New York

1. Organizational Approach to GIT:

The Division of Lands and Forests (http://www.dec.state.ny.us/website/dlf/index.html) is located in the Department of Environmental Conservation (DEC) (http://www.dec.state.ny.us/). Fire management responsibilities are conducted by DEC's Division of Forest Protection and Fire Management. DEC has used GIS in various capacities since the early 1980s, and has had an enterprise-wide approach with a full-time GIS coordinator located in the central information technology area of the department since 1989. The Division has increased its use of GIT for forestry-related work in recent years. However, the Division's GIT usage is primarily for individual applications undertaken by various program staff. The GIS Section consists of three dedicated, full-time GIS specialists located in the main office, including and led by a Principal Forester who supervises the Division's GIT activities. The Section provides high-level data generation, development, distribution and analysis functionality. Regional office staff utilize GIT in conjunction with other program responsibilities. About 25-30 regional staff use GIT, of which 5-6 of these staff use it about 25 percent of the time. The remainder of these field staff use GIT less than 10 percent of the time. The Principal Forester is responsible for GIT administration and oversight of central and regional office programs. Each of the nine DEC regions, including Division staff, have access to digital data and imagery through regional data servers that were established in 1999 as part of the Department's GIS data distribution mechanism. The Division does not have any specific policies regarding GIT.

The benefits of GIT were demonstrated following several severe storms occurring from 1995 - 1998 that resulted in extensive forest blow down and damage. These events served as a major impetus for GIT use as described below. Remote sensing (RS) benefits were realized at policy levels, particularly to assess the damage quickly in order to obtain appropriate federal funds according to the amount of damage. Ice storm damage assessment also revealed that greater sophistication, such as satellite imagery, resulted in greater benefits. According to Kurt Swartz, the Division's Principal Forester, the primary constraint to increasing the use of GIT for forestry related applications is the lack of key technical personnel that can unify technology and applications, particularly to expand the use of remote sensing. In addition, the Division lacks the funds and resources to provide training to staff and to update its GIT infrastructure. It is often necessary to allocate funds from other work areas such as water protection, which receives federal funding. Another problem is the limited communication that occurs among state users of GIT, which impedes information sharing and often results in duplication of effort. This situation has also hindered effective use of the technology. Data limitations are also a key problem, particularly the lack of current statewide land use and land cover data, as well as inconsistency in GPS capabilities and data.

2. GIT Applications and Data Utilized:

The Division uses GIT for **forest health** monitoring, **watershed** protection**, recreation** planning, **land acquisition**, **planning** on **state lands**, **private** landowner assistance, and **forest characterization,** as described below. The Division's forest characterization and inventory efforts use GIS, GPS and digital orthophotos in conjunction with ground based forest inventory techniques for forest type mapping and condition information. GPS is used to collect infrastructure data such as roads and trails, and assets such as structures and improvements. These data are then available for integrated land use planning on state owned lands. While it would be helpful, the Division has not been able to utilize data from the U.S. Forest Service's Forest Inventory Analysis (FIA) program to assist in these efforts.

Remote sensing (RS) has been used to evaluate post-event **forest health** conditions resulting from significant weather events and **emergencies** which cause forest damage, such as the 1995 Adirondack blow down and 1998 ice storm. Data used for these projects included aerial photography, digital

orthophotography, and satellite imagery. Following the 1995 Adirondack blow down, analyses and mapping of damaged areas using GIS were derived from color aerial photographs. The final results were validated through change detection analysis from pre-event and post-event LANDSAT Thematic Mapper (TM) scenes. Based on this experience, mapping of forest damage from the January 1998 ice storm used only satellite images. Due to the extensive area, and highly variable damage to tree species, mapping by more traditional means was both time and cost prohibitive. Although image quality has slowed progress, highly accurate results were obtained for the Western half of the storm impact area. These events revealed the benefits of using RS for these uses and potential future applications.

Aerial imagery is most often obtained through direct capture using the Department's Zeiss LMK 2000 large format aerial photography camera and ancillary peripherals. Satellite imagery (primarily LANDSAT TM, but sometimes SPOT or IKONOS) is procured from technology vendors. Digital imagery, such as color infrared digital orthophotos, and other GIT is increasingly used for forestry applications. For example, GPS is frequently used, including by many field staff, but differences in the precision of various types of GPS units throughout the Division make comparative analyses of some data difficult.

The Division has partnered with others in DEC such as in the New York Gap Analysis Program (GAP), which was coordinated by Cornell University. GIT is also used in conjunction with other state agencies, the SUNY College of Environmental Science and Forestry (ESF), SUNY Albany, U.S. Forest Service (USFS), and St. Lawrence University. The Northern Forest Lands Study was a good example of cooperation, including with the northern New England states. This project and the New York-New Jersey Highlands Regional study were both authorized by Congress, and included some **land cover** work based on satellite imagery and other data.

