



USDA Forest Service, Region 9 Information Management

Region 9 GIS Strategy: Roles, Data Management, and Forest/Prairie Priorities

July 2013



US Forest Service – Region 9



Executive Summary

The application of geospatial technology and information within the U.S. Forest Service has grown exponentially over the past three decades. Recent changes in geospatial business processes at the national level have had major impacts on field level GIS programs. Therefore, the USFS Eastern Region has recognized that its geospatial organization must adapt to meet the evolving needs of the agency. Adjustments of roles, responsibilities, priorities, communication, training, and staffs are needed to successfully acclimate to the current needs of the agency.

In 2013, R9 Information Management formed a strategic planning team to formally assess region-wide geospatial data management issues and produce recommendations for future action. The results are summarized in this strategy document. The target audience of this document is R9 leadership, including line officers and supervisors of unit level geospatial programs.

As a result of extended analysis and discussions with the R9 GIS community, seven broad issues were identified that captured the “state of GIS” in the region. Five high level strategic goals were developed to address these issues, including both data management and stewardship issues. The goals below define a desired condition that the region should strive to achieve over the next 3-5 years.

Strategic Goal 1: *Geospatial roles and responsibilities are staffed and aligned to support Unit and Regional priorities effectively as well as the mission of the agency.*

Strategic Goal 2: *Geospatial priorities are consistently governed across all units and programs and are linked to a defined program of work.*

Strategic Goal 3: *Cultivate and sustain a culture dedicated to improving the geospatial awareness and abilities of employees.*

Strategic Goal 4: *Maintain and support a comprehensive data standardization program that provides direction in the administration, quality, use, distribution, replication and governance of geospatial data.*

Strategic Goal 5: *Lands information, as the foundational base dataset, is of high quality and becomes the authoritative dataset for most mapping and analysis.*

Nine recommendations were developed to meet the strategic goals: 1) Evaluate the R9 geospatial organization, 2) Develop a Data Stewardship strategy, 3) Author a Data Management Plan, 4) Enhance Geospatial Coordination, 5) Define Priorities, 6) Establish Core Skills, 7) Develop an R9 Training Plan, 8) Enhance Data Distribution, and 9) Develop a Regional Strategy for Managing Lands Data.

The recommendations delineate specific measures (initiatives) leadership should implement to achieve the desired condition and are designed to be achievable and compatible with one another. While this strategy is ambitious, goals are achievable with appropriate funding, planning, implementation, and leadership. The overall intent of this strategy is to better define the roles and responsibilities of geospatial activities and organization in the Eastern Region, make recommendations to improve

effectiveness, and to meet national strategic goals for science-based management that requires geospatial data.

Next steps in this process include engagement with R9 leadership to determine which recommendations to implement given diminishing staff and budgets. Failure to act will support inefficient business practices and will result in long-term impacts to the region.

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1. Introduction

The application of geospatial technology and information within the U.S. Forest Service (USFS) has grown exponentially over the past three decades. The USFS has invested over \$1 billion in the development of geographic information systems (GIS) and associated data, tools, and applications (GMO, 2012). The agency currently spends approximately 25% of its annual budget on information resources (hardware, software, staffing) and will continue to do so for the foreseeable future (USFS, 2010). The Forest Service requires accurate, comprehensive, reliable, up-to-date, and accessible geospatial information at every level of the agency to meet the objectives of its mission (USFS, 2005).

The rapid expansion and evolution of geospatial technology (e.g. software, infrastructure, mobile, services, data, and standards) over the past two decades has brought many challenges to the USFS with respect to resource information management. The agency struggles to create and maintain geospatial information at all levels (NRM, 2010). The USFS faces many issues related to geospatial data management such as roles, responsibilities, Information Technology (IT) infrastructure, stewardship, distribution, governance, and implementation of emerging technology (GMO, 2012). The USFS Chief Information Office (CIO), Geospatial Management Office (GMO), and Natural Resource Manager (NRM) have all recognized these challenges in previous planning efforts. The CIO and NRM have made significant progress in restructuring their organizations and business processes to meet current and future technological needs of the agency ((CIO, 2012), (NRM, 2011)).

The Eastern Region (R9) recognizes the major impacts and opportunities caused by the rapid evolution of geospatial technology at the local and national level. Centralization of geospatial roles, responsibilities, and data with the evolution of standards and governance has significantly impacted regional information management, field level GIS programs, and resource staff. Reliance on complex, interconnected systems has proven to be a significant challenge to our decentralized agency resulting in geospatial effectiveness of the agency that is functionally adequate, not optimized (GMO, 2012). The lack of comprehensive geospatial coordination has stifled data administration, stewardship, and awareness with increased frustration amongst staff due to undefined roles, responsibilities, and priorities.

In 2013, R9 Information Management formed a strategic planning team to formally assess region-wide geospatial data management issues and produce recommendations for future action. The planning team was composed of Regional Office (RO) and field staff. Team members and methodology of this planning effort are described in [Appendix A](#). A systematic planning process that included research, surveys, interviews, and analysis was utilized for this endeavor. Following extended analysis and discussions, the planning team recognized seven broad issues that captured the “state of GIS” in the region:

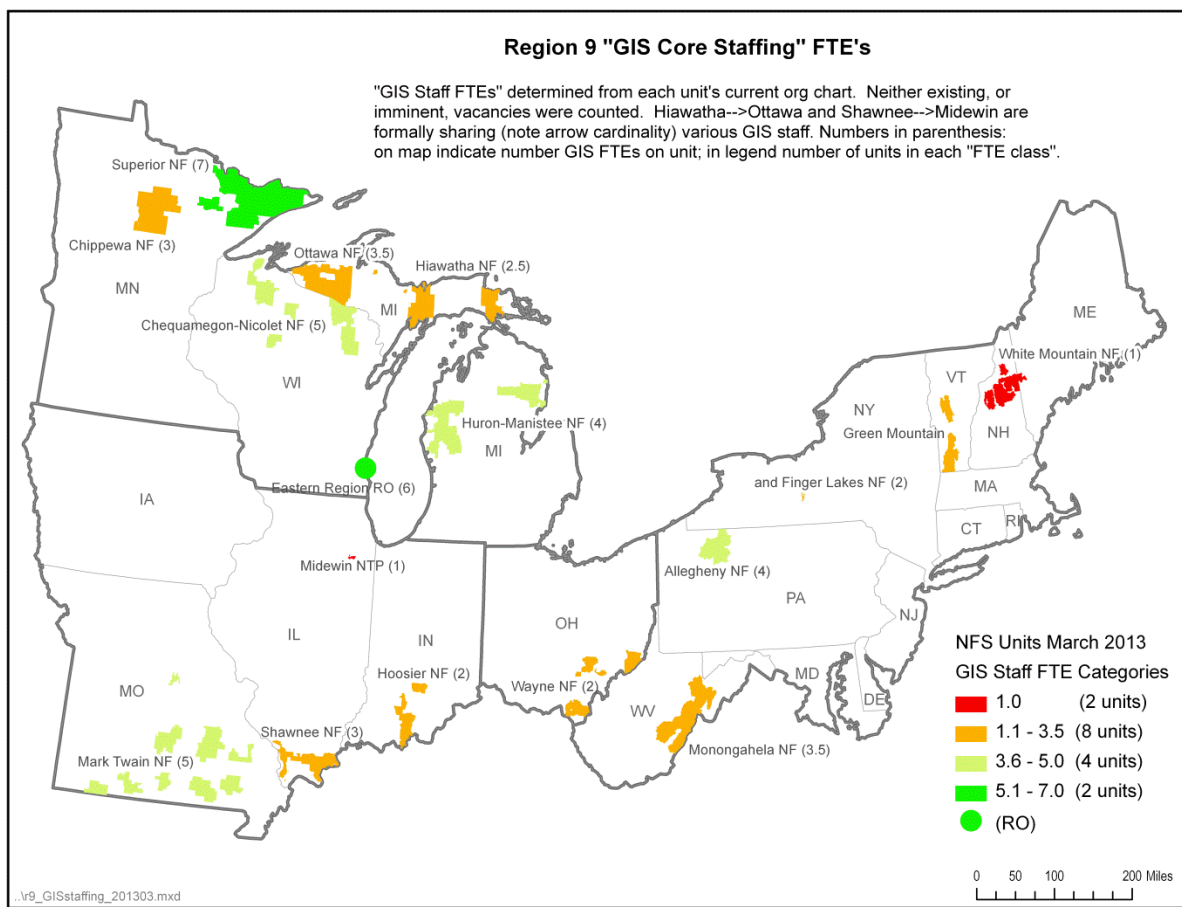
1. Geospatial organizational roles, responsibilities, and priorities are not well defined or governed to effectively address the USFS mission.
2. Geospatial workforce requires staffing, baseline competency levels, training and awareness that presently are not sufficiently supported by leadership.
3. The USFS has complex interdependent systems where poor geospatial coordination has increased replication, hindered data quality, and stifled data stewardship.
4. Existing data standards are inadequate to support quality geospatial data to meet the diverse and shifting business needs of the agency at the field level.

5. Prolonged, wait-to-resolve management within an environment of rapidly evolving technology has adversely impacted workforce efficiency and workflow decisions.
6. Current data distribution and publication methods do not fulfill the public's expectations nor are they keeping pace with current industry best practices.
7. The Forest Service has not been able to effectively manage the volume of resource information needed to keep pace with practitioner and management demands.

The purpose of this document is to present goals, recommendations, and an implementation strategy to R9 leadership. Recommendations are designed to help the Eastern Region conform to the objectives documented in the USDA Forest Service Information Resources Strategic Framework (USFS, 2010). Additionally, this strategy will assist R9 leadership in fulfilling Objective 5.1 *"Improving accountability through effective strategic and land management planning and efficient use of data and technology in resource management"* of the USDA Forest Service Strategic Plan (USFS, 2007).

Recommendations described in this document set a course of action for arriving to the desired condition defined in the [strategic goals](#). This strategy is designed to guide leadership for the next 3 to 5 years. This plan is a living document and should be reevaluated annually by R9 Information Management.

2. Current Situation



Map 1: "GIS Core Staffing" map indicating the 54 total FTE's throughout R9.

2.1 Who are we?

The Eastern Region geospatial community is comprised of a diverse group of resource professionals and GIS experts. At current staffing levels, there are 54 full time equivalent (FTE) geospatial professionals on 14 National Forests, 1 National Tallgrass Prairie, and the Region 9 Information Management program. R9 IM, field GIS programs, and resource staff are dedicated toward the coordination and enhancement of corporate databases, GIS, GPS, remote sensing, inventory and monitoring, alternative analysis, standards, and geospatial services to support the USFS mission and the Eastern Region's vision of *Courageous Conservation* (R9, 2006). In many cases, GIS staff support and perform the creation, maintenance, distribution and use of spatial information.

Field level GIS programs in R9 serve a diverse spectrum of stakeholders at all levels of the agency. GIS program staffs perform analysis for resource staff, program managers, and leadership within each field unit, thereby providing repeatable, defensible decision support. Field level GIS professionals implement standards and requirements set by the CIO, NRM, GMO, and RO. GIS staffs train resource professionals on the use of software, tools, and applications. Data administration, spatial analysis, map production, data distribution, local project and planning support are additional roles field level GIS and resource staff fulfill. R9 Information Management staff coordinates with national and field programs to develop, clarify, support and monitor standards and procedures, and coordinate and develop data access and analysis applications that can be used by many to most R9 units.

2.2 Where are we now?

Organization: National Forests and National Tallgrass Prairie of the Eastern Region are as diverse as the landscape it encompasses. Each forest and prairie of R9 has a unique organizational structure with no two units having identical staffing, structure, or roles within their geospatial staff. The team identified 20 unique position titles under 7 different job series out of 26 survey respondents ([Appendix B](#)). Inconsistencies in organizational structure and staffing have created an environment that makes it difficult to implement enterprise standards, assign roles, and create a data stewardship program on a regional scale.

Skillsets and Training: The skillsets of GIS professionals in the region were evaluated. Twenty-six percent of survey respondents have a graduate degree in GIS, remote sensing, geography or other closely related discipline. Over half of the respondents have college degrees in other resource areas such as biological or physical sciences. Eleven percent holds no college degree. GIS staff in Region 9 does have excellent institutional knowledge and are proficient in cartography, spatial analysis, spatial editing, and general geodatabase administration, validated in the R9 GIS Roles/Responsibilities Survey. However, the region lacks advanced geospatial skillsets such as scripting, programming, ArcGIS Server, remote sensing, digital image processing, quantitative methods, accuracy assessments, LiDAR data processing, and mobile technology (Figure 1). Nearly half of the survey respondents believed their geospatial skillsets were underutilized within their current position due to limited access to technology and poorly defined roles, governance, or priorities. Furthermore, regional and unit level resource staff requires fundamental geospatial skillsets as a mandatory component of their duties. These skills are not sufficiently present throughout the region. Without fundamental geospatial skills, resource staff are deficient in performing their data stewardship duties, and the burden falls to GIS staff.

