



1. Organizational Approach to GIT:

The Department of Resources and Economic Development's Division of Forests and Lands (<http://www.nhdf.org>) manages approximately 200,000 acres of state owned land and has five bureaus with forestry roles including responsibility for all of the state's forested lands. New Hampshire is the second most forested state in the country, after Maine, with 4.5 million acres of forested lands. About 80% of this land is controlled by private forestland owners, though more and more land is going into public ownership. The division has about 50 employees plus 15 University of New Hampshire (UNH) cooperative Extension staff and additional seasonal employees. Work is also carried out by over 2500 wardens, deputy wardens and special deputies that assist the Forest Protection Bureau in their fire, forest health, timber harvesting law enforcement, and town assistance roles. The other parts of the Division include the Land Management Bureau, which is responsible for land acquisition and disposal, and land records and boundary maintenance; Forest Management Bureau, which prepares and executes management and productivity plans for state lands and manages the state's tree nursery program; Community Forestry Bureau, which administers urban and community forestry programs and the Forest Inventory and Analysis (FIA) program; and the Natural Heritage Inventory Program which finds, tracks, and facilitates the protection of NH's rare plants and exemplary natural communities. The UNH Cooperative Extension – Forestry and Wildlife Program functions as the outreach arm of the Division, providing educational and technical assistance outreach programs to forest landowners, communities, resource professionals and the public through an MOU that has existed since 1925. The forest planning and data analysis functions of the Division work directly under the office of the State Forester.

The Division utilizes GIT, but little GIT work is conducted in house. Most GIT work is conducted under contract with the Complex Systems Research Center (CSRC) at UNH's Institute for the Study of Earth, Oceans and Space, which also serves as the statewide clearinghouse for geographic data as described below (<http://www.csrc.sr.unh.edu/>). Within the Division, the Forest Resource Planner serves as the lead contact for GIT matters, but spends limited time in this regard due to other duties. In addition, Division foresters have conducted extensive field work in partnership with CSRC to verify and otherwise assist in imagery interpretation. Several benefits have been realized through GIT use. The graphic display of information such as land type and use strikingly reveals current and anticipated conditions to lay people and decision makers. GIT use also helps to reveal the costs of various management approaches and decisions on the ground. However, several issues exist in order to maximize GIT potential and benefits. It is difficult for a relatively small agency to develop the organizational capacity to fully apply GIT. While there is much staff interest in using GIT, there is a need to cost justify related expenditures beyond hardware and software to departmental leaders. For example, funds do not necessarily exist to support training or modern data development and related activities. A stronger commitment of funding is needed to make progress. The Department has an information technology (IT) group but it is not sufficiently staffed to provide sufficient help to the Division regarding IT, and less so concerning GIT. Existing contractual arrangements with CSRC work as well as possible with an external entity providing expertise and services, but this arrangement can take longer and be more cumbersome than if work was conducted internally and some internal staff capacity was developed as an in house resource to help meet future needs.

2. GIT Applications and Data Utilized:

The Division's GIT activities and benefits to date have largely been through its contracts and work with CSRC at UNH. For example, the Division worked with CSRC to conduct a statewide survey and **assessment** of clearcut areas. Uniquely directed by the Legislature in 1993 to use remote sensing, imagery was used to identify and map all clearings of at least three acres in the state, provided that the

clearings have been made for silvicultural purposes within the last 10-15 years. The project involved the use, processing, interpretation and integration of both LANDSAT Thematic Mapper (TM) and SPOT imagery, as well as GIS analysis, GPS and standard fieldwork. The project clearly revealed the benefits of graphically portraying current and potential conditions. Subsequently, the value of imagery was also revealed in response efforts after the 1998 ice storm that impacted parts of New Hampshire, Maine, New York and Vermont. The storm caused heightened concern about fuel buildup and **wildland fire** risk. As a result, disaster funds were used for data development, including procurement of color infrared photography for the entire state of New Hampshire during the summers of 1999 and 2000. The Division chose infrared photography for its ability to show tree health and for identifying forest types. Nearly six million acres were photographed at a scale of 1:15,840, or 1 inch = ¼ mile. CSRC was contracted to help process the imagery and provide other data to assist in response efforts.