The current New York-New Jersey Highlands study is an update to the original study undertaken in the early 1990s (http://www.fs.fed.us/na/highlands/). The study includes analyses of forest fragmentation, watershed conditions and biological diversity. The EcoMap component of the new study is both a national and regional USFS initiative to map ecological units and encourage their use in ecosystem-based approaches to forestland conservation and management (http://www.na.fs.fed.us/sustainability/ecomap.htm). EcoMap mapping criteria are outlined in the National Hierarchical Framework of Ecological Units (NHFEU), which systematically divides the country into progressively smaller areas of land and water that have similar physical and biological characteristics and ecological processes. The Division is using GIS and a combination of several data sets to map Land Type Associations (LTAs), which are one of several ecological units of the NHFEU. Raster data sets used include The Nature Conservancy's Ecological Land Units (ELUs), landform and slope derived from 10-meter digital elevation models (DEMS), and U.S. Geological Survey (USGS) MultiResolution Land Characteristics (MRLC) data, which are based on LANDSAT Thematic Mapper (TM) imagery. Vector data include 1:250,000 surficial and bedrock geology, and STATSGO soils from the Natural Resources Conservation Service (NRCS).

DEC also uses LANDSAT TM and SPOT satellite imagery from the Highlands study in its evaluation of land use change patterns and categorization to ecological land types. This imagery is produced by the Center for Remote Sensing and Spatial Analysis (CRSSA) at Rutgers University (http://crssa.rutgers.edu/projects/highlands/), which is a contributor to the Highlands study. CRSSA is conducting analyses of land use and land cover change, forest and watershed integrity, hydrologic systems, biodiversity, recreation and open space, population trends and projected future growth. Several additional agencies are also involved in the study, including USGS, the New Jersey Department of Environmental Protection, and the New York-New Jersey-Connecticut Regional Plan Association.

State forestry leaders have expressed the desire to make greater use of RS and other GIT for several uses. The State Forester and Deputy have stated that GIT would be helpful to locate and understand the

characteristics of open space, and to assist in forest inventory and additional forest health efforts. RS could also be applied in urban forestry, open space planning, determinations of land acquisition and protection priorities, and study of land use patterns, as well as determinations and prioritization of riparian treatments and appropriate vegetation to protect watersheds.

Water protection issues are an increasingly important topic, and efforts have been made to use GIT in this regard. The New York City Watershed, which extends over 100 miles north of the city, is a particular area of concern because this water source must maintain a sufficient quality in order to not require treatment. New York City's Department of Environmental Protection uses several forms of remote sensing and GIS to help protect the quality of the watershed. Federal funding has been used to support GIT work for water quality protection efforts in this and other parts of the state. For example, some riparian buffers are being determined using LANDSAT TM imagery, though it can be too coarse to do so because buffers typically need to be 100 feet in width.

GIT is also used in other projects with the Division. For example, work is underway with Dr. Eddie Bevilacqua and Dr. Lee Herrington, Professors at SUNY-ESF, to develop an ArcView™ application to assist **private land owners** with stewardship plans. These plans will be coordinated with **watershed** plans and other GIT work in both the Division of Lands and Forests and the Division of Fish, Wildlife and Marine Resources. This application will allow incorporation of up-to-date spatial and field collected GPS data on private lands. This work is consistent with ongoing statewide public land data formats and efforts, and will include establishment of a mechanism for accomplishments reporting in both tabular and spatial formats.

In another project with SUNY-ESF, Dr. Donald Leopold and graduate student Matt Buff are using GIT to help evaluate plant biodiversity on one million acres of state land. High priority, rare plant geographic subsets are being developed for use in identifying probable locations of rare plants statewide and to determine priority areas for attention without the need for intensive inventory work. In this **assessment** and **protection** project, Wide-Area Augmentation System (WAAS) Garmin handheld GPS units are used to record locations. Several raster and vector layers are used with GIS, including USGS DEM-derived topography data such as slope, aspect, and elevation; climate data from the Spatial Climate Analysis Service at Oregon State University; NRCS soils data; and parcel boundary, inventory and rare plant data from DEC. DEC is providing access to and guidance in using these data. While the project does not include any RS or tree species data use at this time, it is recognized that this would be helpful.

3. Statewide and Other GIT Linkages:

The New York State Office for Technology (OFT) (www.oft.state.ny.us) established the Center for Geographic Information (CGI) in 2000. CGI serves as the official state GIT coordination office, provides statewide GIT oversight and coordination, and hosts and staffs the NYS GIS Coordinating Body (http://www.nysgis.state.ny.us/body_lst.htm) as a permanent Standing Subcommittee of OFT. While the Division is not active in this group, Division staff attends quarterly DEC GIT coordination meetings. An additional coordinating effort is the Metropolitan New York I-Team, which has been developed to link GIS activities between New York City and the surrounding counties in New York State and New Jersey.

New York has two GI/GIT Clearinghouses and a new public access portal with broader functionality. One of CGI's leading functions is to operate and manage the main Clearinghouse, which is called the NYS GIS Clearinghouse (www.nysgis.state.ny.us). CGI also manages the NYS GIS Data Sharing Cooperative, which is New York State's unique data sharing framework. The second data clearinghouse is called the Cornell University Geospatial Information Repository (CUGIR) (http://cugir.mannlib.cornell.edu/index.html). It is managed by Cornell University and specializes in natural resource information.

An effort is underway by CGI to upgrade its existing architecture and add a spatial data warehouse to the highly successful Clearinghouse to provide better service to viewers. A key connected effort to increase public access is MapNY (http://www.nysegov.com/map-NY.cfm), an e-Commerce/e-Government initiative that will provide citizens the ability to search for government services geographically from any State agency home page (www.state.ny.us). On-line mapping initiatives by the State and local governments have become very popular. A future addition will bring together a collection of imagery and other state GI in a unique format that will allow Internet users to explore the State via any Web access.