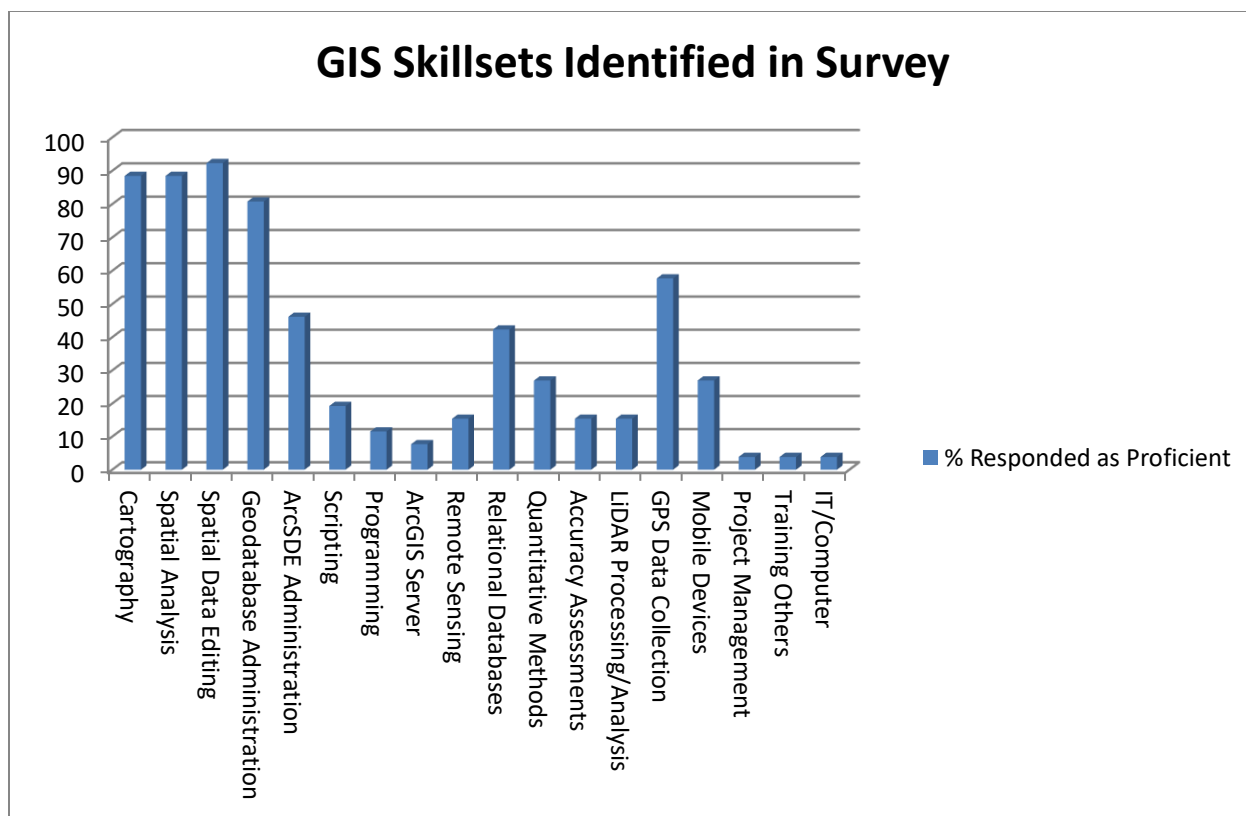


Figure 1: Proficient skillsets of R9 geospatial staff as identified by the GIS Roles/Responsibilities Survey.

The USFS provides a wide range of introductory (and some intermediate) training opportunities to maintain and enhance geospatial skillsets. The Geospatial Technology and Service Center (GSTC) offers numerous free and virtual GIS courses. Additionally, NRM and field level GIS program staff provide resource professionals with virtual and classroom training opportunities related to national applications and Esri GIS software support. Conversely, the team recognized that there is little opportunity (time and budget) for training beyond basic-level GIS courses. Making training a priority is essential to help maintain and enhance existing skills related to advanced GIS or emerging technology.

Program of Work: Field level GIS programs in the Eastern Region do not have a defined Program of Work (POW). There are some units in the region that do define specific goals to be achieved on an annual basis; however, the POW of field level GIS programs in R9 can best be described as “specifically undefined with a vague purpose to support other staff areas with their POW.” The majority of the geospatial community in R9 identified their POW and associated priorities as “reactionary” rather than “proactive and progressive.” Furthermore, Budgetary Line Items (BLI’s) allocated to field GIS programs are as diverse as the organizational structure (see program areas in glossary). Over 90% of survey respondents stated that they are assigned a “mixed bag” of job codes that vary year to year with little or no involvement of GIS staff in the budget allocation process.

Typical Program Areas
Aquatic
Cultural
Ecological
Engineering
Fire
Lands
Law enforcement
Minerals
Planning
Range
Recreation
Research
Soils
Special use
Timber
Wildlife

Roles and Responsibilities: Geospatial related roles and responsibilities in R9 are not clearly defined or governed. However, field level GIS staffs continue to do their best job fulfilling their assigned duties and supporting their units. GIS professionals perform work in almost all program areas. The planning team identified 24 distinct roles ([Appendix C and D](#)) that field GIS programs satisfy. Additionally, there is insufficient guidance on the differences between data management and data stewardship tasks, so that GIS staffs are often saddled with both responsibilities.

The number of roles and responsibilities conducted without clear guidance on organizational structure and assignments by field GIS programs has created an environment of excessive multitasking and many inefficient business processes. In the roles/responsibilities survey, the geospatial community was asked to provide input regarding inefficiencies caused by too many responsibilities. The following is a summary of the responses given:

1. GIS staffs do not know what their official roles and responsibilities are.
2. Leadership does not share the same view regarding what those roles should be and there has been no regional guidance to coordinate or guide decision making.
3. Tasks are not completed in a comprehensive or structured fashion. Many projects are started but few are fulfilled.
4. Roles and responsibilities of data stewardship and management are not practiced, understood or supported; therefore, GIS programs are expected to do both.
5. GIS programs are in a constant state of reaction and are overwhelmed with work.
6. Conflicting priorities, ad hoc stewardship, and excessive multitasking has contributed to the decline in data quality, having a direct impact on management decisions.
7. There is little time to maintain, or advance skillsets and train others.

In light of all of the identified issues and inefficiencies with roles and responsibilities, the planning team documented several examples of what is working well on the units. The list below summarizes those examples:

1. General coordination between GIS staff, project partners, WO, RO, and resource staff is working well even if priorities are not well defined or governed.
2. GIS staffs in the region have demonstrated the ability to be flexible, improvise and adapt to an ever changing work and technology environment.
3. Units have reported success in resource staffs taking on a stronger data stewardship role.
4. Use and reliance on geospatial tools and data in the agency is ever increasing.
5. Field level GIS programs are continuing to get work done with fewer people, smaller budgets, more complicated systems, lack of direction, and too many responsibilities to address.

Roles and responsibilities tied to data stewardship are not clearly defined at the national or regional scale, and should be included in position descriptions. This is important for leadership to value. The geospatial community has expressed confusion regarding stewardship and there is limited governance of roles related to spatial data. Responsibilities for data stewardship and related workflows are not consistently defined across the agency as a whole (GMO, 2012). There are several units who have defined protocols and standards for local data stewardship on a case by case basis.

Attrition: Region 9 has lost a significant number of resource professionals due to retirements, people leaving for new positions, and indefinite vacancies. This attrition has impacted many GIS programs in the region. Several units reported that loss of staff has led to priorities getting ignored, fewer resource staff

to perform data stewardship, leadership gaps, reduced data quality, staff working outside of their position descriptions, confusion, and working conditions that make it very difficult to be proactive in supporting programs.

Data Priorities: The geospatial community was asked to provide information regarding data priorities and feedback on which datasets, *in their opinion*, need some level of investment to improve the overall quality and completeness of information (Figure 4). The following data themes ranked as highest in terms of priority, value, and use (in order) amongst R9 GIS staff: **Lands, Transportation, Activities, Vegetation, and Water.** ([Appendix E](#))

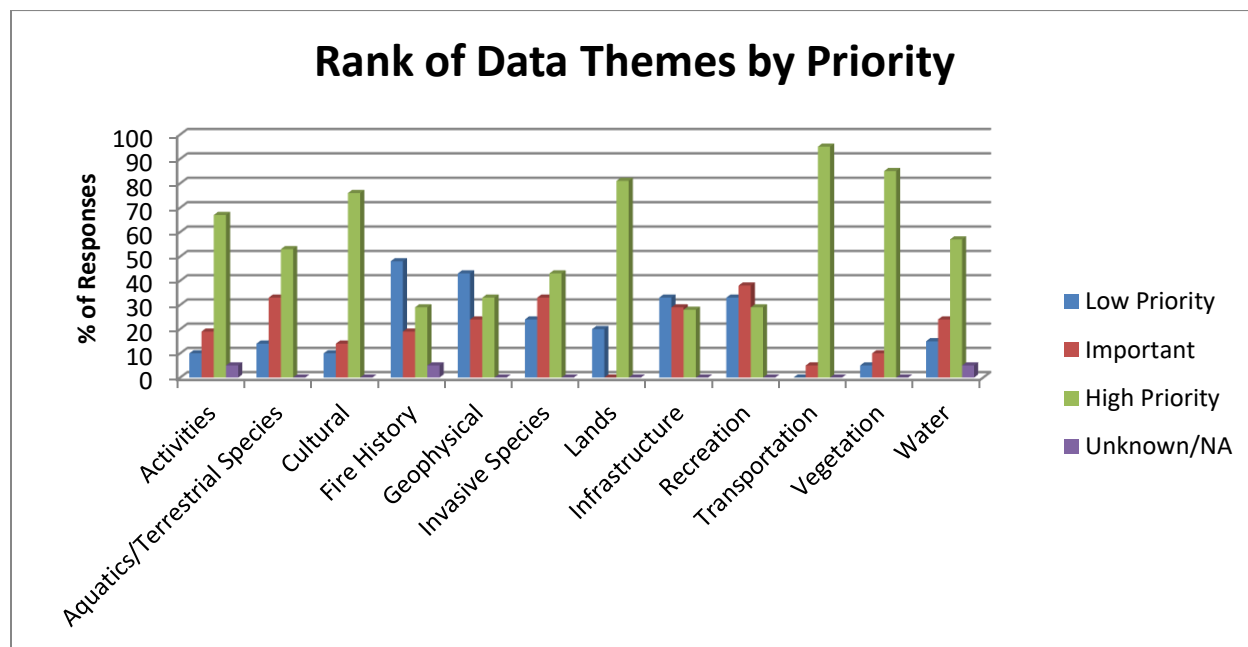
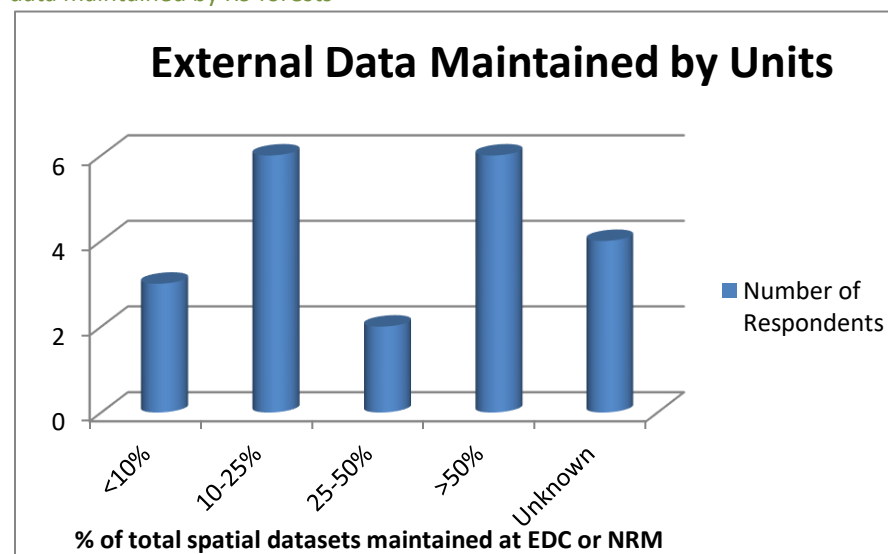


Figure 4: R9 Data Assessment Survey results indicating the geospatial community's designation of priority data themes.

External Data Management:

Field GIS programs support and often perform the creation, maintenance, and distribution of vector and raster datasets that are integral to all program areas and levels of the USFS. The extent and variety of data maintained by each unit varies significantly along with the methods and standards used to administer spatial information.