Today, the Division and other state agencies contract with CSRC for statewide data management for use with GIS and various GIT services, including GIS and remote sensing. CSRC recently completed an extensive Land Cover Assessment Project with funding and assistance from the Division, the Department of Fish and Game, the U.S. Forest Service, and others. The Division provided financial support as well as a forester to help conduct field verification of the imagery. This project resulted in a statewide **land cover** map and data set including detailed information about the state's vegetative and physical features. The project generated a digital, statewide, 23-class land cover data set, developed from LANDSAT TM satellite imagery acquired over the period 1990-1999. LANDSAT 5 and 7 TM data were processed using a combination of traditional supervised and unsupervised classification methods. Data enhancements were achieved by utilizing supplemental sources archived in the state's geographic database (known as "GRANIT" as described below), including digital orthophoto quads, digital raster graphics (DRGs), USGS digital line graphs (DLGs) covering hydrography, NH Department of Transportation road centerlines, digital elevation models (DEMs), SPOT panchromatic (10-meter resolution) images, public/conservation lands, U.S. Fish & Wildlife Service National Wetlands Inventory (NWI) maps, and watershed boundaries. The accuracy assessment indicates an overall accuracy of the aggregate, 7-class data of 95.9%, and an accuracy of 82.2% at the full 23-class level. A supplemental product of the project is a body of field data focused on the state's forested areas, which provides a valuable data resource to a wide variety of users. The data are available from the NH GRANIT website (www.granit.sr.unh.edu) or on CD-ROM upon request. The results will be used, among other applications, for several statewide policy and planning needs, as well as to address several forestry needs. Planned resource applications include assessing forest health, such as insect and disease conditions and high risk areas based on species composition, setting structure and composition goals for state ecosystems by ecological unit using capability analysis, and informing management decisions on state-owned forest lands. The Division also anticipates using these data in economic applications such as in combination with FIA data to determine the feasibility of expanding the existing forest industry or the development of new industry based on resource availability, and secondly to identify potential resource shortages based on development trends.

3. Statewide and Other GIT Linkages:

While the Division of Forests and Lands does not have in house GIT capacity or work, it has a very positive contractual relationship with CSRC to acquire GIT services, including remote sensing (<http://www.csrc.sr.unh.edu/>). This approach enables Division users to access and benefit from the best available data and resources in the state because of CSRC's key statewide role concerning GI/GIT. Statewide GI/GIT coordination roles in New Hampshire have long been shared by the Office of State Planning (OSP) and CSRC (<http://www.state.nh.us/osp/>). OSP has officially served as the lead agency in state government for GIT since 1984, and includes a part-time statewide GIT coordinator. In addition to the CSRC work described above, OSP contracts with and funds CSRC to conduct data base development, maintenance, and dissemination for the state's GIS, known as GRANIT (Geographically Referenced Analysis and Information Transfer) (<http://www.granit.sr.unh.edu/>). Several state agencies, including the Division, provide financial support to help fund CSRC to serve in this role. GRANIT staff participate in a

suite of activities related to hosting GRANIT, including basic data base design and development, web site maintenance, standards/specifications development, applications development, image processing, training, and technical support to the state's GIT user community. New Hampshire's leading GI/GIT coordination group is the GIS Advisory Committee, which has provided statewide direction and coordination for GI/GIT since the Council on Resources and Development (CORD) formed it in 1987. CSRC is also responsible for serving as the state's lead GI clearinghouse, and established a New Hampshire node of the National Spatial Data Infrastructure (NSDI) Clearinghouse with the Federal Geographic Data Committee (FGDC). Emphasis is on documenting data layers according to the FGDC metadata standard. GRANIT metadata are posted and searchable through its web site and core data layers are routinely provided for download.