

Stitching Together the Patchwork Quilt: Using GIS to Assist the Inventory Portion of the Adirondack Forest Preserve Unit Management Planning Process

By STACY A. MCNULTY

Abstract

This article describes a project undertaken by the Adirondack Ecological Center in cooperation with members of the UMP-GIS Consortium, a collaborative effort of the Adirondack Research Consortium. The goal of the project is to facilitate planning for the Adirondack Forest Preserve. The approach is to aid the natural resource inventory portion of the Unit Management Planning process using Geographic Information System datasets provided by the UMP-GIS Consortium. The result will be a coordinated approach to better land use planning in the Adirondacks.

Introduction

"If there is a unifying theme to the master plan, it is that the protection and preservation of the natural resources of the state lands within the Park must be paramount. Human use and enjoyment of those lands should be permitted and encouraged, so long as the resources in their physical and biological context as well as their social or psychological aspects are not degraded." - from page 1 of the New York State Land Master Plan

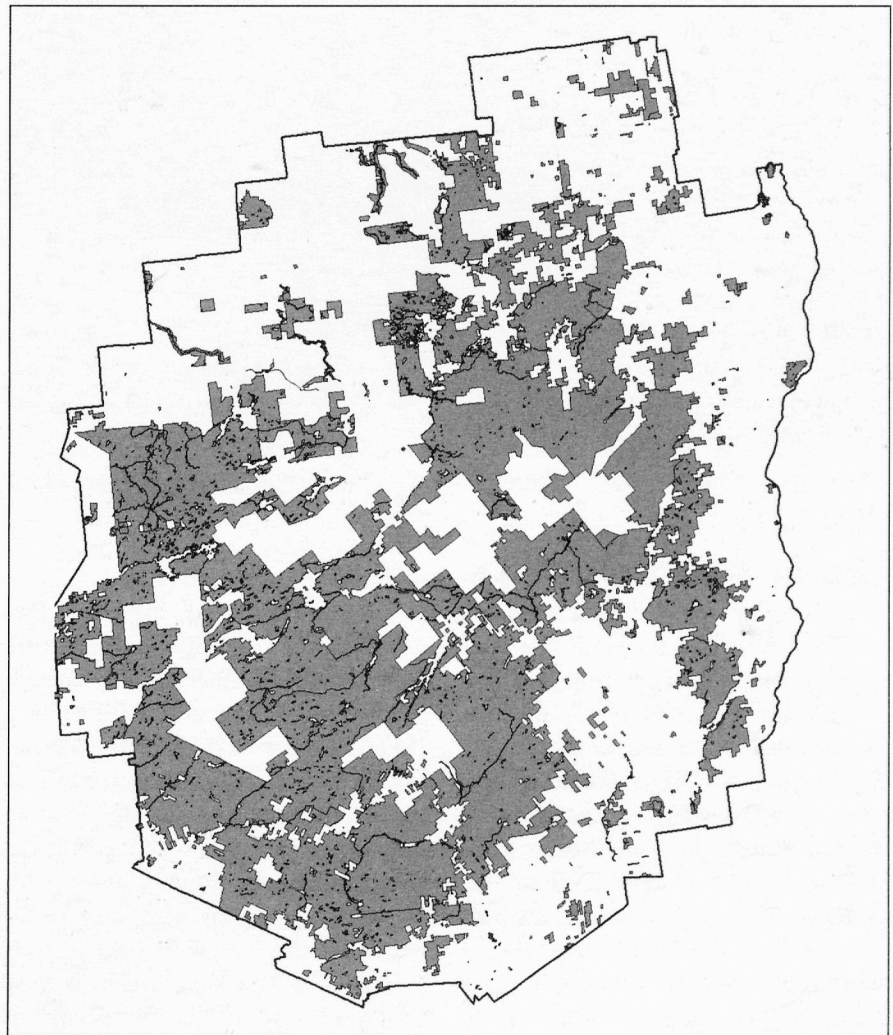
The Adirondack Park represents one of the world's most notable experiments in land-use management and wilderness conservation. Author Barbara McMartin describes the Adirondack Park as a 6-million acre patchwork quilt of publicly-

Stacy McNulty is a wildlife ecologist at the Adirondack Ecological Center, a research and education facility of the State University of New York College of Environmental Science and Forestry located in Newcomb,

