A Conceptual Plan for Monitoring and Assessing the Appalachian Trail Environment

November 8, 2000

We present here a conceptual plan for monitoring and assessing the status of the Appalachian environment, with a focus on areas traversed by the Appalachian Trail (AT). With the Trail and surrounding environment threatened by potentially serious conditions ranging from air pollution to telecommunication towers and invasive pests to trail access, the managers of the trail and areas it traverses, including local jurisdictions, need the information, the access to information, and the educated public this program offers. Specifically, the program aims to make existing information about trends in the area's environmental health widely available and usable, and it will expand existing monitoring activities and fill in the gaps to produce additional, critical information about the health status of the Appalachian Trail environment. The program will be carried out through the cooperation of many partners—universities and resource management agencies and groups, including the Appalachian Trail Conference and the National Park Service. The program will build this partnership using the model of the AT's Cooperative Management System, and will be carried out with a corps of volunteers recruited from and led by experts from university campuses and other groups. The outreach to these groups and the educational benefit that will accrue through their involvement in the monitoring can have a lasting effect on the conservation of the AT and its surrounding environment as a public resource.

The Appalachian Trail

In 1921, Benton MacKaye, architect of the Appalachian Trail concept, envisioned the entire chain of Appalachian Mountains as a resource where people could find recreation, health and recuperation, and employment. In some respects, a significant part of his vision has been achieved, as the Appalachian National Scenic Trail is now a reality enjoyed by people from around the world. It is estimated that over 3 million people use the Trail annually. The Trail now extends for 2,167 miles from Maine to Georgia and is protected along more than 97 percent of its course by federal or state ownership of the land itself or by rights-of-way. It is managed as a unit of the National Park System under an innovative Cooperative Management System in which the Appalachian Trail Conference (ATC) and its 31 member trail clubs and volunteers have planned, constructed, and maintained the Trail and a system of more than 250 shelters and associated facilities.

1. Program Goals

This document describes a conceptual plan for monitoring and assessment of the Appalachian environment with a focus on areas traversed by the Appalachian Trail (AT). The concept[†] is in support of the mission of the Appalachian Trail authorities "to preserve and provide for the enjoyment of the varied scenic, historic, natural and cultural qualities of the areas between the states of Maine and Georgia through which the Trail passes."[1]

The AT, an internationally significant achievement, is seriously threatened by deteriorating environmental quality

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[†] The concept, as initially proposed by Charles H.W. Foster and Karen Filipovich of Harvard University's John F. Kennedy School of Government, was entitled *Monitoring the Appalachian Trail Environment: A New Exploration.* Since the concept was first proposed in 1999 several meetings have explored the feasibility and utility of the concept, and it is with the permission and encouragement of Dr. Foster and Ms. Filipovich that this paper is prepared to update and advance the proposed program.

of the areas through which the Trail passes. Concern is not just for the Trail corridor itself, but also for the surrounding region and the integrity of the "Appalachian experience" sought by trail users, residents, and other visitors to the region.

Air quality is a matter of particular concern. The title of a recent *Appalachian Trailway News* article describes the situation: "Hikers come to the Appalachians for clean air and inspiring views. But air quality is worse than ever, and increasingly they find that the vistas have vanished in the haze."[2] When the vistas are not obscured by haze, they are increasingly being encroached upon by development, such as homes, highways, and communication towers.

Pollutants are causing direct damage to some plant and animal species, and increase the susceptibility of the forest to insect infestations and disease. In addition to causing damage to certain plant and animal species, ozone poses a health hazard to humans, particularly children, elderly people, and those with respiratory problems. Over the last several years, the Great Smoky Mountains National Park, a key barometer of the southern Appalachian region, has experienced a rapid increase in the occurrence of ozone levels harmful to human health. Water quality has also worsened in many areas, and a variety of exotic plants and insects have invaded and negatively impacted the Appalachian environment. Approximately 40% of Forest Health Monitoring plots in the southern Appalachians contain exotic plants.[3]

Such environmental problems interact to form a spreading matrix of trouble that cannot be dealt with by traditional means. There is urgent need to develop a comprehensive, regional understanding of the nature and extent of the problems, from which an ecosystems approach can be used to address the problems. A more informed and participatory public will also be necessary if the goal of restoring environmental quality is to be achieved. Accordingly, while the primary activity of this program would be environmental monitoring, an equally important component would be active public involvement and environmental education.