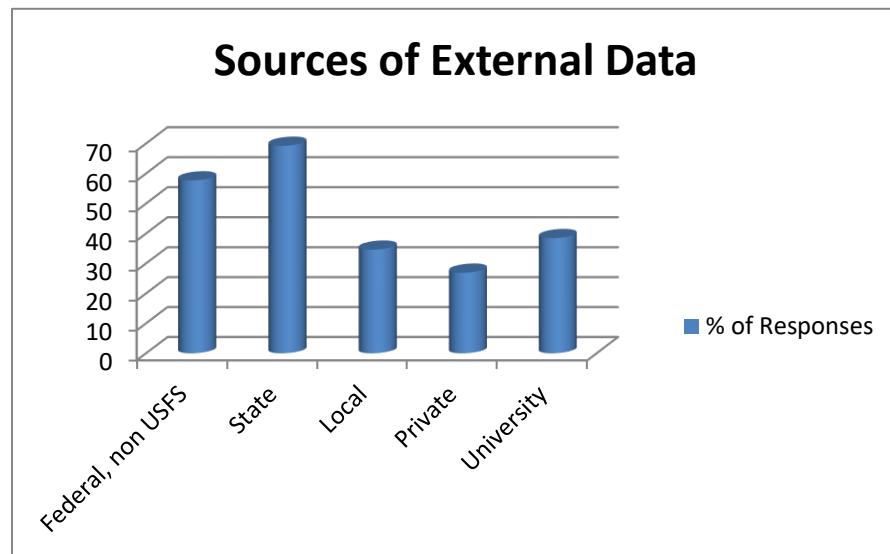
Figures 2 and 3: Survey results indicating the amount and sources of external data maintained by R9 forests



External (i.e., non-FS authored) datasets constitute a significant amount of the total spatial information that is administered by Eastern Region field units. The majority of units reported that over 25% of all their geospatial data maintained at the Enterprise Data Center (EDC) or NRM is from external sources such as state, other federal, private, academic, or other local government agencies (Figures 2 and 3). Some units reported that over 50% of the data they maintain is non-USFS data.

Replication: Region 9 field units report extensive maintenance of replicated (having more than one “official” copy/version) geospatial datasets. There is replication in all data theme areas. Lands and transportation related

datasets are the most frequently replicated data throughout the region. Replication of data is necessary and appropriate for some workflows, but more often replicated data represents replicated work and increasing risk of content discrepancy.



Data Quality: The quality of spatial data was analyzed as part of the data assessments survey. The strategic planning team found that deficiencies in several data theme areas; however, lands related datasets are perceived to be the poorest quality related to horizontal accuracy compared to all other data theme areas. The geospatial community has stressed that the region needs to invest in the improvement of GIS data related to lands in addition to associated workflows due to its authoritative status. The majority of Region 9’s spatial information has never been assessed for horizontal, referential, or topological error.

Infrastructure: Field units have multiple options in choosing the environment in which spatial data may be managed. Region 9 units mainly administer spatial data with NRM or EDC ArcSDE databases. Datasets administered by field GIS programs are by-in-large maintained within ArcSDE at EDC. The majority of units do maintain data within ArcSDE at NRM and other repositories such as the Enterprise File System. The GIS experts who took the data assessments survey reported many complicating issues related to managing data within separate environments (NRM and/or EDC). The following list is a synopsis of common responses:

1. Maintaining data in separate environments is confusing because there are different methods, tools, protocols, and standards. Data stewards need to learn and teach two separate systems.
2. There are major performance issues in both NRM and EDC.
3. The ArcGIS Server software versions at these two environments are seldom the same and are administered differently, adding significant and inherent complication to the data management workload.
4. Capabilities and tools are different between the two systems (e.g. geodatabase replication, ArcSDE administration tools, reconciling to default, etc.)

Needs and Expectations of Data: Region 9 GIS data was evaluated to determine whether or not it was meeting the needs and expectations of work assigned. Twenty-nine percent of staff polled stated that their unit's data meets needs and expectations. The majority stated that data does not meet needs and expectations and/or workarounds (i.e., "non-enterprise solutions") are often required to make data suitable for use. The following list of reasons was identified as factors contributing to data not meeting the needs and expectations of work assigned:

1. Poor quality related to accuracy, coincident or vertical alignment of data, and completeness.
2. There is a lack of and enforcement of substantive data standards.
3. The USFS has inconsistent and undefined data stewardship expectations, roles, and governance.
4. The USFS invests little in comprehensive data planning and implementation of goals.
5. Coordination and communication needs to be improved.
6. Field level GIS staff is stretched too thin. Excessive multitasking leaves little time to invest in fixing or enhancing datasets to meet needs and expectations.
7. There are "fitness of use" issues. Databases are not sufficiently designed to meet existing or emerging needs and uses of work assigned. (Note: this factor is a primary contributor to ad hoc data replication).

Enterprise GIS: The USFS has invested heavily in the creation, maintenance, and use of Enterprise Data Warehouse (EDW) for reporting and analysis. The planning team found little evidence of EDW providing practical use of USFS specific data at the field level; however, the source of EDW content is derived from field data and there is little effort and coordination to ensure high quality geospatial data is published at the national level. There are several significant and emerging risks to the agency given its current approach to the EDW including integration of unit specific data.

Raster Data Management: Raster data, extremely critical to operations at the local unit level, is neither effectively incorporated into an acquisition cycle and program of work nor has been traditionally maintained in a consistent manner across the region. The majority of units administer raster data in more than one location adding to administrative overhead. The data assessments survey results identified high resolution leaf-off color infrared digital orthophotography quarter-quadrangles (DOQQ) and LiDAR data as the two raster products where need is the highest. Standards related to raster dataset storage and management is yet to be published within the agency.

National Data Standards: The USFS provides schema standards for select data themes as part of the National GIS Data Dictionary. This current standard only focuses on the *structure* of geospatial data and not the *quality of the content*. Region 9 has had recent success implementing an ArcSDE standard for administering vector data. Additionally, there has been progress made nationally towards data standardization; however, the USFS lacks comprehensive and sufficiently robust data standards at all levels (GMO, 2012).

Data Distribution: The distribution of geospatial information is an important role of every field GIS program. GIS staff package data, maps, and reports for resource staff, leadership, external partners, and the general public. Standards related to cartography, metadata, and data distribution, as a whole, are not enforced nor exist at the regional level. Each unit makes their own determination of how geospatial data is distributed. Lands, transportation, vegetation, and recreation related datasets are the most common information distributed to the public. Neither the region nor agency has a standard protocol or medium to distribute datasets via the internet. Additionally, there are no defined cartographic standards for project mapping. Maps provided to the public are essentially unregulated.

The implementation and use of the Geospatial Interface (GI) has been highly adopted by Region 9 field units. The GI has proven to be an effective tool to standardize the way information is consumed within the agency in addition to improving ease of access to information. There are some units who have yet to utilize the GI and need assistance with implementation.

The USFS Enterprise Map Services (EMS) program oversees and administers protocol for creating map services. Several field GIS programs have utilized EMS to create internally facing map services for USFS use. The EMS program does not allow externally facing map services. R9 field units have expressed interest and provided specific examples of where externally facing map services would benefit the forests and the public (Figures 5).

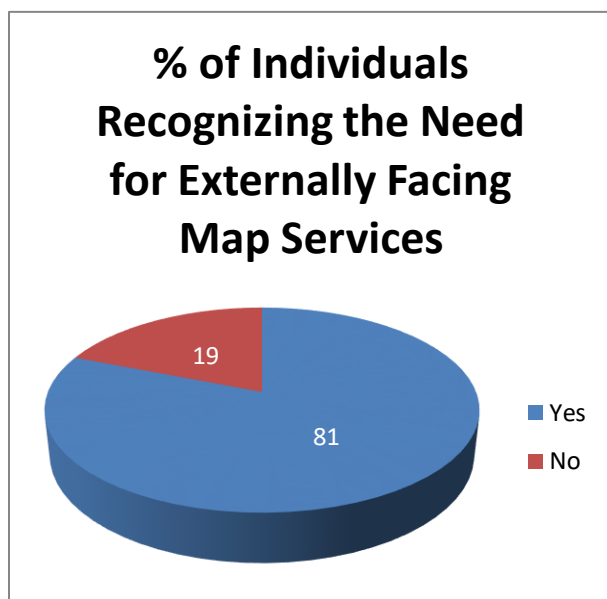


Figure 5: R9 Data Assessments Survey Results indicating need of Map Services.

Lands Data: The quality, use, updates, and administration of R9's Automated Lands Program (ALP) data is a high priority of the Region's geospatial community and resource staff. All of the GIS professionals responding during this planning process expressed concerns related to lands data.

ALP related datasets are ranked as the highest priority; most used, and frequently requested dataset in the region. The planning team documented significant quality issues related to accuracy, vertical alignment, and negative impacts on analysis and management decisions. The process and procedures to maintain R9 ALP

information have been stifled by lack of staff and poor coordination between the WO, RO, and the field. There has been recent progress in defining a process related to ALP stewardship; however, that process has yet to be formally defined and communicated by the WO. The inability for field units to update or enhance ALP data has hindered progress in data quality for most geospatial information tied to USFS lands. Furthermore, some units do not have a land surveyor to support ALP data additions or improvements.

Technology: Access to emerging technology such as mobile devices, ArcGIS Server, ArcGIS Online, Wi-Fi, and other GIS related tools is very limited to field level staff. The geospatial community has expressed interest and necessity to gain access to emerging technology because of the expectations of the general public, collaborating partners, and the need for more efficient data distribution and consumption. NRM and the CIO have recognized these issues and are working on plans for future dissemination and use. In the interim, many resource professionals have "improvised" outside of the USFS enterprise model, on their own terms, to more efficiently accomplish geospatial-related work, with some units using personal mobile devices such as smartphones for local project work.

2.3 Strengths and Weaknesses

The matrix below identifies strengths and weakness of geospatial data management issues in R9.

Issue	Strength	Weakness
Organization	<ul style="list-style-type: none"> Field level GIS programs are organized to meet the distinct needs of each individual forest. Field level GIS staff has proven to be flexible and able to adapt to an ever changing environment. 	<ul style="list-style-type: none"> Region 9 field GIS programs are not consistently organized or staffed on a regional scale. Each field unit is unique on the classification of GIS FTE's. Not enough staff to meet the needs of work assigned. Inconsistent organizational structure hinders progress in the implementation of roles, standards, and data stewardship.
Geospatial Skillsets	<ul style="list-style-type: none"> R9 has highly educated and skilled geospatial professionals. Cartography, spatial analysis, spatial data editing, and general geodatabase administration skillsets are well represented in field level GIS programs. R9 has several GIS FTE's that have advanced degrees in geospatial disciplines and GISP certification. 	<ul style="list-style-type: none"> R9 lacks needed, advanced geospatial skillsets. A high percentage of GIS FTE's in R9 do not have a college degree or certification in geospatial disciplines. GIS staffs with advanced skillsets are not able to utilize their existing abilities and are losing those skills due to lack of use. Required GIS skillsets are not defined for resource staff positions.
Training	<ul style="list-style-type: none"> GSTC and Esri offer free GIS classes and custom webinars. NRM offers training related to national applications. Field GIS programs develop and provide custom training for resource staff. 	<ul style="list-style-type: none"> Limited training opportunities outside of basic GIS classes. NRM training is ad hoc. R9 does not sufficiently support or fund training opportunities for GIS FTE's. There is a lack of coordination and execution of geospatial training. Data is created and maintained by unqualified data editors.
Roles and Responsibilities	<ul style="list-style-type: none"> Roles and responsibilities are being fulfilled even with a lack of definition and direction. Field level GIS staffs satisfy roles across several program areas. 	<ul style="list-style-type: none"> Roles and responsibilities are not clearly defined, including those related to national applications. No defined POW. Confusion on priorities. Data Stewardship is performed on a case by case basis.

Issue	Strength	Weakness
		<ul style="list-style-type: none"> Field level GIS staffs perform roles designed to be executed by other geospatial organizations.
Data Management	<ul style="list-style-type: none"> Field GIS programs are successful in the administration of corporate and non-corporate datasets. Most units administer vector data with ArcSDE. A variety of data management options allows the local unit to develop a strategy that meets their needs. 	<ul style="list-style-type: none"> Stewardship roles are undefined. Too many methods and processes to manage data. Data quality issues are not being addressed. EDW datasets are rarely used and supported in R9. GIS data is replicated throughout the region. USFS does not address volume, and variety of data dynamics.
Data Standards	<ul style="list-style-type: none"> National GIS Data Dictionary Standards are well recognized. Field GIS programs may establish local standards to meet specific needs of each unit. 	<ul style="list-style-type: none"> Standards do not address quality, fitness for use, and roles. Data does not meet the needs and expectations of work assigned. Low quality of priority datasets such as lands and roads. No standardization of data collection devices (e.g. GPS/mobile).
Data Distribution	<ul style="list-style-type: none"> Field GIS programs and resource staff distribute data, map products, and reports for resource areas. Some units have implemented cartographic standards. Metadata creation is heavily supported. The Geospatial Interface is becoming widely adopted in R9. 	<ul style="list-style-type: none"> R9 does not have standards regarding the distribution of data and maps. Access to technology has hindered internal and external data dissemination. Replicated maps and data are released to the public which often provide different information leading to confusion and potential issues with law enforcement. Multiple processes and flexibility with data creation, maintenance, and distribution.
ALP/Lands Data	<ul style="list-style-type: none"> ALP is recognized as the most important, frequently used geospatial dataset in R9. Most external data requests are for ALP/lands information. 	<ul style="list-style-type: none"> No evidence of defined processes for updating and maintaining ALP datasets. ALP is identified as the lowest quality dataset in R9. Quality of ALP data stifles the

Issue	Strength	Weakness
		progress for quality in other datasets.
Communication and Coordination	<ul style="list-style-type: none"> Field level GIS programs have established solid relationships with external partners such as state, tribal, local, and other federal agencies. R9 Information Management and field unit GIS programs have a solid working relationship and coordinate regularly in a virtual environment. 	<ul style="list-style-type: none"> Internal geospatial coordination is obstructed by complex, interdependent systems with non-standardized nomenclature. R9 has no geospatial communication plan/strategy. Coordination of geospatial priorities lacks consistency, detail, and direction.
Governance and Authority	<ul style="list-style-type: none"> Field level GIS programs have autonomy in establishing governance at the local level. 	<ul style="list-style-type: none"> Governance related to data management and stewardship is poorly defined with no expectation management. There is a lack of “best practices” for most data theme areas. GIS staffs have little authority to alter business processes.
Technology	<ul style="list-style-type: none"> The USFS has fully migrated to a “cloud-like” infrastructure. Evolution of geospatial technology continues to grow at an exponential rate. 	<ul style="list-style-type: none"> Complex interdependent systems have proven to suppress coordination, require additional training, and are costly to maintain over time. The inability to use new technology results in inefficiencies.

