

Chapter 3 Project Scope, Methodology and Caveats

This document is an interim report for the policy and institutional component of the project entitled ***Technology and Policy Aspects of Applying Remote Sensing in State Forestry Organizations***. Work to date has used various methods, including review of related information and literature; interaction with state foresters and their representatives; case studies about selected SFOs; and individual contact with each of the 50 SFOs to develop and then classify, synthesize and analyze detailed "State Profiles." Each of these efforts is described below.

3.1 Review of Related Information and Literature

Several related topics were reviewed in preparation for this project, primarily including investigations about GIT conditions in the nation's state governments and SFOs. Federal government and other documents about remote sensing and other GIT were also investigated, both for forestry and related applications. Queries were also made to the National Association of State Foresters (NASF), individual SFOs, federal agencies, and other organizations, and literature searches were conducted to discover related journal articles, conference proceedings, books and other documents.

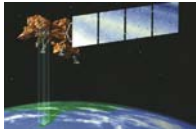
The largest and most current body of related research addresses statewide geographic information and GIT (GI/GIT) conditions in the 50 states, with much of this work conducted by this author and collaborators. Documents about these investigations are likely also to be informative to readers of this report. Most recently, the National States Geographic Information Council (NSGIC) published a report entitled *Statewide Leadership and Coordination of Geographic Information and Related Technology in the 50 States* (Warnecke, et.al. 2002). It provides detailed information about statewide GI/GIT coordinating offices and groups; related enabling legislation, executive orders or other directives; GI/GIT policies and standards; related

data development, clearinghouses and web portals; unique and innovative GI/GIT efforts; and related statewide strategic plans, newsletters, conferences and other key events in each of the 50 states. Summary tables, figures and analysis are also provided about statewide GI/GIT institutional conditions.

Additional information about statewide GI/GIT conditions is available through NSGIC's web site (<http://www.nsgic.org/review/index.cfm>). The site provides access to 50 State Profiles that include even more detailed material about statewide GI/GIT conditions as of 2000. These profiles uniquely include contacts and some descriptions about GIT activities in several state agencies, including some SFOs. They also include detailed histories for each state about the authorization and evolution of statewide GI/GIT coordination efforts. The profiles were developed by this lead author with support from the Western Governors' Association (WGA), National Conference of State Legislatures (NCSL), NASA, National Oceanic and Space Administration's (NOAA) Coastal Services Center, the Federal Geographic Data Committee (FGDC) and NSGIC.

Other related documents are also available about state GI/GIT conditions in the 50 states, including summary articles and book chapters, such as "Geographic Information Technology in State Governments of the US" (Warnecke and Decker 2002), "Geographic Information Technology Institutionalization in the Nation's States and Localities" (Warnecke 1999), and "State and Local Government GIS Initiatives" (Warnecke 1998). The later two are additionally informative because they include comparative material about the development and institutionalization of GI/GIT in local governments in addition to states.

A NASA publication entitled *NASA as a Catalyst: Use of Satellite Data in the States* specifically focuses on remote sensing (Warnecke 1997). It includes an overview about NASA's then current and past efforts to work with state and local governments to encourage and facilitate use of



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satellite data. It also includes an analysis of satellite data use in the 50 states, including determination of the most frequent uses of satellite data. Queries of the states were directed toward statewide GI/GIT coordinators, not state foresters, and a wide range of applications were identified. Forestry tied with land cover inventories as the leading identified application, with 22 states indicating satellite usage for this purpose at the time.

While these documents addressed all parts of state government, other materials focus more directly on forestry in states and/or other organizations, or more generally on environmental and natural resources conditions and related GIT applications. The National Association of State Foresters (NASF) and SUNY-ESF conducted a survey about GIS in the 50 SFOs in 1993, resulting in a report entitled *Geographic Information/GIS in State Forestry Organizations: 1993 Survey Results* (Warnecke and Herrington 1994). This report identified which SFOs are using GIS, remote sensing, and related technology and for what applications, as well as information about benefits, impacts and suggestions. It was useful to compare results in this project.

An analysis of organizational approaches to environmental and natural resources (ENR) functions in the 50 states was particularly helpful to understand SFO reporting relationships (Warnecke, 1994). Sponsored by the U.S. Geological Survey, the resulting report is entitled *Environmental and Natural Resources (ENR) Institutionalization in the 50 States: Organizational Charts Clarify Roles and Relationships*. Various conditions were investigated to compare ENR organizational structures, gubernatorial jurisdictions, and organizational approaches and impacts on specific ENR functions such as forestry, public lands management, wildlife, geology, air quality, and agriculture. Few investigations have been conducted about state organizational approaches for these functions or ENR generally, so this work helped to understand the organizational context in

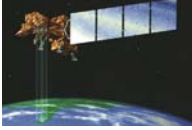
which SFOs operate within state governments and potential impacts on GIT adoption.