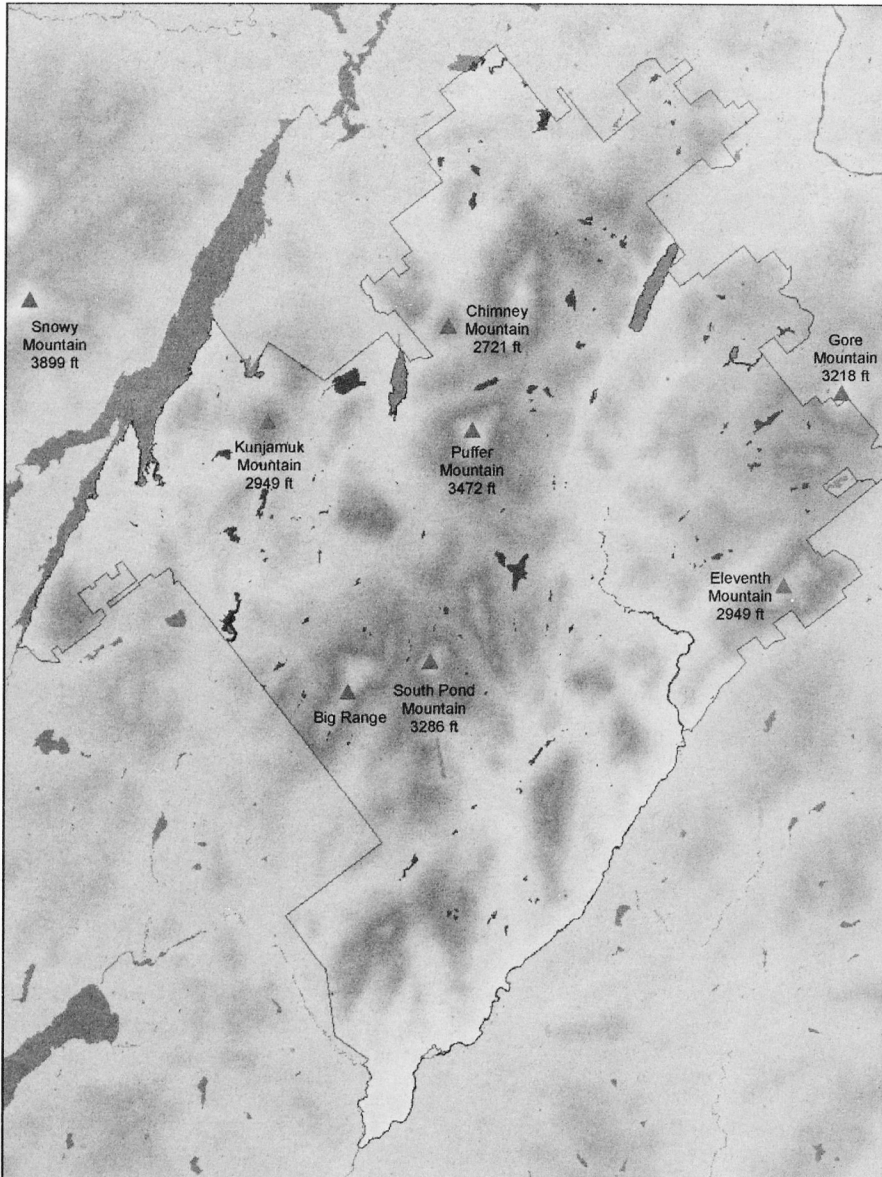
and privately-owned land. Within that quilt, the New York State Department of Environmental Conservation (DEC) is responsible for stewardship of roughly 2.6 million acres of public land. This state land is collectively called the Forest Preserve.

The Forest Preserve contains diverse natural and cultural resources. Significant biological features can be found in

some units, such as montane spruce-fir forests that provide nesting habitat for the globally-imperiled Bicknell's thrush. Other units contain critical wetlands where migrating amphibians breed each spring. Still other units are valuable, not for their rare and endangered species, but because they contain many of the largest and best examples of common forest types in the largely developed



Forest Preserve lands in Adirondack Park



Mountains and hydrologic features of Siamese Ponds Wilderness, one of many Forest Preserve Units.

northeastern United States. The Adirondacks contains a bounty of such areas.