The Cooperative Management System provides a good model for developing a collaborative monitoring initiative. The System has demonstrated the means and techniques to help bring together people and organizations interested in monitoring. The capability to carry out a monitoring program could be developed through partnerships with scientific and educational institutions and regional programs such as the Southern Appalachian Man and the Biosphere (SAMAB)

The Appalachian Trail Cooperative Management System

Under the authority of the National Trails Systems Act (1968) and its amendments, the Secretary of the Interior (represented by the National Park Service) has the responsibility for administration of the Trail in consultation with the Secretary of Agriculture (represented by the Forest Service). In 1984 a NPS agreement was signed with the Appalachian Trail Conference, which delegated management authority to the Conference and in turn to the 31 trail clubs. (In 1999, 4,200 volunteers worked 180,000 hours on the Trail.) The Cooperative Management System for the AT, which has evolved to include more than 100 partners, extends the partnership concept and preserves the tradition of flexibility. It is the mission of the Appalachian Trail Park Office to foster the Cooperative Management System in order to accomplish its goals.

Definitions

Monitoring: *The periodic and systematic measurement of change of an indicator.*

Assessment: *The evaluation of trends in time and geographic distribution of an indicator, as well as an evaluation of relationships (including potential cause and effect relationships) among indicators.*

Indicator*: A measure (measurement) of conditions or processes that communicates information about the status of something of interest, and, when recorded over time, can yield valuable information about changes or trends.*

Ecosystem: *An interconnected community of living things, including humans, and the physical environment within which they interact. The ecosystem approach is a method for sustaining ecosystems and their functions and values based upon common goals and collaboratively developed means to achieve desired future conditions.*

Program. The idea would be to design a synergistic effort combining volunteer activities, university studies, and programs of organizations and institutions with outstanding credentials in science and technology. Such a program would strengthen the capability of the Cooperative Management System to "provide for maximum outdoor recreational potential of the extended Trail and for the conservation and enjoyment of the nationally significant scenic, historic, natural and cultural qualities of the areas through which the Trail passes."[1] Achievement of this goal would benefit all people who live in, or visit, the Appalachian region.

2. Plan

a. Identification and evaluation of existing monitoring efforts

Many research and environmental monitoring programs are already conducted by public and private authorities throughout the Appalachian region. There is an opportunity to link these efforts, and in doing so to create a more synergistic and effective force to deal with the growing environmental problems. The Southern Appalachian Assessment—a collaborative effort among federal agencies, state agencies, universities, special interest groups, and private citizens—concluded in 1996 that the present state of environmental monitoring was inadequate in many areas, and that a larger systematic, comprehensive program was needed.[4]

In 1999 the Research and Monitoring Committee of the SAMAB Interagency Cooperative took steps to promote more interaction among researchers in the agencies and in the academic community by developing a list of the research and monitoring activities that are occurring in the region.

In a similar manner, the Appalachian Trail monitoring project would identify research/monitoring programs that might wish to participate in or collaborate with the proposed environmental monitoring activity. For example, academic institutions with an interest in the proposed program might contribute to the National Park Service natural heritage inventorying. This program, which was started in 1988, conducts natural heritage inventories to identify, record, and monitor rare, threatened, and endangered plant and animal species and exemplary natural communities found along the Trail corridor. This program is designed to guide future land management decisions and to educate the Trail communities about the ecological significance of Trail lands.[5]

What should be monitored?