Augmenting these documents are materials about remote sensing and GIT for forestry and related applications, including materials generated by the U.S. Forest Service, NASA, National Research Council, RAND, and others, and available in regular periodicals and other sources. These materials are referenced in the following chapters where appropriate and included in the bibliography.

3.2 Interaction with State Foresters and their Representatives

Much guidance and assistance has been provided to this project by individual state foresters, both directly and indirectly, and through NASF. A component of this project as compared to many other remote sensing and other GIT research investigations is the strong engagement of officials with policy and management responsibility for the subject area of investigation. Recognizing the growing use and issues associated with GIT adoption in SFOs, NASF's former Executive Director, William Imbergamo, was a strong project advocate and assisted in securing initial funding. NASF's Research Committee, under the chairmanship of Michigan State Forester Gerald Thiede, has served in a direct leadership role since the project began in June, 2000. This attention, support and direct involvement has helped to identify key policy and institutional issues, needs, and opportunities concerning remote sensing and other GIT in SFOs.

Much of the project engagement with state foresters and NASF has been through participation in regular meetings of NASF, the Northeastern Area Association of State Foresters (NAASF), and NASF's Research and Fire Committees. Interactions at these meetings and subsequent telephone and email dialogue with state foresters and their staff provide many formal and informal opportunities to provide project updates and



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discover important issues, concerns and needs to consider in the project. Several state foresters, especially some recently appointed to their position, have expressed strong interest and desire to learn more to more effectively utilize remote sensing and GIT. Additional meetings have been held with NASF staff to provide updates and gather input. Responses to queries and other informal assistance have also been provided to individual state foresters, though not a direct component of the project.

On-site visits and interviews were conducted early in the project through case studies with the SFOs in Maine, Massachusetts, New Hampshire and New York. Additional project meetings and discussions have been held between SUNY-ESF and the New York SFO to learn about complementary efforts and needs while exploring future collaboration opportunities. Efforts and interaction have also extended to benefit the SUNY-ESF community and potential future SFO leaders and staff. For example, the project supported an informative visit to the campus by Fay Rubin, the project manager of New Hampshire's recently completed land cover project, which was partially funded by and will be extensively used by their SFO.

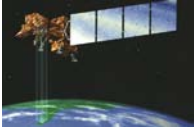
Complementing this work has been participation in related projects, such as with the National Academy of Public Administration (NAPA), Local Leaders for GIS (LLGIS) Consortium, Institute for the Application of GeoSpatial Technology (IAGT) and Rochester Institute of Technology (RIT). These projects have provided additional opportunities to interact with state foresters, and at the same time be aware of leading policy and management concerns of state foresters and other government leaders. Efforts have also been made to encourage others to help inform state foresters about remote sensing and other GIT. For example, the U.S. Geological Survey sponsored booths at the NASF annual conference in 2001 and 2002, providing a public source of information for state foresters and other attendees.

3.3 Development and Content of "State Profiles"

The primary work conducted to date for the policy and institutional component of the project has been to prepare and analyze "State Profiles" about remote sensing and other GIT in each of the 50 SFOs. The original project plan was to make the 50 profiles available through the project web site (<http://www.esf.edu/forest/>). The profiles were intended to be synthesized and evaluated to help design a questionnaire that will be administered to various staff within each of the 50 SFOs. However, the NASF Research Committee and several state foresters asked if the profiles and analysis of their contents could be more widely available, such as in a hard copy document. They indicated that such a report could help state foresters understand conditions in their own state as compared to other SFOs, increase interest in remote sensing and other GIT, and help to secure essential support for the project's follow up questionnaire. Arrangements were then made to prepare and distribute this report to state foresters and other project participants.

Early profile work began in September of 2000 by synthesizing GMA materials obtained from past related research, and compiling additional information about the 50 states concerning remote sensing and GIT in SFOs and other agencies. Published materials from regular hardcopy and online magazines, which often include articles about remote sensing and GIT activities within individual states, were complemented by information provided by individual states, such as policies, project plans, reports and other documents. These materials were synthesized by state, as applicable, forming a knowledge base from which to work with each state to develop summary text for each state, known as "state profiles".

Initial profiles were prepared for each state and summarized in preliminary findings provided to the NASF Research Committee at a briefing during their February 2001 meeting. The



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committee provided essential input about the scope of the profiles and methods to update, synthesize and validate them with the 50 state foresters. It was also concluded from work to date that more detailed information would be helpful about institutional conditions, internal applications and relationships with other organizations.