2.4 Opportunities and Barriers to Success

The matrix below categorizes opportunities and barriers to success of geospatial data management issues in R9. Opportunities are positive potentials to achieve objectives. Threats are considered obstacles and weaknesses that have the potential to do harm to the R9 geospatial program.

Issue	Opportunities	Barriers to Success
Leadership	<ul style="list-style-type: none"> R9 geospatial staffs have demonstrated strong leadership and ability to address geospatial management issues in a highly changeable environment. NRM/CIO/GMO recognizes the greater problems of geospatial roles, responsibilities, priorities, stewardship, standards, and training and has initiated 	<ul style="list-style-type: none"> Leadership decisions are made with the continued creation and support of flawed data. A status quo philosophy will continue to support inefficient business practices and increased ambiguity. Decisions made at the national level do not alleviate local issues and needs.

Issue	Opportunities	Barriers to Success
	<ul style="list-style-type: none"> planning efforts to mitigate. Regional leadership supports the creation of an R9 GIS strategy. 	<ul style="list-style-type: none"> In many cases, leadership does not recognize the importance or differences of data stewardship and management.
Program of Work	<ul style="list-style-type: none"> GIS is an essential component of the USFS business model. Elimination of replicated roles will free field GIS programs from performing duties that are the responsibility of other units such as the CIO, NRM. Strategic planning team has recognized 5 priority datasets for the Region which can be addressed in future POW. 	<ul style="list-style-type: none"> Goals and priorities are undefined creating a reactive rather than proactive environment. BLI's to support field GIS programs are not standardized or support actual work performed. Excessive multitasking has led to priorities not being fulfilled and deteriorated data quality. Priorities continue to come from all levels of the agency with little coordination and resources to accomplish them.
Budgets	<ul style="list-style-type: none"> Geospatial data requires significant investment at all levels to ensure completion of POW and sound decision making. 	<ul style="list-style-type: none"> Work does not reflect BLI's assigned. Current budgets cannot address all data quality issues or priorities. USFS will continue to have lower budgets for the foreseeable future. Not enough funding to maintain staff skillsets, training, and collaboration. Available funding for data purchases (e.g. LiDAR, DOQQs) is insufficient.
Attrition	<ul style="list-style-type: none"> Demand for GIS support continues to increase due to lack of resource staff and limited expertise to accomplish geospatial priorities. Attrition can prompt leadership to find more efficient business processes and restructure organization for greater efficiency. Provides motivation to clearly define roles, responsibilities, and priorities. 	<ul style="list-style-type: none"> Fewer resource staff to accomplish priorities and data stewardship. Leadership gaps and delayed decision making. Staff working outside of their position description. Increases in helpdesk support. "Burnout" of existing staff and higher GIS attrition rates. Loss of institutional knowledge.

Issue	Opportunities	Barriers to Success
Emerging Technology	<ul style="list-style-type: none"> • Opportunities for skilled GIS staffs to advance their career. • Public demand and need for geospatial data and use of emerging technology. • GIS programs and resource areas have documented a strong need for externally facing map services. • Adaptation of emerging technology can save time and resources. • Current out of the box technology can address much of the existing needs. 	<ul style="list-style-type: none"> • Limited access to emerging technology. • USFS does not fulfill the public's expectation of consuming information via mobile devices. • Employee skillsets are not adapting to technology. • Resource staffs are utilizing personal devices (i.e. smartphones) to accomplish work without standards. • No available Wi-Fi in USFS facilities. • Lack of innovative thinking regionally/nationally on how best to adapt emerging technologies.
Communication	<ul style="list-style-type: none"> • Information technology has made a virtual work environment easier to accomplish and manage. • Data sharing can be addressed as a function of standards. • Crowdsourcing is an opportunity for data improvement and better collaboration with the public. 	<ul style="list-style-type: none"> • Undefined roles and responsibilities make it difficult to ensure communications are properly targeted and timely. • Inconsistent coordination and communication channels with lack of transparency at all levels.
Replicated Systems and Processes	<ul style="list-style-type: none"> • Ability to change business processes to meet local needs. • Flexibility and multiple systems and processes to manage data. • Cost savings from eliminating duplicated systems and processes. 	<ul style="list-style-type: none"> • Replicated environments cause confusion and requires additional training. • Poor performance at the Enterprise Data Center leads to the creation of improvisational workaround solutions. • Different update cycles for software such as ArcGIS.
National Applications	<ul style="list-style-type: none"> • NRM conceptual architecture and the vision of common interfaces and interoperability for users. • Demands for higher quality information for decision making. • NRM's vision to bolster geospatial expertise and awareness. 	<ul style="list-style-type: none"> • Roles and responsibilities of field GIS staffs in relation to national applications are undefined. • Databases populated by undertrained staff. • Lack of comprehensive data standards.
IT Infrastructure	<ul style="list-style-type: none"> • EDC continues to evolve and fix performance issues. 	<ul style="list-style-type: none"> • Poor performance of the data center has produced significant

Issue	Opportunities	Barriers to Success
	<ul style="list-style-type: none"> USFS is committed to ensuring a reliable and performing infrastructure for data management. 	<ul style="list-style-type: none"> inefficiencies. Lack of wireless network availability will make it impossible to implement existing and emerging mobile technology.
Culture	<ul style="list-style-type: none"> The use of geospatial data and technology is widely adopted. <i>Cultural Transformation</i> and the USFS commitment to embrace change and diversity. USFS is committed to establishing a culture of safety. USFS recruits people with advanced geospatial skillsets. Telework and virtual collaboration is the norm. 	<ul style="list-style-type: none"> Resource staff struggle to adapt to a rapidly evolving, technological environment. Distributing flawed data can lead to safety, litigation, and law enforcement issues. No change in data culture will result in long-term impacts to credibility, affecting staffing and compounded data issues.
Unpredictable Forces	<ul style="list-style-type: none"> Pilot opportunities to utilize emerging technology such as ArcGIS Online. Change in budgets and political environment. Natural events can lead to increased need for geospatial data and technology. 	<ul style="list-style-type: none"> Unknown changes in budgets and political environment. Natural events can change local geospatial priorities. Change in requirements. Change in local priorities. New USFS initiatives.

3. Vision and Goals

Regional Geospatial Vision

The Eastern Region’s geospatial vision is tiered to Goal 5, found in the USDA Forest Service’s Strategic Plan, to “Maintain Basic Management Capabilities of the Forest Service.” Effective enterprise-level geospatial services succeed when scalable geographic data is accurately entered at the field level and through aggregation, meets regional and national demands for data and information. Complete, fully populated, and routinely maintained spatial and non-spatial data sets are stored in the NRM database-of-record repositories. These statements lend themselves to an Eastern Region Land Management Geospatial Vision that aspires to:

“an enterprise-wide Geographic Information System that is referenced to a geodetically-controlled land status record system (LSRS); designed to a common spatial data standard with topological integrity (vertically aligned); and, integrated with non-spatial resource data in the enterprise decision support system that meets local, regional, and national needs.”

Mission Statement

The Eastern Region will facilitate this vision by focusing on key components of a geospatial program including:

- **Data Stewardship:** Adherent to practical national standards that meet local needs and result from engaged data stewards. Data stewards take ownership and responsibility for data quality, documentation (i.e., metadata), and timeliness in crafting federal datasets that are freely and easily accessible through common Internet platforms.
- **Roles, Skillsets and Competencies:** Clearly articulated geospatial roles and priorities dictate a streamlined, and effective, organizational structure within well documented workflows that are aligned to both local and corporate goals. Identified competencies and skillsets are promoted, embedded, and supported in Forest Service human resource protocols.
- **Geospatial Toolsets:** Engage leadership to ensure corporate applications are designed and programmed based on common techniques and best practices. Standard professional training and development for staff are required to ensure successful implementations.
- **Information Technology (IT):** Communication, coordination, and implementation are critical facets to a successful IT program and in concert with the CIO. IT must be leveraged to facilitate integration and sharing of data, tools, and applications.

3.1 Strategic Goals

The planning team developed five, high level strategic goals to address R9's major data management and stewardship issues. The goals of this strategy are designed to support the mission and vision, and to define a desired condition that the region should strive to achieve over the next 3-5 years. Regional leadership are encouraged to use the strategic goals as a guide in making decisions related to GIS, spatial information, and the geospatial community as a whole. Leadership is respectfully urged to implement these specific recommendation and initiatives to achieve the sought after goals that address the broader issues Region 9 faces.

Strategic Goal 1: *Geospatial roles and responsibilities are staffed and aligned to support Unit and Regional priorities effectively as well as the mission of the agency.*

Strategic Goal 2: *Geospatial priorities are consistently governed across all units and programs and are linked to a defined program of work.*

Strategic Goal 3: *Cultivate and sustain a culture dedicated to improving the geospatial awareness and abilities of employees.*

Strategic Goal 4: *Maintain and support a comprehensive data standardization program that provides direction in the administration, quality, use, distribution, replication and governance of geospatial data.*

Strategic Goal 5: *Lands information, as the foundational base dataset, is of high quality and becomes the authoritative dataset for most mapping and analysis.*

3.2 Strategic Recommendations

The recommendations of this strategy delineate specific measures leadership could implement to achieve the desired condition. The planning team defined nine recommendations with associated initiatives to assist with decision making. The recommendations and potential initiatives or actions are designed to be achievable and compatible with one another. Recommendations are not designated in priority order; however, the [Implementation Program](#) advises logical groupings of recommendations for execution of actions. The initiatives describe several alternative actions that should be considered to fulfill each recommendation. R9 Information Management recognizes that the actions suggested in this strategy are high level approaches. Separate business plans are needed to define the finer details such as project management, requirements, work structure, and schedules.

Recommendation 1: Evaluate and provide direction to align R9's geospatial organizational processes, capacity and skillsets to best support the mission of the agency.

Actions:

Assemble and charter a team to construct a more efficient geospatial organization in Region 9. The team should work as part of the data stewardship and prioritization effort (Recommendations 2 and 5) in defining roles, responsibilities, and priorities related to geospatial data management. The goal of this effort will be to define what is working well, where deficiencies and inefficiencies are, and what resources can be leveraged to make geospatial management in Region 9 more effective and scalable.

The strategic planning team found inefficiency related to current field level GIS roles and responsibilities. Reducing the amount of replicated and unneeded roles, along with unproductive business practices, present an opportunity to leverage the existing workforce to focus on higher level priorities.

Recommendation 2: Clearly define geospatial roles and responsibilities by establishing a formal, required Data Stewardship Strategy.

Actions:

Assemble and charter a team to develop a data stewardship strategy for Region 9. Team members should consist of participants of the geospatial community, program areas, and a project manager. The intent of the data stewardship strategy is to formally define roles and responsibilities of GIS and resource staff as related to national applications and geospatial priorities set by the WO or RO. The data stewardship strategy should ensure important tasks are identified, that the appropriate and best quality tools will be available, and stewardship roles and responsibilities are performed throughout the data life cycle.

Roles and responsibilities defined in the data stewardship strategy need to be accountable. Assigned roles must be tied to specific elements and measures of individual performance plans. Additionally, geospatial roles and responsibilities should be associated to field unit's year-end performance evaluations.

Recommendation 3: Author a data management plan to address regional best practices and standards.

Actions:

Create an R9 data standardization strategy to establish regional standards that are comprehensive and address schema, quality, fitness of use, and scalability of geospatial information. The data standardization strategy must include an effort to author a data management plan to formally define geospatial standards and best practices.

The strategic planning team identified several approaches to fulfill this recommendation: 1) Create a Data Standardization Program Manager position. Roles and responsibilities of this position will primarily focus on creating a data management strategy, implementation of standards, and coordination with all program areas. 2) Assign these roles to an existing R9 IM position. 3) Establish a subcommittee of volunteers. Each alternative will need someone to fulfill a leadership role.

The data management plan should coincide with defined roles and responsibilities in Recommendations 1 and 2. Data management and stewardship will need monitoring and re-evaluation to ensure efficiency and best practices remain optimized.

Recommendation 4: Enhance geospatial coordination in all program areas by enhancing communication, formalizing coordination, establishing priorities, and engaging leadership.