The Forest Preserve lands also offer an array of recreation opportunities: hiking paths that culminate in spectacular views of the surrounding landscape, former Adirondack Great Camps to explore, attractive waterways for canoeing and kayaking, and trails for biking, horse riding, skiing, or snowmobiling. Yet planning for both protection and enjoyment of these resources is sometimes at odds, because use or overuse of an area may degrade the resources that make an area unique. Stewardship is essential to

protecting these resources.

Like any large area, the Forest Preserve is divided into smaller units where management activities can be initiated. Stewardship of each unit is guided by a Unit Management Plan (UMP), a document that serves as a mechanism to apply the State Land Master Plan to each Unit. The purpose of a UMP is to identify natural resources along with present and potential recreation facilities, while ensuring that these very resources are not compromised by overuse or degradation. This is the essence of stewardship.

A Unit Management Plan must be completed before any recreational facilities (such as trails, lean-tos, and boat launches) can be constructed, altered, or removed. UMPs were required to be completed and revised every 5 years; yet since the inception of the Adirondack Park Agency Act and UMPs in 1971, few UMPs have been completed and virtually none have been revised. In 1999, Governor Pataki announced that all UMPs for the 90 units would be completed in 5 years. The DEC Forest Preserve Bureau within the Division of Lands and Forests is the body responsible for completing the UMPs. The creation of each UMP is a team effort led by a DEC forester collaborating with many other DEC professionals from the regional and central offices. The challenge is large and the timeframe is short.

Unit Management Planning:

The Process

Planning is the detailed formulation of a program of action. Without a guiding plan, the management of these public lands could easily become a series of uncoordinated reactions to immediate problems. ~ from the introduction of the William C. Whitney Area Stewardship Management Plan, 1998

The UMP process consists of seven steps: (1) an inventory of the natural resources on the unit, (2) public participation and comment, (3) development of alternative management recommendations, (4) development of a draft UMP for review by the Adirondack Park Agency (APA), (5) review of the draft UMP for public comment, (6) approval of the revised UMP by the APA, and (7) approval of the UMP by the DEC Commissioner and final plan adoption. Of these, inventory is the first and potentially most complex step in completing a UMP for several reasons. First, data must be collected, an expensive and time-consuming process. Datasets may already have been created by various organizations, but it is unlikely that an individual will know of all datasets created by the many people studying the Adirondacks.

Then, once datasets are located, they must be collected and organized into one unified system. Finally, interpretation of terrestrial, aquatic, and land use data requires expertise in those fields. Therefore, data collection, synthesis, and interpretation are most efficiently accomplished by a group of experienced partners who work together to provide information to DEC planners.