An important complementary effort was established by the National States Geographic Information Council (NSGIC) in 2001. In partnership with USGS, NSGIC contracted with GMA to investigate and prepare a report about statewide GI/GIT conditions in each of the 50 states (Warnecke, et.al. 2002). Each of the 50 state GI/GIT coordinators and others helped prepare individual summary reports for all 50 states. A portion of the statewide GI/GIT coordination information gathered via the NSGIC project was incorporated into the profiles on a state by state basis. While the projects had separate efforts underway with different assistants, additional state findings through the NSGIC project were compared with that of this project to increase the accuracy and completeness of the SFO profiles.

Following the Research Committee's suggestions, email and telephone contact was made with each of the 50 state foresters and many of their staff to distribute the initial state profiles and identify informational needs to complete comparable texts. An outline including desired profile contents was prepared based on the input of the committee, dialogue with state foresters and others, material from the NSGIC project, and the results of the case study visits to four nearby SFOs as discussed above. While SFOs differ, each profile in Appendix C generally follows this outline and includes information on these topics:

Section 1: Organizational Approach to GIT

1. Identification of SFO and "parent" as applicable, with websites
2. Overall GIT presence, usage and organizational structure for GIT

(individual programs or enterprise-wide approach)

3. GIT staffing, including title and role of lead SFO contact and other users
4. Presence of GIT use/staff in regional or field offices as well as headquarters
5. GIT relationship with SFO "parent" if applicable
6. GIT policies and issues/problems/needs concerning GIT as applicable

Section 2: Remote Sensing and GIT Applications and Data Utilized

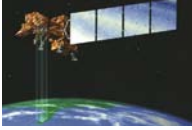
1. Identification of current GIT applications based on standard profile categorization
2. Description of current, planned and potential GIT applications, with particular focus on remote sensing and GIS
3. Identification of hardware and software utilized (if volunteered)
4. Identification of data utilized, with emphasis on remote sensing
5. Identification of other participating organizations in specific applications as applicable
6. Links to documentation such as websites, reports or presentations as applicable

Section 3: SFO Linkages with Statewide GIT Coordinators and Others

1. Identification of statewide GI/GIT coordinators, offices or other entities
2. Identification of statewide GI/GIT coordinating groups
3. Relationship of SFOs and their organizational "parents" (if applicable) with these entities and groups
4. Identification of statewide geographic data clearinghouses

Section 4: Lead GIT Contact(s) in SFOs

This section includes full contact information for key individual(s) concerning GIT.



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While this outline was used to guide the development of each profile, SFO representatives were able to use their own words to describe conditions and encouraged to freely provide information about unique matters or applications in their state. However, this approach may have resulted in some instances in which GIT is used, but was not reported. This was most evident in terms of GPS use, particularly due to the minimal cost of GPS receivers and the fact that it is becoming pervasive for many SFO applications. As a result, some SFOs identified using GPS for several applications, while several others essentially only discussed remote sensing and GIS use as was the primary goal of the project.

Where possible, contact was made with individuals who are the lead GIT staff within each SFO. In some cases, additional individuals were contacted in and outside of SFOs to provide more thorough information, particularly if GIT responsibilities were charged to an individual or organization outside the SFO. Some SFOs do not have a lead person designated for GIT, so a lead contact was established particularly for this project. These individuals may not have formal or informal GIT responsibilities within their SFO, so the results reflect their help but limited role.

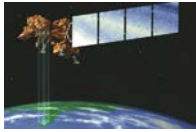
The profile development process accelerated in September 2001 and continued until completion of all 50 profiles. While some states were more responsive than others, contact and interaction continued with each of the 50 SFOs as needed in order to complete comparable profiles. Great disparities exist among the SFOs. Some are much larger than others, and some have extensive GIT activities while others have few efforts in this regard. As a result, it was necessary to customize an appropriate approach for each SFO, but at the same time endeavor to meet at least the minimum level of information that was needed to be thorough and consistent. Profile completion required extensive contact with state foresters and their staff, including four or more individuals in some states.

As shown in Appendix C, the final profiles ranged from one page to more than three pages. Some SFO representatives prepared much of their own profile text, while in other cases, it was necessary to draft text and then garner approvals that the prepared text accurately represented conditions in their SFO. Some states required multiple versions and submission of additional documentation to ensure consistent content as compared with other states.

