip)

13. Software

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Understands the uses of a variety of software within the FS corporate environment on multiple platforms to enhance efficiency of GIS work. Is aware of proprietary software (e.g., ARC/INFO, Lotus Notes Databases, ORACLE) and FS-developed national software applications (e.g., ALP/NILS, INFRA, NRIS, TIM).

Tasks

Operating Systems

- Aware of operating systems (e.g., UNIX, Microsoft) used to access, store, and process geospatial data

Security Systems

- Understands the confines of the existing security systems

Space Management

- Cognizant of large space requirements for geospatial processing and file storage
- Assists in ensuring sufficient storage space is available for geospatial storage and processing

Software

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Understands and uses a variety of software within the FS corporate environment on multiple platforms to enhance efficiency of GIS work

Tasks

Operating Systems

- Uses operating systems (e.g., UNIX, Microsoft) to access, store, and process geospatial data

Security Systems

- Understands and works within the confines of the existing security systems

File Access Permissions/ORACLE Roles

- Understands file permissions, ORACLE roles, etc., as appropriate to meet users' needs

Space Management

- Estimates needs and coordinates with systems manager to ensure sufficient working space for geospatial processing and file storage

Software Updates

- Keeps abreast of geospatial software updates

Software

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Understands and uses a variety of software within the FS corporate environment on multiple platforms to enhance efficiency of GIS work

Tasks

Operating Systems

- Uses operating systems (e.g., UNIX, Microsoft) to access, store, and process geospatial data

Security Systems

- Understands and works within the confines of the existing security systems

File Access Permissions/ORACLE Roles

- Recommends and coordinates file permissions, ORACLE roles, etc., as appropriate to meet users' needs

Space Management

- Estimates needs and coordinates with systems manager to ensure sufficient working space for geospatial processing and file storage

Software Updates

- Keeps abreast of geospatial software updates and recommends local update schedule

14. Surveying

Manager

(Forest Supervisor, District Ranger, Staff Officer, Research Project Leader)

Core Competency

Understands basic elements of land description, and the limitations of land survey data.

Tasks

Land Description Systems

- Recognizes the use of the Public Land Survey System and metes and bounds as a frame of reference for other geospatial data

Limitations of Data

- Is aware that survey data is limited by timeliness, method and purpose of survey, and changing technology

Surveying

Occasional GIS User

(Data Steward, Resource Specialist, Scientist/Researcher, Technician)

Core Competency

Understands and applies the elements of land description, survey data sources, and the limitations of land survey data.

Tasks

Land Description Systems

- Uses Public Land Survey System as frame of reference for other geospatial layers and preserves PLSS positions & attributes.
- Creates GIS features from metes and bounds descriptions
- Understands principles of basis of bearings, and how to apply rotation angles to data entered with dimensions.
- Recognizes conflicting calls and can find help in resolving them.
- Understands how urban subdivisions differ from PLSS parcels

Geo Coordinate Database (GCDB)

- Recognizes the BLM Geographic Coordinate Data Base (GCDB) as a distinct and official source of data

Limitations of Data

- Integrates survey data into GIS with respect for the limitations of timeliness, method and purpose of survey, and changing technology

Surveying

Advanced GIS User

(GIS Specialist, Remote Sensing Specialist, GIS Coordinator, GIS Developer)

Core Competency

Understands and applies the elements of land description, survey data sources, and the limitations of land survey data.

Tasks

Land Description Systems

- Uses Public Land Survey System as frame of reference for other geospatial layers and preserves PLSS positions & attributes.
- Creates GIS features from metes and bounds descriptions
- Understands principles of basis of bearings, and how to apply rotation angles to data entered with dimensions.
- Is able to resolve conflicting calls with the help of surveyors or legal technicians
- Understands urban subdivisions, methods of capture, and how they differ from PLSS parcels

Geo Coordinate Database (GCDB)

- Is able to import features from the BLM Geographic Coordinate Data Base (GCDB)

Limitations of Data

- Integrates survey data into GIS with respect for the limitations of timeliness, method and purpose of survey, and changing technology

