Northeast Temperate Network

National Park Service
U.S. Department of the Interior

Northeast Temperate Network
Inventory & Monitoring Program

Protocols Developed for Vital Signs Monitoring: Fall 2005
Acadia National Park

The Northeast Temperate Network

The Northeast Temperate Network contains 10 parks with diverse cultural and natural resources. Parks in the Network range from Acadia National Park in coastal Maine to Morristown National Historical Park in central New Jersey, and encompass a diverse region where 61 ecological systems have been identified. Parks in the Northeast Temperate Network, most of which were established for cultural resources, are relatively small in size and located in increasingly urbanized landscapes. Staff from the Northeast Temperate Network and regional scientists are designing and implementing a long-term monitoring program to measure key indicators of ecological integrity, or "Vital Signs." The network is presently completing its monitoring plan which will be reviewed in 2006 in preparation for implementation in 2007. The following three protocols are part of this plan.

Water Quality Monitoring

Our overall goal is to monitor the status and trends of NETN aquatic resources, to assess changes in ecological integrity and the impacts of key stressors, and to make informed management decisions affecting these resources.

Water monitoring site

Water Quantity Protocol

Water quantity monitoring is essential for evaluating ecological issues in NETN parks, and is a high priority vital sign for the NETN. Information about water quantity is necessary to interpret other vital signs such as eutrophication, sediment processes, or contaminants because stream discharge is used to calculate annual loads and annual watershed yields.

The specific objectives of this protocol are to:
1) Establish a long-term monitoring network of permanent sites representative of the freshwater aquatic resources present within NETN parks;
2) Use estimates of water quantity to understand annual to decadal cycles of floods or droughts from which to interpret chemical and biological data; and
3) Determine if there are any long-term trends in water quantity due to anthropogenic causes or climate change.

Water monitoring site

Water Chemistry Protocol

Water chemistry is another NETN vital sign. Measures of water chemistry directly address one of the inventory and monitoring objectives: to detect changes in the status of physical, chemical, or biological attributes or vital signs of the ecosystem. Water chemistry measures are an essential indicator to any long-term aquatic monitoring program.

The specific objectives of this protocol are to:
1) Establish a long-term monitoring network of permanent sites representative of the freshwater aquatic resources present within NETN parks;
2) Compare current measurements of water chemistry to baseline measures and historical records from unimpacted sites. This will facilitate the assessment of the ecological integrity of NETN systems and establish a range of natural variability; and, 3) Guide management decisions impacting NETN aquatic systems such as the building and maintenance of roads and trails, the use and maintenance of Best Management Practices (BMPs), and decisions regarding visitor and recreational uses.

Measures for this protocol include specific conductance, percent dissolved oxygen (DO) saturation, temperature, and pH. Targeted ecosystems include lakes and streams. Optional measures include alkalinity/acid neutralizing capacity (ANC), color, turbidity, cations and anions (especially iron and aluminum), and dissolved organic carbon. USGS National Water-Quality Assessment methods for sampling and analytical protocols will be used for data collection and analysis. Integration with existing state and park protocols will be done where appropriate and feasible.

Forest Monitoring

The Northeast Temperate Network (NETN) is comprised of northeastern parks dominated by temperate forested ecosystems. This protocol is designed to assess the status and trends in the diversity, structure and condition of these forests, which are subjected to a suite of anthropogenic and natural forces of change. It addresses the forest vegetation, white-tailed deer herbivory, invasive exotic plants, invasive exotic animals, and acidic deposition & stress Vital Signs.

Vegetation diversity and structure are fundamental properties of terrestrial ecosystems. Monitoring these properties provides basic information describing the site, the type and quality of habitat available for wildlife, and the response of vegetation to anthropogenic and natural forces of change. Moreover, this basic information provides the foundation to properly interpret many other vital signs indicators. Stand basal area summarizes the dominance and density of trees in a stand, which may change in response to natural or anthropogenic agents of change, including management. Monitoring tree regeneration provides an anticipatory indicator of future forest cover type as well as an integrative measure of the impacts of multiple stressors, such as deer herbivory, invasive exotic species, and atmospheric deposition. Monitoring tree mortality and growth rate provides an additional key integrative measure of multiple stressor impacts. Stand structural or age class is indicative of both successional stage and habitat quality, and is a particularly useful measure in forest systems subject to silviculture. Dead trees in the form of snags and coarse woody debris provide important habitat for birds, mammals, and herptiles, as well as decomposers, bryophytes and tree seedlings. These legacy features can be useful indicators of wildlife habitat within early- and mid-successional forests and those subject to silviculture. Additionally, simple measures of light penetration or leaf area index provide useful information about levels of stand disturbance.

Our overall goal is to monitor the status and trends of NETN ecological resources in order to assess ecological integrity and the impacts of key agents of change acting upon these resources, and to inform management decisions affecting these resources. Our specific objectives for this protocol are to: 1) Monitor temporal change in elements of stand structure, overstory and understory/herbaceous diversity, and vegetation condition in order to assess overall forest ecological integrity; 2) Monitor the impact upon forest vegetation of key stressors like deer browsing and acidic deposition; 3) Detect the onset, and monitor the spread and effects of forest insect pests and pathogens and key exotic invasive species such as earthworms and shade-tolerant flora; 4) Compare current measurements of forest structure, diversity and condition to baseline measures from other sites, historical records and modeling efforts, in order to assess the ecological integrity of NETN forested systems; and 5) Inform management decisions impacting NETN forested systems such as NPS land management and forest harvest plans, exotic species control, deer population management, NPS internal development, and national pollution control legislation.

Avian Monitoring

Blackburnian warbler

Ovenbird

Birds are an important component of park ecosystems, and their high body temperature, rapid metabolism, and high ecological position in most food webs make them a good indicator of local and regional ecosystem change. Among the public, birds are a high profile taxa, and many parks provide information on the status and trends of the park's avian community through their interpretive materials and programs.

In developing comprehensive long-term monitoring plans, landbirds are among the best taxonomic groups to monitor because: 1) they are the most easily and inexpensively detected and identified vertebrate animals, 2) a single survey method is effective for many species, 3) accounting and managing for many species with different ecological requirements promotes conservation strategies at the landscape scale, 4) many reference datasets and standard methods are available, and 5) the response variability is fairly well understood. In addition, birds are a useful biotic indicator of the effects of habitat fragmentation, an ecological stressor that all NETN parks are impacted by.

Gaining insights into the long-term trends of avian species composition and relative abundance will provide one measure for assessing the ecological integrity and sustainability of northeastern temperate systems. Additionally, monitoring long-term patterns of bird composition and numbers relative to habitat change due to various stressors, including deer herbivory, invasive species, fragmentation, and silvicultural practices, will improve understanding of the effects on bird populations and help guide management actions within NETN parks.

The overall goal is to monitor the status and trends of breeding landbird populations, to assess changes in ecological integrity and the impacts of key stressors, and to guide management decisions affecting avian populations and other natural resources. The specific objectives of this protocol are to: 1) Determine annual changes in species composition and relative abundance of bird species during the breeding season; 2) Improve our understanding of the relationships between breeding birds and habitat; and 3) understand the effects that management actions, such as silvicultural practices and mowing regimes, have on bird populations by correlating changes in bird communities with changes in specific habitat variables.