A rigorous process was also used to ensure accuracy and finalize each profile. The NASF Research Committee asked that all profiles be approved by applicable state foresters before finalization. This review provided an additional opportunity to engage each state forester in the project and increase their familiarity with remote sensing and GIT conditions within their organization and statewide. In some instances, the state forester delegated this role to a deputy or assistant state forester. The lead GIT contact for each SFO identified in Appendix C and the lead author of this report also approved each profile before finalization. As each profile was completed and approved, it was placed on the project web site (<http://www.esf.edu/forest/>), where all 50 profiles are now available. The profile development process extended over several months, but efforts were made to make all of the contents current as of, or more recently than, the beginning of 2002. Profile production for all 50 SFOs was finished early in the summer of 2002 and all completed profiles are presented in Appendix C.

3.4 Data Classification, Synthesis and Analysis

Systematic summarization and analysis of the profile contents also was a significant portion of the project work. Efforts were made to classify and synthesize some of the profile contents beginning in the fall of 2001. The first topics to be classified and analyzed were GIT applications and technology usage as included in Section 2 of the profiles. Several profiles were reviewed in order to



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develop a classification scheme to incorporate all potential GIT applications in SFOs into general categories. A detailed process and careful effort was used with multiple reviews to uniformly define and code GIT applications and specific technology used by the SFOs. Names of the application categories were bolded in all profiles to facilitate coding and are similarly bolded in Appendix C to enable the reader to understand this coding. A preliminary synthesis of available findings was provided to the NASF Research Committee at their February 2002 meeting. Frequencies of applications and technology usage were determined and compared to results from the NASF and SUNY-ESF survey about GIS in the 50 SFOs described earlier (Warnecke and Herrington 1994).

The second portion of the analysis addressed internal and external institutional and policy conditions concerning GIT in the 50 SFOs. After careful qualitative review of the contents of the profiles, with particular attention to Sections 1 and 3, classification schemes were developed to categorize conditions in each state for various factors. Each of the 50 profiles were reviewed thoroughly and repeatedly to ensure accuracy and consistent classifications for each factor. The content of Sections 1 and 3 required more extensive review and evaluation than Section 2 because quantification and coding of institutional and coordination conditions and policy matters can be more difficult than applications and technology.

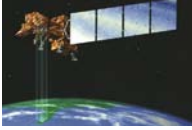
Development of classification schemes was primarily based on the information provided in the state profiles and on the research team's knowledge of the government sector as the institutional context in which GIT is used. The schemes provided a generalized representation of the scope of GIT use; organizational approach; outside assistance; staffing; leadership and responsibilities; coordination and relationship with other organizations and groups; GIT policies, issues, and benefits; and future activities.

Two types of classification schemes were used: pre-designed classifications based on past research about related conditions; and classifications that evolved from the contents of the state profiles. In both cases, the categories were made distinctive, well defined, and mutually exclusive. Coding was based on interpretation of the text from the profiles and conversion of mostly qualitative information and statements into defined categories. Due to the nature of provided information, it was difficult to precisely designate codes for each SFO, but it allowed differentiation among the SFOs and presentation of variability across the 50 states. Therefore, the analyses and presentations based on this data represent general trends and cumulative assessment of overall GIT arrangements, institutional and coordination approaches, and policies, issues and benefits in SFOs.

Classification schemes were developed for the following variables:

1. GIT and GIS, GPS, RS Presence and Use
2. Assistance Level and Sources
3. Organizational Approach
4. Staffing
5. GIT Contact and Responsibilities
6. External Coordination and Relationships
7. GIT Issues, Policies and Needs
8. GIT Benefits

Investigation of the profile contents was also complemented with consideration of available external data, such as population size and change; state land area and relative amount of forested or public land to all land; forested land ownership; internal SFO organizational conditions and organizational placement; SFO responsibilities; SFO funding, expenditures and staffing; and other factors to explore and help explain and understand differences among the SFOs. Data was derived primarily from the U.S. Bureau of the Census statistical reports (<http://www.census.gov>) and from the report entitled *State Forestry Statistics - Fiscal Year 1998 Report* produced by NASF



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(Dupree 1998) (http://www.stateforesters.org/statistics/FY98_Statistics).

Statistical data analysis included: calculation of frequencies, contingency analysis with Chi-square testing of significance of the cross-tabulation results, and bivariate correlation analysis with Pearson's coefficient and significance test (Grimm et. al. 1990). Recent analysis of statewide GI/GIT conditions (Warnecke et.al. 2002) was also used in this phase of the project. These findings were used to explore potential correlations, particularly in terms of organizational conditions associated with GIT coordination on a statewide basis. Limited additional research is available about RS and other GIT policy and institutional issues in and as relevant to forestry and SFOs. However, attempts were made to find and reference applicable material where related research addressed some of the findings in this report.

In addition to this report, the results of this work will also be used to design and implement a follow up survey instrument to refine findings and further investigate conditions to identify issues, benefits, pitfalls, needs and lessons learned, and generate suggestions and recommendations for future actions to address these concerns.

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