15. Appendix

Appendix A – Geospatial Core Competencies Matrix for GIS Users

Geospatial Skills	Managers	Occasional GIS Users	Advanced GIS Users
Cartography			
Cartographic Design	Awareness	Working Knowledge	Advanced Knowledge
Map Composition		Working Knowledge	Advanced Knowledge
Symbology and Labeling		Working Knowledge	Advanced Knowledge
Data Scales		Working Knowledge	Advanced Knowledge
Map Production		Working Knowledge	Working Knowledge
Lithographic Printing		Working Knowledge	Working Knowledge
FS Manual Specifications	Awareness	Working Knowledge	Advanced Knowledge
Copyright Compliance	Awareness	Working Knowledge	Working Knowledge
Standards		Awareness	Working Knowledge
Geographic Names		Awareness	Working Knowledge
National Map Accuracy Standards		Awareness	Working Knowledge
Field Data Collection Methods			
Global Positioning System (GPS)	Awareness	Working Knowledge	Working Knowledge
Traditional Surveying		Awareness	Awareness
Hand-held Laser Data Collection		Awareness	Awareness
Field Data Recorders	Awareness	Working Knowledge	Working Knowledge
Hard Copy Mapping		Working Knowledge	Working Knowledge
Geodesy			
Coordinate Systems		Working Knowledge	Working Knowledge
Projections		Working Knowledge	Working Knowledge
Datums	Awareness	Working Knowledge	Working Knowledge

Geospatial Skills	Managers	Occasional GIS Users	Advanced GIS Users
Geospatial Database Management			
Data Administration	Awareness	Working Knowledge	Advanced Knowledge
Data Standards		Working Knowledge	Advanced Knowledge
Data Structure		Working Knowledge	Advanced Knowledge
Data Dictionary		Working Knowledge	Advanced Knowledge
Database Administration	Awareness	Working Knowledge	Advanced Knowledge
File Management		Working Knowledge	Advanced Knowledge
Maintenance	Awareness	Working Knowledge	Advanced Knowledge
Mgmt of Attributes Stored in Relational DB's		Working Knowledge	Advanced Knowledge
Archive/Backup/Retrieval	Awareness	Working Knowledge	Working Knowledge
Metadata	Awareness	Working Knowledge	Advanced Knowledge
Data Security	Awareness	Awareness	Working Knowledge
GPEA, including E-FOIA	Awareness	Awareness	Working Knowledge
Quality Assurance/Quality Control	Awareness	Working Knowledge	Advanced Knowledge
Geospatial Program Management			
Organizational Structure and Resources	Awareness	Awareness	Working Knowledge
Benefits of geospatial technology	Working Knowledge	Working Knowledge	Advanced Knowledge
Cost/Benefit	Working Knowledge	Awareness	Advanced Knowledge
Startup Costs	Working Knowledge	Awareness	Advanced Knowledge
Maintenance Costs	Working Knowledge	Awareness	Advanced Knowledge
Training/Awareness Needs	Working Knowledge	Working Knowledge	Working Knowledge
Skills Assessment	Working Knowledge	Awareness	Working Knowledge
Training Sources	Awareness	Awareness	Advanced Knowledge
Quality Assurance/Quality Control	Awareness	Working Knowledge	Advanced Knowledge

Geospatial Skills	Managers	Occasional GIS Users	Advanced GIS Users
Geospatial Project Management			
Project Design and Implementation	Awareness	Working Knowledge	Advanced Knowledge
Information Needs Assessment	Awareness	Working Knowledge	Advanced Knowledge
Contracting Skills	Awareness	Working Knowledge	Working Knowledge
Quality Assurance/Quality Control	Awareness	Working Knowledge	Advanced Knowledge
Geographic Information Systems			
Data Capture	Awareness	Working Knowledge	Advanced Knowledge
Digitizing		Working Knowledge	Advanced Knowledge
Scanning		Working Knowledge	Advanced Knowledge
COGO		Awareness	Awareness
File Transfer		Working Knowledge	Working Knowledge
Data Format Conversions		Working Knowledge	Working Knowledge
GPS Import		Working Knowledge	Working Knowledge
Attributing		Working Knowledge	Advanced Knowledge
Spatial Data Editing		Working Knowledge	Advanced Knowledge
Edgematching		Working Knowledge	Advanced Knowledge
Vertical Integration/Coincidence		Working Knowledge	Advanced Knowledge
Spatial Analysis	Awareness	Working Knowledge	Advanced Knowledge
Overlays		Working Knowledge	Advanced Knowledge
Network Analysis		Working Knowledge	Advanced Knowledge
Display	Awareness	Working Knowledge	Advanced Knowledge
Data Query		Working Knowledge	Advanced Knowledge
Data Models (Raster/Vector)		Working Knowledge	Working Knowledge
Application Development		Awareness	Working Knowledge
Customization		Awareness	Working Knowledge