The resources that make up the natural environment of the Appalachian Mountains are at the core of the Appalachian Trail experience. Accordingly, the status of these resources, as well as human activities that affect them, should be monitored.

The resources to be monitored include, generally, air quality, water quality, vegetation, and biotic resources. Examples of human activities that affect the Trail environment include development that affects viewsheds and access.

The determination of what, specifically, is to be monitored will be based on management needs and what the subregions that will carry out this program define as important. The determination will also be influenced by existing efforts and the resources and capabilities of the participants, as the program seeks to capitalize on these factors.

b. Collaborative development of an Appalachian Regional Information System

An initial organizing activity would be the development of an Appalachian Region Information System (ARIS). This system would focus on the AT corridor and adjacent lands from Maine to Georgia. As a distributed information system, ARIS would make use of existing information sources to the extent possible by coordinating data-collection, archiving, and presentation activities. Users with web browsers would be able to use ARIS to generate and view maps, charts, and reports about historic and present natural resource use, environmental conditions, and development impacts throughout the Appalachian range. ARIS would support data integration to answer specific questions of the AT management authorities and the Cooperative Management System, including the broad spectrum of scientists, planners, educators and students, decision-makers at all levels, stakeholders, hikers, and other resource users. ARIS would display real-time monitoring data and information about current and forecast weather, air quality, and trail conditions.

Steps in the Development of an Appalachian Regional Information System

An Appalachian Regional Information System (ARIS) would make existing information widely available and easily usable. To develop an Appalachian Regional Information System the following activities must occur.

- *Identify existing information systems with significant Appalachian data holdings*
- *Identify organizations currently collecting or planning to collect relevant data*
- *Identify major GIS activities that cover the Appalachians and particularly the Trail corridor*
- *Determine organizations interested in the proposed collaborative effort*
- *Hold focus group meetings of potential partners and users to prioritize data themes for ARIS integration and to identify the important data gaps*
- *Develop cooperative agreements*
- *Determine implementation phases*

c. Organizational structure, procedures and standards

A flexible organizational structure for a collaborative regional monitoring program is needed since most of the participants already have established organizational structures, procedures, and standards. It is desirable that a project coordinator should be employed by the Appalachian Trail Park Office to help guide the development of the project by working closely with leaders of the sub-regional sections.

After endorsement of the concept by the Trail authorities, the next step would be to invite interested parties from the community of federal agencies, state and local governments, academic institutions, and the private sector to join in planning and development of the project. Most of the planning would be done in the three or four sub-regional sections of the AT environment.

The AT monitoring initiative should be developed using approved protocols, standards and guidelines such as those developed by the Forest Health Monitoring, and the Forest Inventory and Analysis programs of the U.S. Forest Service. These programs collaborate with a large number of State agencies and non-governmental organizations in inventory and monitoring activities. The Forest Service has offered to collaborate in providing consistent data collection methods and standards—including their field manuals and quality assurance control procedures.

A program of monitoring and assessment of the AT environment would benefit from and contribute to national objectives of developing indicators for the conservation of ecosystems, and in research to improve the effectiveness of indicators. Participation of the AT project in these national initiatives could also help advance the development of internationally agreed criteria and indicators for conservation and sustainable management of ecosystems.

The establishment of a broad, resource-monitoring program for the AT is in keeping with recent national attention given to inventory and monitoring in the NPS. The 1998 National Parks Omnibus Management Act gives the most explicit direction to date regarding inventory and monitoring in NPS areas: "The Secretary shall undertake a program of inventory and monitoring of National Park System resources to establish baseline information and to provide information on the long-term trends in the condition of National Park System resources. The monitoring program shall be developed in cooperation with other Federal monitoring and information collection efforts to ensure a cost-effective approach."