Actions:

R9 should develop a “Geospatial Communication Plan” to resolve the current state of inconsistent coordination and communication channels that lack transparency. The geospatial communication plan should 1) delineate coordination with NRM applications, 2) provide direction to engage program areas and unit leadership, 3) offer more meaningful direction when data priorities are given to the field units, and 4) develop a mechanism for geospatial service requests. Coordination of geospatial priorities should include clear expectations of standards, requirements, training, impacts to POW, and guidance that is productive in completing additional work with little disruption to field units.

Region 9 must assign leadership duties to plan, implement, and complete this initiative. A “strike team” approach may be used to leverage existing staff. Overall, communication associated with formal correspondence must have details that define the target audience, describes roles and responsibilities, and clearly state goals.

Recommendation 5: Formally recognize R9 priority datasets, products and associated program of work on an annual basis.

Actions:

The strategic planning team found data themes related to lands, transportation, activities, vegetation, and water as being the highest priority (most frequently used, requested, and needed) datasets in R9. Resources and budgets need to be allocated to enhance and maintain these essential geospatial datasets. A regional program of work should be created to formally recognize and sanction the funding of staff time to work on standards, priorities, and newly assigned roles. Evaluation and determination of priorities, on a regional scale, should be conducted annually.

Region 9 must recognize geospatial priorities through formal correspondence, as a second initiative. Formal correspondence letter(s) should define the goals, schedules, and expectations of affected program areas and staff. Leadership roles and responsibilities must be defined for each geospatial priority. The planning team recommends that a formal project management approach (initiative associated with Recommendation 4) is used to ensure priorities get completed. Geospatial priorities must be accountable through integration with the existing year-end performance evaluation process.

As a second initiative, R9 IM should develop a geospatial service request system to help each field unit track, manage, and plan priorities and POW.

Recommendation 6: Establish core geospatial skills and competencies for GIS and resource staff. Develop and utilize criteria for assessing geospatial skills for resource staff candidates.

Actions:

R9 should launch an effort to define the core skills and competencies needed to fulfill geospatial duties performed by GIS and resource staff at the unit level. Region 9 will need to work closely with each program area to determine the full extent of existing skillsets and where knowledge gaps exist. Additionally, program areas should receive direction on what geospatial skillsets are needed to fulfill assigned roles related to national applications. These actions are highly dependent on the successful implementation of Recommendations 1-5.

There are several measures the Region can take to establish core geospatial skillsets. R9 IM can contribute to the GMO's recent effort to explore GIS centric position descriptions. Determination of core skills for resource staff will provide direction for program managers and hiring officials. There may be opportunities to add KSA's or interview questions to the hiring process to help leadership find qualified candidates with essential geospatial skills.

As a second initiative, Region 9 should establish guidelines used to hire GIS and resource staff in order to standardize and improve the hiring process. Guidelines should include specific expectations such as operational knowledge of Esri's ArcGIS Desktop software.

Recommendation 7: Develop an R9 geospatial training plan, aligned with corporate applications and commercial GIS, that maintains and develops the skills of both GIS and resource staffs.

Actions:

Region 9 must provide more direction and funding related to geospatial training. R9 IM should provide leadership a geospatial training plan to support maintenance and development of geospatial skillsets. The geospatial training plan should define the training that is needed and required by resource and GIS staff at the field level. Training investments should be allocated based on needs, support of priorities, and POW. Geospatial training should be required rather than recommended to ensure accountability and fulfillment of stewardship responsibilities. Like Recommendation 6, these actions are related to implementation of Recommendations 1-5.

The R9 geospatial training plan must leverage existing training resources and opportunities such as virtual GSTC and Esri courses. Coordination of NRM related training needs refinement and must be a priority of any training plan. The strategic planning team recommends greater investment in advanced

training opportunities be made to support the existing geospatial workforce to ensure skillsets stay relevant.

As a second initiative, R9 Information Management should reinstate an annual Regional GIS Coordinator's Conference. The conference may be conducted in a virtual environment; however, significant return on investment occurs through conducting a more traditional conference. Additionally, R9 IM can promote virtual "brown bag" sessions to showcase innovative projects in the region. Sessions of this nature would broaden geospatial awareness and provide an opportunity for peer review and support of local projects.

Recommendation 8: Improve end user experience by enhancing data and product distribution processes, and integration with emerging technologies.

Actions:

Region 9 needs to assess the way geospatial data is distributed and shared internally and externally. R9 IM should develop standardized media to distribute geospatial information to the public via the web. A regional web portal should be established to centralize and standardize how forests distribute GIS datasets to external partners and the public. The planning team documented the need for externally facing map services. An effort must be made to work with the GMO and CIO to enhance the Enterprise Map Services policy of the USFS, as it is currently cumbersome, inadequate, and at best only modestly effective. Additionally, R9 needs a committed effort to ensure EDW datasets, representing the Eastern Region, are of the highest quality, meeting the needs of the most demanding use case.

The Eastern Region must establish basic cartographic standards that are required for all map products to ensure quality, safety, and consistency in distribution of information. R9 can refine its web presence by adopting dynamic maps and fulfilling the public's expectations (i.e. maps and data accessible via mobile technology).

The objective of this recommendation is to support the May 9, 2013 Executive Order – *Making Open and Machine Readable the New Default for Government Information* (POTUS, 2013). The Executive Order outlines the Administration's resolve that information is vital to our national interests and data should be accessible and shared in digital form to business, academia, and the public to generate new products, services, businesses, and jobs. Region 9 needs to manage data as an asset throughout its life cycle. This promotes interoperability, openness, and, wherever possible and legally permissible, ensures that data are released to the public that make data easy to find and use. Therefore, data collection protocols and tools need to be adequately documented and referenced; quality control techniques conducted on the data are documented; and metadata requirements (especially those explaining fitness for use, intended purpose and basic quality parameters) have been completed.

Recommendation 9: Develop a regional strategy for managing lands base data to specifically address issues, processes, and workflows for ensuring accurate, timely, and consistent lands base data for both PLSS and metes and bounds forests.

Actions:

A strategy to specifically address lands data must be a high priority of Region 9, based on the current condition of information and overall need for improvement. R9 IM and the Regional Lands Program should establish a coordinated effort to define roles, responsibilities, standards, priorities, and business processes.

The strategic planning team recommends filling an FTE position to perform lands data coordination and maintenance. There must be a liaison to define a regional strategy and coordinate between R9 IM, the Regional Lands Program, field units, and the WO Automated Lands Program (ALP) team. There may be an opportunity to create this position based on available vacancies in R9's current organization. Additionally, there is an imbalance of surveyor resources throughout the region. There are field units who do not have access to a licensed surveyor. It is recommended that all units have adequate access to a professional surveyor.

An alternative approach to accomplish this recommendation is to develop a lands subcommittee or strike team to address the issues.

A leadership role must be defined, regardless of the approach used, to enhance lands data coordination. The strategic planning team recommends that the current condition of ALP data be evaluated for each field unit. This includes identifying which units have supplemental lands datasets, survey points, or other legitimate control that may be used to update/refine lands data. Each field unit should be appraised to determine the present state of their ALP data based on quantitative analysis. Standards, roles, and processes used to refine lands data should be approved by R9 IM, the Regional Lands Surveyor, and the ALP team.

The planning team met with the WO ALP team and the R9 Lands Surveyor during the formation of this strategy. The team found that all parties are willing to support this effort and immediate action can be initiated for units that have quality lands information to update the corporate version. Additionally, the BLM's CadNSDI effort is currently updating the Eastern State's Public Lands Survey System for Michigan, Minnesota, Missouri, Ohio, and Wisconsin. CadNSDI updates performed by the BLM constitute high quality, certified data and are expected to significantly enhance the quality of ALP data for national forests within these states.

3.2.1 Summary of Strategic Recommendations

Strategic Recommendation	Potential Actions	Strategic Goals Supported	Broad Issues/Themes Addressed
#1 Evaluate Organization	<ul style="list-style-type: none"> Assemble team. Create a strategy to better align R9's geospatial organizational structure. 	1,2,3,4,5	1,2,3,4,5,7
#2 Data Stewardship	<ul style="list-style-type: none"> Assemble team. Create a data stewardship strategy. Monitor strategy and tie to performance. 	1,2,3,4,5	1,2,3,4,5,7
#3 Data Management Planning	<ul style="list-style-type: none"> Develop an R9 data standardization strategy. Assign leadership roles and responsibilities. Assemble a team. Create an R9 data management plan. Monitor strategy. 	1,2,3,4,5	1,2,3,4,6
#4 Geospatial Coordination	<ul style="list-style-type: none"> Assign leadership roles and responsibilities. Create an R9 geospatial communication plan. 	1,2,3,4,5	1,2,3,4,5,7

#5 Define Priorities	<ul style="list-style-type: none"> Recognize lands, transportation, activities, vegetation and water related geospatial data as the current priority datasets for Region 9. Create a Regional POW. Communicate via formal correspondence. Adopt a project management approach. Plan, manage, and monitor priorities. 	1,2,3,4,5	1,2,3,4,5,7
#6 Establish Core Skills	<ul style="list-style-type: none"> Define core geospatial skills of GIS and resource staff. Provide recommendations to improve the hiring process. Support national initiatives to standardize the classification of GIS related positions. 	1,2,3,4	1,2,5,7
#7 Training	<ul style="list-style-type: none"> Provide direction and funding of geospatial training. Adopt an R9 geospatial training plan. Reinstate the annual R9 GIS Coordinator's Conference. Promote a culture of learning. 	1,2,3,4	1,2,3,4,7
#8 Data Distribution	<ul style="list-style-type: none"> Establish an R9 geospatial web portal. Implement the use of emerging technology. Create basic cartographic standards. Manage data as an asset throughout its life cycle. 	3,4	4,6
#9 Lands Data Management	<ul style="list-style-type: none"> Assign lands coordinator roles and responsibilities to existing or new FTE. Assemble a team. Ensure each unit has access to a licensed lands surveyor. Adopt an R9 lands data management strategy. 	1,2,4,5	1,3,4,7

3.3 Monitoring and Measuring Success

The recommendations presented in this strategy require monitoring to ensure successful and timely implementation. Measures should be reevaluated and recalibrated on an annual or project basis to suit evolving priorities and goals of the agency. The matrix below delineates indicators that verify Region 9 has met the desired condition set in the strategic goals. Subsequent planning and projects should include dedicated measures and monitoring.

Strategic Recommendations	Measures of Success
#1 Evaluate Organization	<ul style="list-style-type: none"> Geospatial organization is aligned for efficiency and adaptable to new and changing demands. Replicated and unnecessary geospatial roles are eliminated. Responsibilities are assigned for roles that are presently lacking or unfulfilled. Consistency in organizational structure throughout R9. Attrition has less impact due to efficient use of available GIS resources.
#2 Data Stewardship	<ul style="list-style-type: none"> Region 9 has a data stewardship strategy that defines roles and responsibilities of GIS and resource staff. Leadership fully understands geospatial roles and responsibilities. Defined roles are accountable and tied to performance measures of individuals and units.
#3 Data Management Planning	<ul style="list-style-type: none"> R9 IM assigns Data Standardization Manager roles to an existing or newly created position. R9 has a data management plan that addresses best practices, quality, fitness of use, scalability, and standards. Geospatial data meets the needs of the defined POW. Quality of geospatial data increases as evidenced by significant reductions in data gaps and replication. Data is trusted, useable, and workaround procedures are reduced. Over 90% of data adheres to a well-defined standard.
#4 Geospatial Coordination	<ul style="list-style-type: none"> R9 IM has a formal geospatial communication plan in practice. Ad hoc communication channels are reduced and transparency is increased. Correspondence of geospatial priorities includes clear direction, expectations, requirements, and schedules. Leadership is aware of the direct and indirect costs of information resources management.
#5 Define Priorities	<ul style="list-style-type: none"> Field level GIS programs have a clearly defined POW. Governance of geospatial priorities is defined and accepted. Field, Regional, and Washington Office geospatial priorities and needs are aligned. Region 9 improves the overall quality of lands, transportation, activities, vegetation, and water related geospatial data through effective data stewardship. Regional priorities are communicated via formal correspondence.
#6 Establish Core Skills	<ul style="list-style-type: none"> Required geospatial skillsets for GIS and resource staffs are clearly defined, cultivated, and maintained.

	<ul style="list-style-type: none"> USFS hires resource staff with sufficient geospatial skills to meet the data management requirements of the work assigned.
#7 Training	<ul style="list-style-type: none"> Adequate training resources are made available to maintain and grow geospatial skillsets amongst GIS and resource staff. Training is required rather than recommended. Region 9 is committed to a culture of learning and awareness.
#8 Data Distribution	<ul style="list-style-type: none"> Region 9 geospatial information is easily available through a standardized web portal. Geospatial services are used to enhance the USFS web presence and improve access to information for staff and the general public. Manually serviced data requests are rare. Basic cartographic standards are implemented. Increased collaboration with external partners. Data is scalable to meet legitimate, diverse use cases and supply the performance needs of emerging technology.
#9 Lands Data Management	<ul style="list-style-type: none"> Region 9 adopts a new ALP data management strategy which includes an FTE dedicated to lands data coordination. ALP becomes the trusted and authoritative dataset for all geospatial mapping and analysis. Processes to maintain and update ALP data are streamlined. Each field unit has access to a licensed land surveyor.