Geospatial Skills	Managers	Occasional GIS Users	Advanced GIS Users
Programming		Awareness	Working Knowledge
Data Shopping (Sources)	Awareness	Working Knowledge	Advanced Knowledge
Data Sharing/Partnerships	Awareness	Working Knowledge	Advanced Knowledge
Data Dissemination/Publishing	Awareness	Awareness	Advanced Knowledge
Data Liability	Awareness	Awareness	Working Knowledge
Appropriate/Ethical Use of Data	Awareness	Working Knowledge	Advanced Knowledge
Accuracy and Precision	Awareness	Working Knowledge	Advanced Knowledge
Legality Law/Policy/Regulation	Working Knowledge	Working Knowledge	Working Knowledge
National Applications	Awareness	Working Knowledge	Working Knowledge
Accuracy Assessment		Awareness	Working Knowledge
Hardware/System Components			
Servers/PC/Workstation	Awareness	Awareness	Working Knowledge
Fundamental Digital Concepts		Awareness	Awareness
Memory Sizes		Awareness	Working Knowledge
Operational Speeds	Awareness	Awareness	Working Knowledge
Telecommunication Networks	Awareness	Awareness	Working Knowledge
Monitor		Awareness	Working Knowledge
Storage Options		Awareness	Working Knowledge
Input		Working Knowledge	Advanced Knowledge
Digitizers		Working Knowledge	Advanced Knowledge
Scanners		Working Knowledge	Advanced Knowledge
Keyboard/Mouse		Working Knowledge	Working Knowledge
Output		Working Knowledge	Advanced Knowledge
Plotters/Printers		Working Knowledge	Advanced Knowledge
Modeling/Analysis			

Geospatial Skills	Managers	Occasional GIS Users	Advanced GIS Users
Geospatial Modeling	Awareness	Awareness	Working Knowledge
Simulation Modeling	Awareness	Awareness	Awareness
Statistics/Sampling	Awareness	Working Knowledge	Working Knowledge
Landscape Analysis	Awareness	Working Knowledge	Working Knowledge
Visualization	Awareness	Awareness	Working Knowledge
Expert Systems	Awareness	Awareness	Awareness
Remote Sensing			
Aerial Photo Utilization	Awareness	Working Knowledge	Working Knowledge
Photo Interpretation		Working Knowledge	Working Knowledge
Infrared/Color		Working Knowledge	Working Knowledge
Photogrammetry/Photogeometry		Working Knowledge	Working Knowledge
Digital Camera/Videography		Awareness	Working Knowledge
Orthophotos/DOQ	Awareness	Working Knowledge	Working Knowledge
Satellite Imagery	Awareness	Awareness	Working Knowledge
Image Processing		Awareness	Working Knowledge
Electromagnetic Spectrum		Awareness	Working Knowledge
Thermal Infrared Imagery		Awareness	Awareness
Resolution	Awareness	Working Knowledge	Working Knowledge
Spectral		Working Knowledge	Working Knowledge
Spatial		Working Knowledge	Working Knowledge
Radiometric		Working Knowledge	Working Knowledge
Temporal		Working Knowledge	Working Knowledge
Serving Data			
Internet (WWW)	Awareness	Working Knowledge	Advanced Knowledge
Intranet (FSWEB)	Awareness	Working Knowledge	Working Knowledge