In August 1999 NPS Director Robert Stanton announced a five-year action plan called the Natural Resource Challenge." Among the specific thrusts of the Natural Resource Challenge are: 1) expand efforts to monitor and understand air quality in parks, 2) monitor and protect park waters, watersheds and aquatic life, 3) monitor changes in the condition of park natural resources, 4) collaborate to acquire, apply, and disseminate scientific knowledge in pursuit of natural resource goals, 5) facilitate broad scientific inquiry for the betterment of both parks and society, and 6) expand and improve opportunities for the public to enjoy and learn about park natural resources and their preservation. Unlike earlier efforts to increase the attention given to inventory and monitoring in the NPS, the Natural Resource Challenge will provide funding to all NPS units with significant natural resources. In 2000 the AT was designated as on of approximately 265 NPS units to possess significant natural resources, enabling it to be incorporated in the NPS Natural Resource Challenge.

AT Monitoring Program Helps to Meet National Objectives

The AT Monitoring Program aims to contribute to national objectives, including the Trail's objective of preserving the scenic, historic, and cultural qualities of the Trail area and public agencies' objectives to work more closely with the public. Using widely accepted and approved protocols, standards, and guidelines allows the monitoring to help to meet ecological monitoring objectives embodied in the National Research Council's 1999 Report, "Ecological Indicators for the Nation" and the Interagency Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests (known as the Montreal Process.[6,7] It is also consistent with the prototype laid out in the H.J. Heinz III Center report, Designing a Report on the State of the Nation's Ecosystems,[8] which provides a framework of indicators to describe the extent of U.S. ecosystems, the human uses of those systems, and their basic condition. This report draws data from public and private sources to describe croplands and forests, and coasts and oceans, and in 2001 will also include arid lands, rangelands, cities and suburbs.

3. Implementation strategies

a. Sub-regional components

The project will require coordination region-wide, but planning for specific monitoring activities and collection of

existing monitoring data will occur at the sub-regional level. The principal sub-regions of the Trail are New England, the mid-Atlantic, and the southern Appalachians. Careful thought and attention will be required in determining the boundaries of the target region.[†] To monitor and assess environmental health as described above, ecosystems need to be characterized and monitored at very large scales. The boundaries for particular ecosystem monitoring efforts would be determined by the participants in each sub-region based upon what they decide they want to accomplish, or the problems they want to solve.

b. Funding

Funding to plan and implement the project is expected to be derived through a number of sources. The ATPO has agreed to provide funding from its Challenge Cost Share Program to employ a person to facilitate the planning and coordination of the monitoring project. The work of the coordinator will include development of funding strategies. These strategies are expected to be diverse and may include the following:

1) Concentrate on securing funds to cover the costs of several working conferences at the sub-regional level, and one held regionally to coordinate the individual plans.

2) Identify an interested national foundation program to host a meeting of other foundation program officers at which the plans for the monitoring initiative can be presented. Through this approach some overall strategy for funding from foundation sources might be developed.

3) Pursue funds rationally from federal agency sources, such as EPA's Empact program, and the NPS Natural Resource Challenge Program.

4) Use in-kind and volunteer labor wherever possible and available.

c. Progress

Steps taken to advance this concept already are underway and are discussed in an appendix to this paper.

References

[1] National Park Service, *Strategic Plan for the Appalachian National Scenic Trail Long-term Goals for Fiscal Years 2001-2005.* Appalachian Trail Park Office, Harpers Ferry, West Virginia, April 2000.

[2] Glenn Scherer, "Vanished in the Haze," *Appalachian Trailway News*, March-April 2000.

[3] Southern Appalachian Man and the Biosphere Program (SAMAB), *Forest Health Monitoring Program,* TVA Forest Sustainability Initiative (in Cooperation with the National Forest Health Monitoring Program and SAMAB), Knoxville, Tennessee, 1996

[4] Southern Appalachian Man and the Biosphere (SAMAB) Cooperative, *Southern Appalachian Assessment,* SAMAB, Knoxville, Tennessee.