4. Implementation Program

4.1 Implementation of Recommendations

The strategy to implement recommendations and associated initiatives or actions is apportioned to be manageable and achievable. The strategic planning team designed implementation phases and milestones to occur over the next 3 to 5 fiscal years. All of the strategic recommendations brought forward in this strategy are equally important and dependent of each other; however, there are limited resources to accomplish all of the objectives as part of a simultaneous effort. Leadership must decide which recommendations and alternative actions to implement given diminishing available time, staff, and budgets.

The strategic planning team endorses grouping several of the recommendations based on dependencies of initiatives and efficient use of available resources. Recommendations 1-3 should be concurrently aligned to produce a data management and stewardship plan. The proposed actions will require significant investment of resources and time to accomplish with the expectation to be managed as a continuous lifecycle.

Recommendations 4 and 5 can be achieved as part of a unified project. Establishing priorities and coordination of such priorities should be implemented at the beginning of each fiscal year and carefully monitored as conditions change.

Accomplishment of proposed actions for Recommendations 6 and 7 will include long term projects to establish core geospatial skillsets and provide training opportunities. Like Recommendations 4 and 5, projects created to support these goals must be reviewed annually based on agency needs.

Close coordination with CIO, GMO, and NRM is required to fulfill the actions described in Recommendation 8. Objectives related to implementation of emerging technology are highly dependent on information technology infrastructure that is controlled by Washington Office staffs which present opportunities and risks to achieving goals. Region 9 can implement cartographic and data distribution standards with relatively small investment in staff time.

A dedicated project to develop a strategy that improves the overall condition and management of ALP data should be considered a high priority for implementation. The critical and authoritative nature of this dataset requires immediate attention and a project should ensue at the beginning of FY2014.

Several projects will ensue from the proposed initiatives or actions of this strategy. Any succeeding project should consider the agile project management approach recognized by the Project Management Institute. Adopting a formal project management approach will ensure projects are officially sanctioned, planned, executed, and controlled to stay within the scope of the project.

4.2 Phasing and Milestones

Major milestones and recommended schedules are estimated in the chart below:

R9 GIS Strategy Milestones																				
	FY 2013				FY 2014				FY 2015				FY 2016				FY 2017			
Initiatives	Quarters				Quarters				Quarters				Quarters				Quarters			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Assemble Data Stewardship Team																				
R9 Data Stewardship Project																				
Create Data Standardization Strategy																				
R9 Data Management Plan																				
Geospatial Coordination																				
Establish Geospatial Priorities/POW																				
Define Core Geospatial Skillsets																				
R9 Geospatial Training Plan																				
Develop R9 Cartographic Standards																				
Create R9 Geospatial Web Portal																				
Implementation of Emerging Technology																				
Assign Lands Data Coordinator Roles																				
Author Lands Data Management Strategy																				
Project Management																				

4.3 Budget Plan

The allocation of fiscal resources to achieve the goals of this strategy is outside the scope of this document. Each subsequent project or effort will require a budget plan.

4.4 Lessons Learned from Prior Efforts

The strategic planning team reviewed and [cited](#) several national and regional geospatial planning efforts previously published by the USFS over the past decade. Past plans were found to be high-level strategies

that lacked detail, governance, and monitoring of accomplishments. Communication and marketing of previous planning efforts were narrowly focused to a small audience.

The Eastern Region Information Management Strategic Plan of 2006 outlined many of the same goals as this strategy; however, that plan lacked specificity and resources to implement all of the objectives. Other factors such as rapidly changing technology, shifting priorities, Washington Office initiatives and evolving organizational structures could limit the success of this plan.

Implementing a geospatial strategy at the regional or field level is always at risk of derailment by geospatial priorities dictated at the national level. WO priorities may divert resources causing delay or changes to any geospatial strategy or plan. The risk of failure is high because of the lack in transparency of multiple national objectives exceeding Unit and Regional capacity and the historic pattern of field level GIS staff reacting to nationally focused initiatives.

4.5 Marketing

Subsequent projects, priorities, standards, and protocol related to geospatial roles, responsibilities, and data management should be conducted through formal correspondence. R9 IM and the field level GIS community presently conduct monthly meetings to discuss national and regional GIS related initiatives. These meetings have proven to be a successful medium to relay information and discuss issues and will continue for the foreseeable future. Additionally, R9 IM must regularly engage supervisors, line officers, and program managers so that the brunt of delivering information does not fall solely on field level GIS staff.

Leadership must be engaged through formal channels of communication. Assigned project managers and designated “Champions” of geospatial projects must provide progress reports, needs, and accomplishments to unit and regional leadership. R9 IM will coordinate with the CIO, NRM, and GMO with geospatial priorities on a national scale. Furthermore, mediums such as SharePoint should be used for all project based work to enhance collaboration, organization, and transparency.

4.6 Expectations and Assumptions

The Eastern Region’s geospatial organization lacks uniformity, direction, and resources to meet existing needs. The planning team recognizes the current organizational structure is not aligned to support the desired condition set by the strategic goals. Unknown budgets, staffing, and the current rate of attrition pose a high risk that the status quo will remain intact leading to the continued degradation of geospatial data management.

Priorities, strategies, and policies established at the national level will continue to shift and evolve. Adjustments will need to be made to this strategy to accommodate those shifts. GIS and information technology will continue to change exponentially requiring annual review and refinement of regional geospatial priorities and processes.

Region 9 does not expect national level geospatial management units to define all roles, responsibilities, standards, priorities, and policy related to GIS. R9 will follow the precedent set by other regions to develop a geospatial strategy that suites its unique organizational circumstances to better support the needs of both field units and the Washington Office.

R9 IM and field level GIS programs have to operate within the confines of the USDA Forest Service Enterprise Data Center (EDC) and other information technology infrastructure that is controlled at the

national level. Some elements of the GIS strategy proposed in this document will be limited in scope as a result. The current level of performance and lack of autonomy within EDC will stifle many geospatial data management strategies proposed to meet the needs of Region 9.

5. Summary

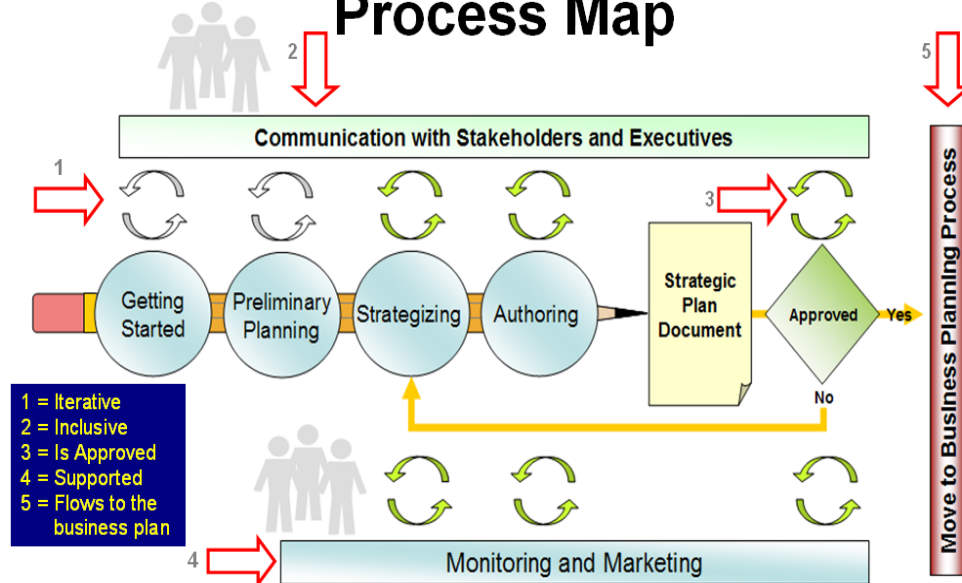
In budget testimony before the Senate Committee on Energy and Natural Resources in 2011, Chief Tidwell stated that the Forest Service is prepared, “to take some serious steps to reduce the deficit and reform government so that it is leaner and smarter for the 21st century.” Centralization, standardization, and organizational restructuring of information technology and GIS will continue to ensue in order for the USFS to meet the expectations of a more efficient agency. USFS CIO, GMO, and NRM have made significant progress in restructuring technology, processes, and staff to meet resource information management objectives over the past several years.

The USFS Eastern Region recognizes that its geospatial organization must also adapt to meet the evolving needs of the agency. Recent changes in geospatial business processes at the national level have had major impacts on field level GIS programs and adjustments of roles, responsibilities, priorities, communication, training, and staffs are needed to successfully acclimate to the current needs of the agency.

This document is a guide to better define the role of “geospatial” in the Eastern Region, make recommendations to improve effectiveness, and to meet national strategic goals for science-based management. We acknowledge that this strategy is ambitious: however, the goals are achievable with appropriate funding, planning, implementation, and leadership. This strategy is designed to be a living document that requires continuous re-evaluation and input from the geospatial community as priorities shift, technology evolves, and milestones are accomplished.

Appendix A: Strategic Planning Methodology

Strategic Planning Process Map



Process Map developed by Federal Geographic Data Committee (FGDC)

The strategic planning team:

- Charlene Breeden – Regional Inventory Coordinator, R9 Information Management
- Sam Lammie – Forest GIS Coordinator, Monongahela National Forest
- Mike Martischang – Regional GIS Coordinator, R9 Information Management
- Joe Miller – NRM Information Technology Specialist, R9 Information Management
- Marcus Sadak – Forest GIS Coordinator, Chequamegon Nicolet National Forest
- Mary Schoeppel – Forest GIS Coordinator, Hoosier National Forest

In November 2012, the R9 Information Management staff began this effort through formal communication with the regional geospatial community and the adoption of a formal planning process. The Process Map above was developed by the FGDC to assist with strategic planning related to the National Spatial Data Infrastructure (NSDI). The strategic planning team adopted this methodology and customized it to fit the needs of the region. A [Process Map](#) was written and followed to provide organization for the planning team and a structured method to start and complete the plan.

The full planning team was formed by early 2013. The team met regularly and acquired its own SharePoint [site](#) for collaboration and collection of reference materials. The SharePoint site contains all documents such as templates, surveys, milestone charts, spreadsheets, and tools used to gather and analyze information. The team used project management principles and requirements gathering techniques as stated in the Project Management Institute's Project Management Body of Knowledge (PMI, 2009).

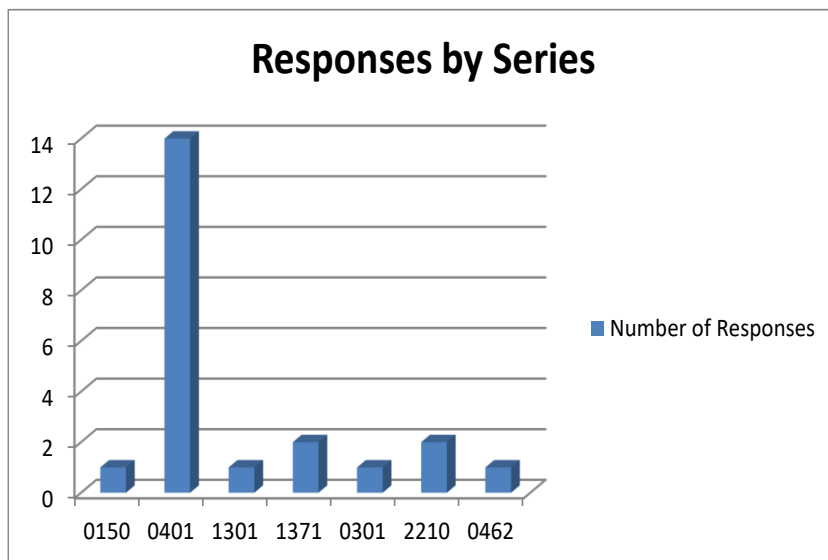
Collaboration of team members was conducted virtually through the use of emails, conference calls, LiveMeeting, and Lync sessions. Communication with the stakeholders was fulfilled via emails and utilization of the monthly R9 GIS Coordinator's Conference calls. The SharePoint site was left open to the stakeholders to review documentation at any time.

Appendix B: Identified Geospatial FTE Titles and Series

The GIS Roles and Responsibilities Survey were completed by staff from 14 of 16 field units in Region 9 (including the RO). The survey asked each individual to provide their current title and series. Twenty unique position titles/series/grades were identified out of twenty-six respondents. Seven unique series and five unique grades were reported by geospatial staffs. GIS organization charts ([link](#)) identified no consistency in staffing, supervision, nor structure.