Geospatial Skills	Managers	Occasional GIS Users	Advanced GIS Users
File Transfer Protocol (FTP)		Working Knowledge	Working Knowledge
E-Mailing Data		Working Knowledge	Working Knowledge
File Compression/Formats		Working Knowledge	Working Knowledge
Software			
Operating Systems	Awareness	Working Knowledge	Working Knowledge
Security Systems	Awareness	Awareness	Awareness
File Access Permissions/ORACLE Roles		Awareness	Working Knowledge
Space Management	Awareness	Working Knowledge	Working Knowledge
Software Versioning		Awareness	Working Knowledge
Surveying			
Land Description Systems		Working Knowledge	Working Knowledge
Public Land Survey System	Awareness	Working Knowledge	Working Knowledge
Metes and Bounds		Working Knowledge	Working Knowledge
Rotation/Basis of Bearings		Working Knowledge	Working Knowledge
Conflicting Calls		Awareness	Awareness
Urban Subdivision		Awareness	Awareness
Geo Coordinate Data Base (GCDB)		Awareness	Working Knowledge
Limitations of Data	Awareness	Working Knowledge	Working Knowledge
Timeliness/Age of Survey	Awareness	Working Knowledge	Working Knowledge
Resolution	Awareness	Working Knowledge	Working Knowledge

Appendix B – Geospatial Advisory Committee Issue #3 Report

Issue 3: There is a need to develop geospatial expertise and support expertise as well as awareness now and in future employees.

Issue #3 Team Members:

Robin Carroll - Team Leader
Henry Lachowski
Ron Gendreau
Jenny Rechel
Steve Gregonis

Recommendation 1: Perform workload analysis to identify staffing and skill requirements

- Action 1: Identify the resource management requirements for Geospatial data
- Action 2: Perform Geospatial workload analysis
- Action 3: Establish the required Geospatial knowledge and skills (Core Competencies)
- Action 4: Establish suggested staffing requirements for successful management of Geospatial duties
- Action 5: Share information and findings from Actions 1 through 4 with the National Application Managers as information for their implementation plans.

Recommendation 2: Develop and implement a recruiting and placement plan, i.e. feed the pipeline

- Action 1: Add a specific requirement for knowledge of Geospatial technologies and applications to the position descriptions for resource managers and research project leaders.
- Action 2: Add specific requirements for Geospatial education and/or experience in the position descriptions of resource specialists and research scientists and research technicians.
- Action 3: Investigate establishing a Geospatial Specialist Series with Office of Personnel Management.
- Action 4: Ensure that the Geospatial staffing requirements are included in Human Resource staffing studies.

Recommendation 3: Sponsor training for key technical Geospatial courses to be delivered to the field

- Action 1: Establish overall geospatial training support strategy for the FS
- Action 2: Identify existing Geospatial courses
- Action 3: Identify required courses for introductory/intermediate/advanced level technical Geospatial users.
- Action 4: Investigate the various methods to deliver the above course material
- Action 5: Develop identified required courses for technical Geospatial users.
- Action 6: Create and maintain a catalogue of Geospatial courses for Users
- Action 7: Develop a blanket Virtual campus National Training Contract

Recommendation 4: Develop a strategy for developing Geospatial awareness within the FS

- Action 1: Develop Geospatial awareness briefing for WO, Regional Office, and Station Directors
- Action 2: Develop Geospatial awareness briefing for Field Line Officers and Field Lab Managers
- Action 3: Develop action plan to deliver the two previous awareness briefings

Recommendation 5: Coordinate with IRM to improve operating system (OS) administrator skills in support of Geospatial activities

- Action 1: Develop Geospatial requirements awareness course for systems personnel
- Action 2: Develop operating systems awareness course for Geospatial personnel
- Action 3: Develop specific system requirement training for upcoming Geospatial packages for systems personnel
- Action 4: Predict future hardware/software needs of the Geospatial community in order to help plan for Geospatial needs ahead of time