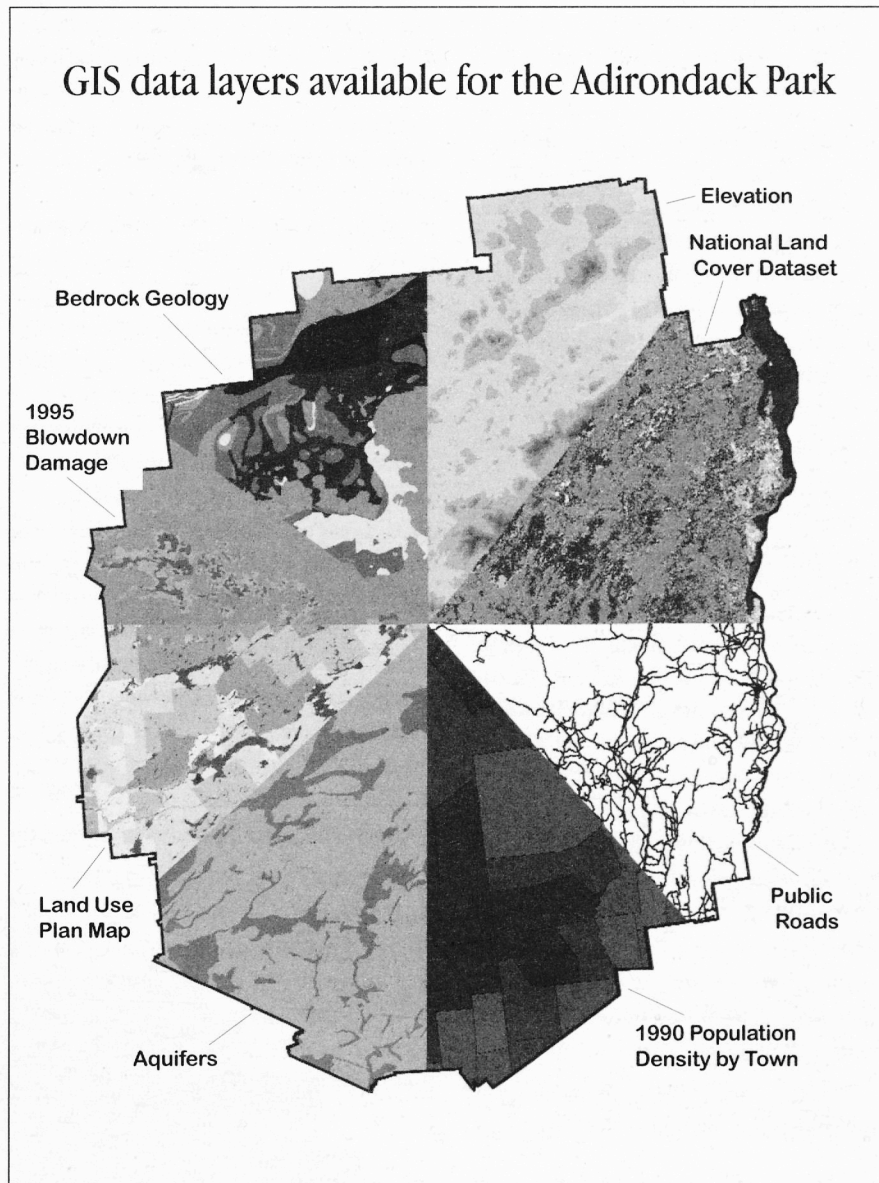
Not long after the Governor's announcement, a group of individuals from many institutions met through the Adirondack Research Consortium to discuss ways to assist in finding, collecting and interpreting data on the resources in each unit. Many universities, state agencies, and non-profit organizations were represented, including organizations such as the Association for the Protection of the Adirondacks, Audubon Society of New York, and the Adirondack Nature Conservancy, among many others. This partnership, led by researchers at the Adirondack Ecological Center of SUNY College of Environmental Science and Forestry, agreed to collaborate with the DEC to initiate a project beginning in late 2003. The project goal is to provide DEC with an efficient method to access existing inventory data using GIS.

GIS: Tool of the Trade

A Geographic Information System (GIS) consists of a computer database of spatial (geographic) data and a set of tools to analyze and display that data. GIS software is used to access the database and assemble, store, manipulate, and display information stored within it. Internet applications that provide street maps are common examples of GIS, though the user sees only the map-making tools and not the database behind the map. GIS can have a steep learning curve, making it difficult for the average user to efficiently extract all of the information he or she needs.

Example GIS Datasets

- Future forest stand conditions, especially for American beech (an



important forest component and wildlife food resource) and sugar maple (important both ecologically and economically).

- Current biodiversity and ecosystem health based on measures of biotic integrity for songbirds, small mammals, reptiles and amphibians.
- Potential impacts of visitor use on biodiversity (e.g., intersection of hiking and snowmobile trails with rare or significant ecological communities).
- Potential impact of recreational facilities on wildlife habitat (e.g., bat

and rattlesnake hibernacula, deer wintering areas, loon nesting areas).

- Potential impacts of road proximity on wildlife.

UMP-GIS Project Objectives

The AEC staff will lead the project, calling on UMP-GIS Consortium members for expert opinion when needed, and coordinating with DEC staff. Within the project goal are four objectives:

- *Assemble the GIS database.* Establish a collection of data layers from diverse sources.

- *Provide interpretation and analysis.* Offer GIS, statistical and ecological expertise.
- *Maintain a data library for future users.* Ensure high-quality, well-documented, consistent data that is compatible with existing DEC databases and flexible for inclusion of data in the future. Provide data documentation (metadata) including the description, age, scale, and original creator of the data.
- *Provide technical support to DEC planners.* Enable the planners to focus on planning rather than the finer points of using GIS software.

A critical feature of the process is the restriction of decision-making to the DEC. UMP-GIS Consortium members agree to provide information without advancing any agenda, whether pro- or anti-development. The DEC planners have been charged with making the decisions about facilities in the Forest Preserve and that responsibility remains in their hands.