Unique Titles:

Geographer
GIS Coordinator
Forest GIS Coordinator
Regional GIS Coordinator
Resource Information Manager
Resource Information Specialist
East Zone GIS Specialist
West Zone GIS Specialist
GIS Specialist
Data Management/GIS Specialist
Cartographic Technician
Biological Technician
Forestry Technician
General Biologist
Biological Scientist/GIS Analyst



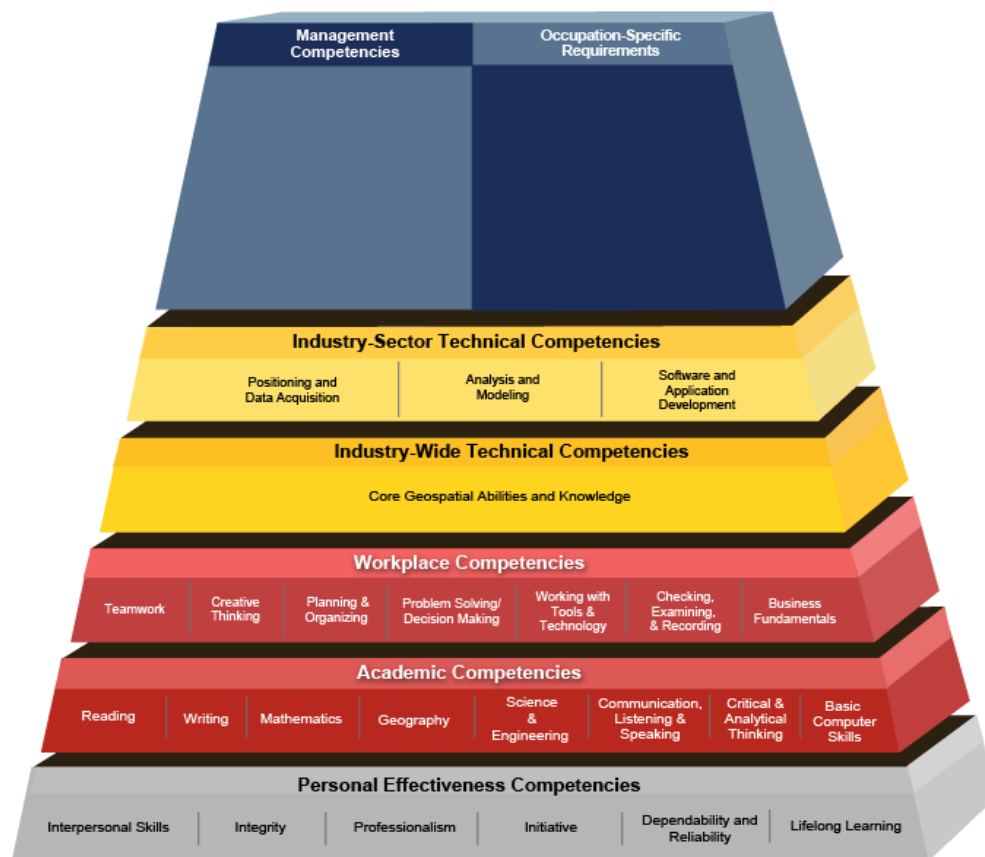
Other regions have implemented different, more consistent organizational structures to meet evolving information needs. The lack of consistency in structure, titles, and series contributes to the overall inefficiency to the R9 geospatial program. An in-depth analysis of other agency organizations was considered beyond the scope of this team.

Appendix C: Identified Roles and Responsibilities

The R9 GIS Roles/Responsibilities survey identified 24 unique roles that most R9 forest level GIS programs fulfill on a regular basis.

1. NRM helpdesk (e.g. stewardship of NRM data and assisting with software)
2. CIO helpdesk and/or general computer support (e.g. printer, peripheral, T:\ & O:\ drive support)
3. Forest specific project support (non-NEPA)
4. Forest planning/NEPA/MVUM/TMR related support
5. National level project support
6. Ensuring forest data meets USFS National GIS Data Dictionary standards
7. Train staff (includes preparing materials and documents)
8. General map production
9. Data QA/QC
10. Data distribution (fulfilling data requests, posting data to web, creating dynamic mapping apps)
11. Integration of data from one source to another
12. ArcSDE administration within NRM
13. ArcSDE administration within EDC
14. Website and/or SharePoint site management
15. GI RegTool management and editing
16. Spatial analysis
17. GPS support (collecting/processing data, training, etc.)
18. Supervision of staff
19. Coordination with external partners (other state, fed, local agencies)
20. Fire/All incident support
21. Digital image processing and/or remote sensing
22. General GIS support (e.g. ArcMap/geodatabase questions, how-to inquiries)
23. GIS work related to law enforcement
24. Other duties as assigned

Appendix D: Department of Labor’s Geospatial Technology and Competency Model (GTCM)



The Geospatial Technology Competency Model (GTCM), developed by the Department of Labor, is depicted as a pyramid with nine tiers. This depiction illustrates how occupational and industry competencies build on a foundation of personal effectiveness, academic, and workplace competencies. Each tier consists of one or more blocks representing the skills, knowledge, and abilities essential for successful performance in the industry or occupation represented by the model. At the base of the model, competencies apply to a large number of occupations and industries. As a user moves up the model, the competencies become industry- and occupation-specific.

In the GTCM, **Tiers 1 through 3**, called Foundation Competencies, form the foundation needed to be ready to enter the workplace. **Tier 4—Industry-Wide Technical Competencies**, lists 43 examples of “Critical Work Functions” that many geospatial professionals will be expected to perform during their careers. The model description notes that, few if any workers are responsible for every Critical Work Function in any one job. Thus, the examples cited represent both the core competencies of the geospatial field and the diversity of professional practice within it.

Tier 5—Industry Sector Technical Competencies identifies Critical Work Functions and Technical Content Areas required for worker success in each of three industry sectors: (1) Positioning and Geospatial Data Acquisition; (2) Analysis and Modeling; and (3) Software and Application Development.

The sectors represent clusters of worker competencies associated with three major categories of geospatial industry products and services.

Tiers 6-9 deal with Occupation-Specific Competencies and Requirements such as licensing and certification. For the USFS, specific NRM applications would fall into this category.

While this is only a model, it represents the issues the geospatial community is facing with reduced staff and the evolving technology environment we are facing. In looking at the roles and responsibilities listed above (Appendix C), the current GIS staffs are expected to fulfill all 5 tiers in the model plus tiers 6-9 (such as supervision or NRM helpdesk role) in some cases. The roles and responsibilities staffs are currently fulfilling are in most critical work functions, with limited staff. Attrition and unfilled vacancies cause those skills to be picked up by other existing staff members or dropped all together. While all functions do not need a full-time position, the current organizational structure forces each field unit to 'know all and be all' in each tier or sector. The lack of prioritization, lack of program of work, and a 'must know all and be all' expectation contribute to hindrance of progress, wellness, and efficiencies.

Appendix E: The Federal Geographic Data Committee (FGDC)

The Federal Geographic Data Committee (FGDC) is an organized structure of Federal geospatial professionals and constituents that provide executive, managerial, and advisory direction and oversight for geospatial decisions and initiatives across the Federal government. Governmental policies provide a broad framework for geospatial activities in the Forest Service and across the federal government agencies (see FGDC structure). Presidential Executive Order 12906, signed into law in 1994, launched a broad geospatial initiative for coordinating geographic data acquisition and access through a National Spatial Data Infrastructure (NSDI). Executive Order 13286, issued in 2003, amended Executive Order 12906 to transfer certain functions to the Secretary of Homeland Security. These broad executive orders represented initial attempts at governance of geospatial technologies.

Current FGDC geospatial initiatives (4) direct and influence federal agencies in conjunction with and to policy set by the Office of Management and Budget and Congress. These four umbrella initiatives target a Geospatial Platform, Portfolio Management and Circular A-16 Supplemental Guidance, the Geospatial Line of Business, and the SmartBUY Purchase Agreement.

Specifically, as pertains to Region 9's effort to assess geospatial roles and responsibilities and data management, FGDC geospatial initiatives are especially relevant as pertains to Portfolio Management and the sixteen (16) National Geospatial Data Asset (NGDA) Themes. These FGDC-designated themes meet at least one of the following criteria: support mission goals of multiple federal agencies; statutorily mandated; supports Presidential priorities as expressed by Executive Order or by OMB (shown to the right are data asset themes, number of datasets in parentheses, and lead agency).

FGDC A-16 NGDA Theme List (# Datasets), Lead Agency
Biota (7), DOI BLM
Cadastre (20), DOI BLM
Climate and Weather (6), DOC NOAA
Cultural Resources (6), DOI NPS
Elevation (12), DOI USGS and DOC NOAA
Geodetic Control (4), DOC NOAA
Geology (2), USGS USGS and BOEM
Governmental Units, and Administrative and Statistical Boundaries (67), DOC CB
Imagery (7), USDA FSA and DOI USGS
Land Use-Land Cover (23), USDA FS and DOI USGS
Real Property (15), GSA
Soils (5), USDA NRCS
Transportation (10), DOT
Utilities (2), DOI BSEE and Offshore/Terrestrial Utilities (TBD)
Water - Inland (7), DOI USGS/USFWS
Water - Oceans and Coasts (10), DOC NOAA
Total (203)

The US Forest Service is co-lead on the Land Use-Land Cover theme with the US Geological Survey which comprises 23 datasets (shown below):

	Dataset Name	Theme	Agency
1	C-CAP Coastal Change Analysis Program	Land Use - Land Cover	DOC-NOAA
2	Geographic Information Retrieval and Analysis System (GIRAS)	Land Use - Land Cover	DOI-USGS
3	NLCD Land Cover Classes	Land Use - Land Cover	DOI-USGS
4	NLCD Percent Imperviousness	Land Use - Land Cover	DOI-USGS
5	NLCD Percent Tree Canopy	Land Use - Land Cover	DOI-USGS
6	North American Land Change Monitoring System (NALCMS)	Land Use - Land Cover	DOI-USGS
7	Cropland Data Layer (CDL) (CropScape)	Land Use - Land Cover	USDA-NASS
8	Forest Inventory and Analysis (FIA)	Land Use - Land Cover	USDA-USFS
9	Landfire Biophysical Settings	Land Use - Land Cover	USDA-USFS
10	Landfire Environmental Site Potential	Land Use - Land Cover	USDA-USFS
11	Landfire Existing Vegetation Cover	Land Use - Land Cover	USDA-USFS
12	Landfire Existing Vegetation Height	Land Use - Land Cover	USDA-USFS
13	Landfire Existing Vegetation Type	Land Use - Land Cover	USDA-USFS
14	Landfire Fire Events Geodatabase	Land Use - Land Cover	USDA-USFS
15	Landfire Fire Regime Groups	Land Use - Land Cover	USDA-USFS
16	Landfire Forest Canopy Base Height	Land Use - Land Cover	USDA-USFS
17	Landfire Forest Canopy Bulk Density	Land Use - Land Cover	USDA-USFS
18	Landfire Forest Canopy Cover	Land Use - Land Cover	USDA-USFS
19	Landfire Forest Canopy Height	Land Use - Land Cover	USDA-USFS
20	Landfire Wildfire Disturbance	Land Use - Land Cover	USDA-USFS
21	MTBS Wildfire Burn Severity Moasics	Land Use - Land Cover	USDA-USFS
22	MTBS Wildfire Burned Area Boundaries	Land Use - Land Cover	USDA-USFS
23	MTBS Wildfire Occurrence	Land Use - Land Cover	USDA-USFS

Region 9's GIS Strategy has identified through a formal survey that Lands, Transportation, Activities, Vegetation, and Water rank as the highest priority, value, and use (in order) as determined by R9 GIS staff. These dovetail with FGDC NGDA themes and are tied to commonly used GIS datasets that are fundamental to geospatial work in the Forest Service. Additionally, various other geospatial datasets are considered to be critical as identified in federal legislation such as the Federal Cave Resources Protection Act (1988), the National Historic Preservation Act (1966), and the Endangered Species Act (1973). Cave resources, cultural resources, and threatened and endangered species (T&E) are relevant to all of the above, respectively. There are also national security concerns and guidelines (as explicitly identified by the Department of Homeland Security) for a number of other geospatial datasets such as transmission lines, storage fields, and other prioritized datasets.