Recommendation 6: Conduct a biennial Geospatial workshop

- Action 1: Solicit for a Chair of the FY2001 Biennial Geospatial Workshop
- Action 2: Establish Chair of Technical Program Subcommittee
- Action 3: Establish Chair of Logistics Subcommittee
- Action 4: Establish workshop agenda 6 months prior to meeting
- Action 5: Inform other agencies (federal, state, local) of FS workshop

Appendix C – Work Plan for Core Competencies Action Team

Geospatial Advisory Committee Issue #3

August 22, 2000

Basic Direction taken from Issue Report to Geospatial Executive Board:

- Issue 3 - There is a need to develop geospatial expertise and support expertise as well as awareness now and in future employees.
 - Recommendation 1 - Perform workload analysis to identify staffing and skill requirements.
 - Action 3 - Establish the required geospatial knowledge and skill (Core Competencies)

Team Members (tentative):

1. Bruce Williams (GSTC/team co-leader)
2. Jule Caylor (RSAC/team co-leader)
3. Mike Hoppus (NE)
4. Dave Spildie (RMRS)
5. Tom Stockslager (R2)
6. Glenna Siegfried (R3-Prescott)
7. Joe Calderwood (R4)
8. Laura Folwell (R8 - Chattahoochee-Oconee)
9. Lowell Suring (R10 - Chugach)

Objectives:

- To identify basic geospatial knowledge and skills (core competencies) for three levels of GIS users across the organization.
- To determine what level of understanding is required for a variety geospatial sciences and specialties.

Timeline:

- Action team meeting scheduled for August 22-24, 2000 at GSTC
- Products to be completed by September 30, 2000

Products:

- Written report listing specific GIS core competencies will include summary (probably a matrix) and supporting documentation. Documentation will be sufficient for specific staffing and skill planning, and will be used to complete several subsequent Issue 3 action items.

Budget:

- \$6,000 approved for team travel in FY2000

Narrative:

- The overall objective of this team is to identify core competencies for three levels of GIS users; managers, occasional GIS users, and high end or advanced GIS users.
- To perform their job duties and responsibilities, GIS users need a certain level of understanding of a wide variety of geospatial sciences and specialties including remote sensing (photo interpretation and image analysis), GIS, cartography, photogrammetry, geodesy, surveying (public land survey system and metes and bounds), geospatial database management, field data collection methods, management of attributes stored in relational databases, visualization, and serving data via Internet and FTP. The various organizational levels of the Forest Service (Districts/Field Labs, Forests, Regions/Stations, and National) will be considered in the analysis.
- Team members were intended to represent a cross section of the Forest Service - personnel with day-to-day resource and GIS responsibilities, knowledge of National applications (NRIS, INFRA, ALP, TIM, etc.) and FS Research needs and applications, and a Human Resources representative.
- Specific tasks will include establishing a process and protocol for developing core competencies, and developing a matrix displaying what skill level (core competency) is required to perform GIS work at the various user levels identified for each of the geospatial specialties. Matrices developed by the NRIS Terra group and by Region 8 (John Caffin and Bill Clerke), may serve as examples. A listing of specific GIS core competencies will be another product.

Appendix D – Core Competencies Team Members

Members	Title	Location	Phone
Bruce Williams - Co-Chair	Geospatial Training Program Manager	Geospatial Service and Technology Center	(801) 975-3818
Jule Caylor - Co-Chair	Inventory, Analysis, & Accuracy Assessment Program Leader	Remote Sensing Applications Center	(801) 975-3754
Joe Calderwood	Cartographer/Visual Information Team Leader	R4	(801) 625-5213
Laura Folwell	GIS Specialist	R8 - Chattahoochee-Oconee NF	(770) 297-3048
Mike Hoppus	Research Forester	NE - Forest Inventory & Analysis	(610) 557-4039
Glenna Siegfried	Forest GIS Coordinator	R3 - Prescott NF	(520) 771-4788
Dave Spildie	Biologist	Rocky Mountain Research Station	(406) 542-4190
Tom Stockslager	Land Surveyor	R2	(303) 275-5178
Lowell Suring	Wildlife Biologist	R10 - Chugach NF	(907) 271-2836
Debbi White	Analytical Tools Specialist	NRIS - Tools	(541) 383-4030