[5] Kent Schwarzkopf, "Inventory and Monitoring Program along the Appalachian Trail," In *Parks and Public Lands, The 1999 George Wright Society Biennial Conference*, George Wright Society, Hancock, Michigan, 1999.

[6] National Research Council, 2000. *Ecological Indicators for the Nation,* the National Academy Press, Washington, D.C.

[7] Canadian Forest Service, 1995. *Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests- The Montreal Process.* Quebec, Canada

[8] H.J. Heinz III Center for Science, Economics and the Environment, *Designing a Report on the State of the Nation's Ecosystems: Selected Measurements for Croplands, Forests, and Coasts & Oceans.* The Heinz Center, Washington, D.C., 1999.

[†] For example, it may be desirable to have an additional working conference for the metropolitan New York sub-region (portions of Connecticut, New York and New Jersey) where special problems and institutional capabilities exist.

Appendix
Progress in Program Development and Implementation
Conceptual Plan for the Monitoring of the Appalachian Trail Environment:
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Two meetings and several informal discussions have been held to explore the potential for a comprehensive program to monitor the Appalachian Trail environment.[†] These meetings and discussions have provided a means for interested participants, including representatives of the National Park Service, the U.S. Forest Service, the U. S. Fish and Wildlife Service, the Environmental Protection Agency, the Appalachian Trail Conference, and other interested groups and individuals to explore the potential for utilizing the Appalachian Trail and associated lands as a focus for monitoring a variety of environmental health indicators and as a "classroom" for environmental education.

Participants in these meetings agreed that the Trail could have great value as a "barometer" in monitoring the Appalachian regional environment, and as an ecological transect, and that the Trail has unique value because of its significance and wide recognition.

Meeting participants agreed that ascertaining what monitoring is already occurring and determining how existing programs can better meet management needs are the first steps in deciding what elements of the AT environment should be monitored. They pointed out that a large amount of environmental data on some issues already exists, but that there is need for greater collaboration in organizing, interpreting, and using this data as a basis for deciding natural resource policies and management approaches.

It was felt that the supplemental monitoring that the proposed program would involve could be carried out, under proper standards and supervision, by new volunteers interested in the Appalachian environment, and by doing so would prevent the imposition of an additional burden on existing AT volunteers. The volunteers' activities would both expand the knowledge base and educate Trail users about the environment they encounter.[††] Based upon interest expressed to date by university professors and students, it is likely that representatives of many of these institutions would be willing to participate in an organized program. In a cursory survey, SAMAB staff has identified more than 400 universities and colleges within 100 miles of the Trail, many of which have Appalachian studies and/or environmental science programs.

It was pointed out that most government agencies have mandates to increase citizen involvement, and that many research sites/programs are encouraged to broaden their efforts to regional contexts, so participation in the proposed monitoring program would help accomplish these goals.

The timing of the proposed project was considered appropriate because the ATC is currently involved in strategic planning, and the Appalachian Trail Park Office had just revised its Strategic Plan in April 2000. This plan describes Long-term Goals for Fiscal Years 2001-2005,

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[†] Two meetings were held in early May 2000. One in Asheville, North Carolina was co-hosted by SAMAB, the ATC, and the Appalachian Trail Park Office (NPS). The second at Harvard's Kennedy School of Government was hosted by Dr. Foster. A summary of both meetings is available on the SAMAB web site at http://www.samab.org/projects/atwrksum.pdf.

[††] It was suggested that a new designation, "Volunteers in Monitoring" (VIMs) might give the activity a measure of stature and prominence.

one of which is to acquire GIS and other natural resource data, and to perform analyses to assist in the identification of vital signs for natural resources in the AT corridor.

A cooperators meeting in October 2000 began work to define the New England portion of the monitoring protocol. A planning meeting for the Southern Appalachian sub-region held in September 2000 explored prototype activities that could be built into pilot monitoring project. A summary of the Southern Appalachian meeting is available at <http://samab.org/Projects/at-project.html>.