Glossary

Accountability	Degree to which agency personnel assume responsibility for the quality of the data.
Agile Project Management	Agile project management is a technique that is adaptable and allows iterative development to deliver functional pieces of a project quickly and adjustments can be made on the fly.
ArcGIS On-line	A Web-based system for sharing, finding, and using maps, layers, and services. ArcGIS Online includes a set of base maps, map layers, and tools published by Esri for use inside ArcGIS products. [Esri]
ArcGIS Server	Software provided by Esri for sharing GIS resources (maps) via the web. [Esri]
ArcSDE	Part of the ArcGIS platform of software. It is the data server between ArcGIS and relational databases to enable geographic information to be shared, by many users across a network. [Esri]
Authoritative Data Source	A cohesive set of data assets that provide trusted, timely, and secure information to support a business process.
Automated Lands Program (ALP)	The authoritative corporate geospatial landownership data for the agency. It is an accurate account of acreage, condition of title, administrative jurisdiction, rights and interests held by the United States, administrative and legal use restrictions, encumbrances, and access rights on land or interests in land. [USFS, Website]
Cadastral National Spatial Data Infrastructure (CadNSDI)	A Bureau of Land Management (BLM) product. This is the beginning of an authoritative source of a nationwide Public Land Survey System (PLSS) dataset.
Cartography	The art and science of expressing graphically, usually through maps, the natural and social features of the earth. [Esri]
Chief Information Office (CIO)	The acronym can refer to either the person holding the responsibility and authority for information resources, as described in the Clinger-Cohen Act or Office of Management and Budget A-130, or to the organization that is headed by that person. [IR strategic framework]
Cloud Infrastructure	Computer resources which are available in a remote location and accessible over a network. For example, GIS users currently use Citrix to utilize GIS software and files located at NITC.
Crowdsourcing	The practice of obtaining needed services, ideas, or content by soliciting contributions from a large group of people, especially from an online community, rather than from traditional employees or suppliers. Crowdsourcing is a task or problem that is outsourced to an undefined public rather than to a specific, named group. [Webster]

Data	Any collection of related facts arranged in a particular format; often, the basic elements of information that are produced, stored, or processed by a computer. [Esri]
Data Accuracy	Degree of conformity of a measured or calculated quantity to its actual (true) value.
Data Administration	<p>The comprehensive management of an organization's data:</p> <ul style="list-style-type: none"> • Ensuring consistent definitions of data elements • Coordinating the development of data dictionaries • Providing oversight and management of metadata • Facilitating data standards boards and committees • Overseeing the compliance to data standards • Establishing a data management training program.
Data Completeness	A characteristic of data quality, measuring the degree to which all required data is known. A data set with minimal amount of missing features can be termed as Complete Data.
Data Consistency	Data consistency can be termed as the absence of conflict in a particular database.
Data Dictionary or 'National Data Dictionary'	<p>A catalog or table containing information about the datasets stored in a database. In a GIS, a data dictionary might contain the full names of attributes, meanings of codes, scale of source data, accuracy of locations, and map projections used. [Esri]</p> <p>The USFS has a National Data Dictionary for the collection and storage of geospatial data.</p>
Data Integrity	The degree to which the data in a database is accurate and consistent according to data model and data type. [Esri]
Data Quality	Data quality is a perception or an assessment of data's fitness to serve its purpose in a given context. Aspects of data quality include: Accuracy, Completeness, Update status, Relevance, Consistency across data sources, Reliability, Appropriate presentation, Accessibility. [search Data Management]
Data Standards	Data standards refer to the name, definition, presentation, and business rules governing data sets. They are based on the known data requirements and are set by the stakeholders who need the data. [BLM]
Data Steward (Regional/Station/Zone/Unit)	Data stewards are resource specialists held accountable for the capture, creation and management of data sets assigned to them, upholding any policies, standards, and regulations governing its collection and use to ensure accuracy and integrity. They further refine the business value, scope, standards and services of the organization's data within the context of their R/S/Z/U.
Dataset	Any collection of related data, usually grouped or stored together. [Esri]
Digital Image Processing	Any technique that changes the digital values of an image for the sake of analysis or enhanced display. [Esri]

Digital Orthophoto Quarter Quadrangle (DOQQ)	A digital orthophoto quadrangle divided into four quadrants. [Esri]
DOC CB	Department of Commerce, Census Bureau.
DOC NOAA	Department of Commerce, National Oceanic and Atmospheric Administration.
DOI BLM	Department of Interior, Bureau of Land Management.
DOI BOEM	Department of Interior, Bureau of Ocean Energy Management.
DOI NPS	Department of Interior, National Park Service.
DOI USFWS	Department of Interior, United States Fish and Wildlife Service.
DOI USGS	Department of Interior, United States Geological Survey.
DOT	Department of Transportation
Dynamic maps	Maps that change behavior ‘on the fly’.
Enterprise Data Center (EDC)	The Forest Service Enterprise Data center is located at the USDA National Information Technology Center (NITC) in Kansas City, Missouri. This portion of the data center is outside the Forest Service firewall and houses raster information, published Forest Service GIS data, and each unit’s, Non-NRM, spatial data.
Enterprise Data Warehouse (EDW)	The Enterprise Data Warehouse (EDW) brings together and integrates data from various sources, in formats for reporting and analysis. This is the location of published Forest Service GIS data for internal and limited public use.
Enterprise Map Services (EMS)	A type of Web service that generates maps. [Esri]
Esri	Environmental Systems Research Institute, Inc. Esri is our GIS software provider.
Federal Geographic Data Committee (FGDC)	An organization established by the United States Federal Office of Management and Budget responsible for coordinating the development, use, sharing, and dissemination of spatial data. The FGDC defines spatial metadata standards for the United States in its Content Standard for Digital Geospatial Metadata and manages the development of the National Spatial Data Infrastructure (NSDI). [Esri]
Field Unit	Term used in this document to collectively refer to all National Forests and Prairie in Region 9.
Fitness of Use	The degree to which a dataset is suitable for a particular application or purpose, encompassing factors such as data quality, scale, interoperability, cost, data format, etc. [Esri]

Forest Activity Tracking System (FACTS)	<p>An activity tracking system for all levels of the Forest Service. It supports timber sales in conjunction with TIM Contracts and Permits; tracks and monitors NEPA decisions; tracks KV trust fund plans at the timber sale level, reporting at the National level; and, it generates National, Regional, Forest, and/or District Reports. [USFS Website]</p> <p>Four GIS layers are associated with FACTS that are maintained at the NRM datacenter.</p>
Geodatabase	A database or file structure used primarily to store, query, and manipulate spatial data. [Esri]
Geographic Information Systems (GIS)	An integrated collection of computer software and data used to view and manage information about geographic places, analyze spatial relationships, and model spatial processes. A GIS provides a framework for gathering and organizing spatial data and related information so that it can be displayed and analyzed. [Esri]
Geospatial	Term refers to anything that has a geographic location.
Geospatial Community	Our stakeholders. The community that shares everything geospatial, from GIS staff to end users, to leadership.
Geospatial Data	(Also referred to as spatial data) Information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth. This information may be derived from, among other things, remote sensing, mapping, and surveying technologies. Statistical data may be included in this definition at the discretion of the collecting agency. [Executive Order 12906 of April 11, 1994 Coordinating Geographic Data Acquisition and Access: The National Spatial Data Infrastructure]
Geospatial Interface (GI)	An ArcMap extension that helps resource specialists work efficiently with data. It provides tools that simplify loading data while giving access to custom products for display, analysis and output of data. (USFS, NRM)
Geospatial Management Office (GMO)	<p>The GMO was established in January 2009 as a follow-up to recommendations made in the Integrated Business Environment Geospatial Services Organization Report. The idea was to "...provide a single organizational structure within the Washington Office to support all geospatial information program delivery in the Forest Service." As such, the GMO is "...responsible for the policy, oversight, direction, and delivery of the Forest Service geospatial program, including geographic information systems (GIS), remote sensing, cartography, photogrammetry, geodesy, and global positioning systems (GPS)." The GMO is positioned within the WO Engineering Staff, with the Geospatial Information Officer (GIO) serving as an Engineering Assistant Director.</p>

Geospatial Service and Technology Center (GSTC)	<p>GSTC, a National Service Center in Salt Lake City, Utah, is a unit of the Forest Service Geospatial Management Office (GMO), and is co-located with the Forest Service Remote Sensing Applications Center (RSAC).</p> <p>GSTC provides a variety of geospatial services and products used daily by Forest Service field units, research offices, and WO Staffs, as well as other federal agencies, state, local, and tribal governments, private industry, academia, and the public. [USFS website]</p>
GIS Professional (GISP Certification)	A GISP is a certified Geographic Information Systems Professional who has met the minimum standards for ethical conduct and professional practice as established by the GIS Certification Institute.
Global Positioning System (GPS)	A system of radio-emitting and -receiving satellites used for determining positions on the earth. The orbiting satellites transmit signals that allow a GPS receiver anywhere on earth to calculate its own location through trilateration. The system is used in navigation, mapping, surveying, and other applications in which precise positioning is necessary. [Esri]
Governance	Governance refers to the overall management of the availability, usability, integrity, and security of the data employed in an enterprise. A sound data governance program includes a governing body or council, a defined set of procedures, and a plan to execute those procedures. [Data Management search]
GSA	General Services Administration.
Information Resources (IR)	This is the broad collection of technologies, capabilities, and services related to information. The Clinger-Cohen Act of 1996 defines information resources as “information and related resources, such as personnel, equipment, funds, and information technology” and information resources management as “the process of managing information resources to accomplish agency missions and to improve agency performance ...”(44 USC Sec. 3502 (6) and (7)). [USFS IR strategic framework]
Information Technology (IT)	The application of computers and telecommunications equipment to store, retrieve, transmit and manipulate data. The term is commonly used as a synonym for computers and computer networks. Several industries are associated with information technology, such as computer hardware, software, electronics, semiconductors, internet, telecom equipment, e-commerce and computer services. [Wikipedia]
Layer	In ArcGIS, a reference to a data source, such as a shapefile, coverage, geodatabase feature class, or raster, that defines how the data should be symbolized on a map. Layers are conceptually similar to themes.[Esri] Examples include road, trail, and ownership.
LiDAR Data	Acronym for Light Detection And Ranging. A remote-sensing technique that uses lasers to measure distances to reflective surfaces. [Esri]

Metadata	Metadata consists of information that characterizes data. In essence, metadata answer who, what, when, why, where, and how about every facet of the data that are being documented. With objective metadata, anyone, at any time can confidently judge the fitness of a data set for the use they wish to put the data set to.
Mobile Device or Mobile Technology	Also known as a handheld device or handheld computer or the cellular communication associated with these devices. Devices have an operating system that can run applications or 'apps'. Examples include smart phones, GPS, PDAs, tablet PCs, or e-readers.
National Spatial Data Infrastructure (NSDI)	A federally mandated framework of spatial data that refers to U.S. locations, as well as the means of distributing and using that data effectively. Developed and coordinated by the FGDC, the NSDI encompasses policies, standards, procedures, technology, and human resources for organizations to cooperatively produce and share geographic data. The NSDI is developed by the federal governments; state, local, and tribal governments; the academic community; and the private sector. [Esri]
Natural Resource Manager (NRM)	A national Forest Service organization that is responsible for coordinating software development activities for four application groups: <ul style="list-style-type: none"> • Forest Activity Tracking System (FACTS) • INFRA • Natural Resource Information System (NRIS) • Timber Information Manager (TIM)
Nonspatial Data	Data without inherently spatial qualities, such as attributes. [Esri]
Process Map	Organization tool and structured method for completion of this strategy document.
Program Areas	Program areas at the local unit level most often correlate to budget line items (BLIs) and are identified by four character acronyms such as NFIM, NFMG, or NFWF, representing inventory and monitoring, minerals, and wildlife, respectively. Primary BLIs at the local unit level include, but are not limited to: Engineering fund codes of CMDF and CMTL; Timber fund codes of KV0547 and NFTM; Planning codes of NFIM and NFPN; Lands code of NFLM; Range code of NFRG; Aquatic code of NFVW; Wildlife code of NFWF; and, Fire codes of WFHF and WFPR.
Program Managers	Program managers function as part of the FS's Management team, providing overall program direction and executive oversight necessary to identify and document agency-wide data management requirements.
Quality Assurance	A process used to verify the quality of a product after its production. [Esri]
Quality Control	A process used, during production of a product, to ensure its quality. [Esri]
R9 Information Management (IM)	Program Managers with supporting data management in the program areas under their jurisdiction.

R9 Leadership	A term used in this document that refers to the regional office leadership, as well as, the leadership found on each national forest and prairie in the eastern region.
Raster Data	A spatial data model that defines space as an array of equally sized cells arranged in rows and columns, and composed of single or multiple bands. Each cell contains an attribute value and location coordinates. Groups of cells that share the same value represent the same type of geographic feature. [Esri] Images and photographs are considered raster data.
Reconciling	In GIS, this term refers to the process for resolving conflicts between a library (default) and edit version of data.
Remote Sensing	Collecting and interpreting information about the environment and the surface of the earth from a distance, primarily by sensing radiation that is naturally emitted or reflected by the earth's surface or from the atmosphere, or by sensing signals transmitted from a device and reflected back to it. Examples of remote-sensing methods include aerial photography, radar, and satellite imaging. [Esri]
Replicated	Reproduced. In this document, this term refers to R9 field units having more than one copy of geospatial datasets. One copy may reside at EDW while an additional copies may be within each unit's geodatabase; resulting in inefficiency of data maintenance and increased risk of discrepancy.
Schema	Database structure or plan.
Scripting	A programming language (such as python) which is used to automate tasks.
Spatial Analysis	The process of examining the locations, attributes, and relationships of features in spatial data through overlay and other analytical techniques in order to address a question or gain useful knowledge. Spatial analysis extracts or creates new information from spatial data. [Esri]
Stakeholder	Any individual who has an interest in and dependence on a set of data or information.
Topological	Refers to topology. Topology defines and enforces data integrity rules (for example, there should be no gaps between polygons. [Esri]
USDA NASS	United States Department of Agriculture, National Agricultural Statistics Service.
USDA NRCS	United States Department of Agriculture, Natural Resources Conservation Service.
Vector Data	A coordinate-based data model that represents geographic features as points, lines, and polygons. Attributes are associated with each vector feature, as opposed to a raster data model, which associates attributes with grid cells. [Esri]
Wi-Fi	Wireless local area network.

Workflow	An organization's established processes for design, construction, and maintenance of programs, products, and business objectives. [Esri]
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