The GIS Approach to Forest Preserve Planning

Like any tool, there are advantages and limitations of using GIS for planning.

Regional planning. One important benefit is the ability to manage the entire Adirondack region. Many management issues require the same datasets (e.g., land cover, hydrology, topography) for all regions of the Adirondack Park. Rather than treat all units separately, the UMP-GIS Consortium will create a series of Parkwide datasets. GIS enables the user to look at a unit and the surrounding area. Some Forest Preserve units are fragmented: they are comprised of several separate parcels or have privately-owned inholdings. It is important to consider natural resources on private land during UMP planning because wildlife and vegetative communities cross political

boundaries. Black bears, for example, have been documented to use managed timberlands to find certain food resources and move to Forest Preserve lands for other resources.

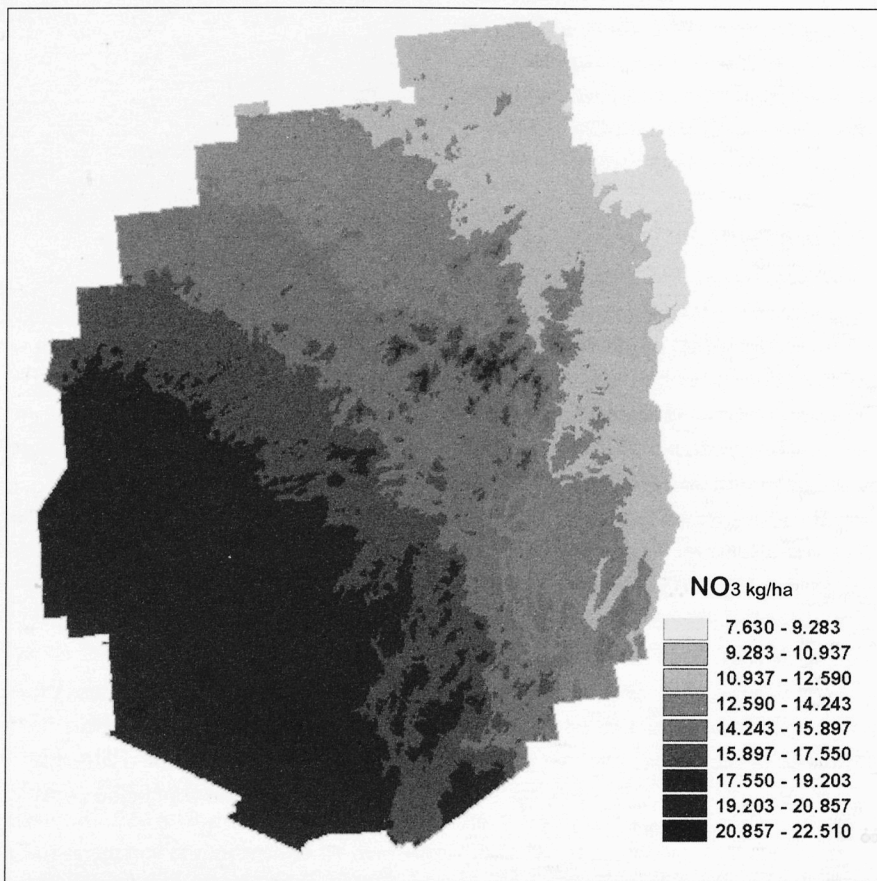
Unit-specific focus. GIS can enable planners to look at multiple scales, zooming in to a smaller area to assess the resources there. The GIS database will also contain unit-specific information (e.g., point locations of eagle nests). Because each unit has a unique set of natural resources and potential users, for each unit the questions will be different. The GIS can be used to ask questions such as “what is the erosion potential for three options for the location of a new trail?” and “How far from a campground is a sensitive wetland?” Additionally, new inventory information can be included in the GIS as it is collected.

Who’s who? Through the UMP-GIS Consortium, DEC planners have access

to scientists and other specialists in ecology, hydrology, and myriad other subjects who will help interpret data layers. The AEC will also have GIS experts to augment the DEC GIS staff and help planners use the technology at their fingertips. The Adirondack Ecological Center will be the node through which this access will occur, so DEC planners do not have to remember which expert can answer specific questions.

Rapid return. The GIS database is an investment in the future: as new data are integrated, revisions to a UMP can be made quickly. DEC planners can expect a rapid return of information once the database is compiled.

A picture is worth a thousand words. GIS experts can produce digital maps highlighting certain features of a unit. Consistent map products using the same symbols and colors make comparison of units or regions easy.



Atmospheric Deposition of NO_3 in the Adirondack Park

Economy of scale. Digital maps are easily created, duplicated, and modified. The effort and cost of making maps for all units is lower than producing such products separately.

It is important to note that GIS has some limitations, however.

GIS data will not answer every question. This project is a first cut to bring together data sources. Although existing GIS data will not address every data requirement for a comprehensive inventory, the GIS database will allow DEC planners to focus on the decision-making portion of the UMP process.

Knowledge gaps. Some information is currently unavailable; perhaps the largest gap is information on recreational usage within units. The DEC and researchers from various universities are in the process of collecting information including the number of people using different units, their planned activities, and length of stay. This will be helpful as the UMPs are revised in the future. As we collect datasets, those gaps in information will become apparent, and researchers will be able to focus their efforts on collecting the most critical data.

Scale. Some data will not be at the proper scale to answer certain questions. For instance, soil data collected at the county level will probably be too general to determine differences in soil within a 10,000-acre unit. However, this same soil dataset may be useful for answering questions about the soil type variation across the entire Adirondack region.

Ground-based data will always be needed. GIS cannot replace the need for on-the-ground data collection, nor should it. Vegetation maps and other GIS layers are only as good as the ground data used to create them. Spatially-referenced ground data should feed into a GIS just as satellite imagery does.

The intent of this Consortium is not only to bring together what we know already, but also to identify what other types of data might be useful for state land planning. In this round of planning, there is not enough time to collect ground data. However, assessment of public land health would be much more productive if a ground-based sampling scheme were instituted. We need to know how recreation in heavily-used areas impacts the system, and we also would like to know the level of forest change over time. One option is to establish permanent plots where the DEC and other scientists could assess tree health, water quality, soil erosion, recreational pressure, and other information. If such data are not collected, how will the land stewards at DEC assess forest change; how will we know whether the number of people and the kinds of use within a unit are affecting the health of the system?

Partnerships and Data Sharing

This is an exciting time to apply GIS to planning on this large scale because many datasets have become available and many of those are free to the public. Initially, data will be integrated into the DEC's existing GIS database. Ultimately, much of the information may be accessible to researchers, agencies, and other groups. Sharing can improve the ability to protect natural resources and plan for varied land uses while allowing the research community to focus on targeted data collection in the areas most needed.

Ideally, the UMP-GIS Consortium partner list could expand to include anyone with information. Further, information may not always be in GIS format, as there are many individuals and groups who have excellent knowledge of the resources on state land that could be placed in a spatial context. Organizations wishing to become involved should contact the author.



RAY JENKINS

Conclusion

The forests of the Adirondack Mountains contain some of the largest, most intact ecological communities in the eastern US, and a significant proportion of the biodiversity of New York State. The Forest Preserve accounts for 89% of New York's protected forests¹ and represents the best place for conservation of biodiversity in the northeastern forest. The issues of protection of and public access to state lands are central to the debate over management of the Adirondack Park.

Public land stewardship is clearly a priority in New York State. Since 1995, the State has invested more than \$62 million to preserve more than 203,000 acres in the Adirondack Forest Preserve. In that same period, approximately \$4.8 million has been invested in stewardship projects in the Adirondacks².

Thus it is essential that state land planning include the best inventory data available. Only after the inventory has been completed can the DEC identify areas threatened by overuse and enumerate steps in the UMP to avoid degradation of natural resources or loss of biodiversity. The GIS database that results from this cooperative project will facilitate DEC planners' access to scientists and other experts, and allow them to devote more time to the decision-making portion of the UMP process. Through partnerships such as the UMP-GIS Consortium, we can take advantage of technology and tools such as GIS to better manage the spectacular Adirondack quilt that is made of Forest Preserve and private land.

Notes

¹EPA Region 2 *State of the Environment Report*, 1998.

²DEC press release "DEC Announces Funding For Adirondack Stewardship Projects", <http://www.dec.state.ny.us/-website/press/pressrel/2002-116.html>, July 24, 2002.