Forest Monitoring Branches into Second Cycle

Results of 2010 Forest Health Survey

Background

Forests of the northeastern U.S. have a long history of change, resiliency, and recovery. Ice ages, weather events, large scale clearing, and introduction of pests and invasive species have all played significant roles in shaping the forest communities we have around us today. Long-term health of the forests of Northeast Temperate Network (NETN) parks is a high-priority for the network.

Though still in the very early stages of a long-term monitoring program, the 2010 field season marked a milestone for NETN in that it was the first year that forest plots in several parks, including Marsh-Billings-Rockefeller, were resurveyed. The goals of the forest monitoring program are to assess status and trends in the composition, structure, and function of forested ecosystems, and to interpret and report the condition of forest systems in a way that effectively informs park managers and other stakeholders.

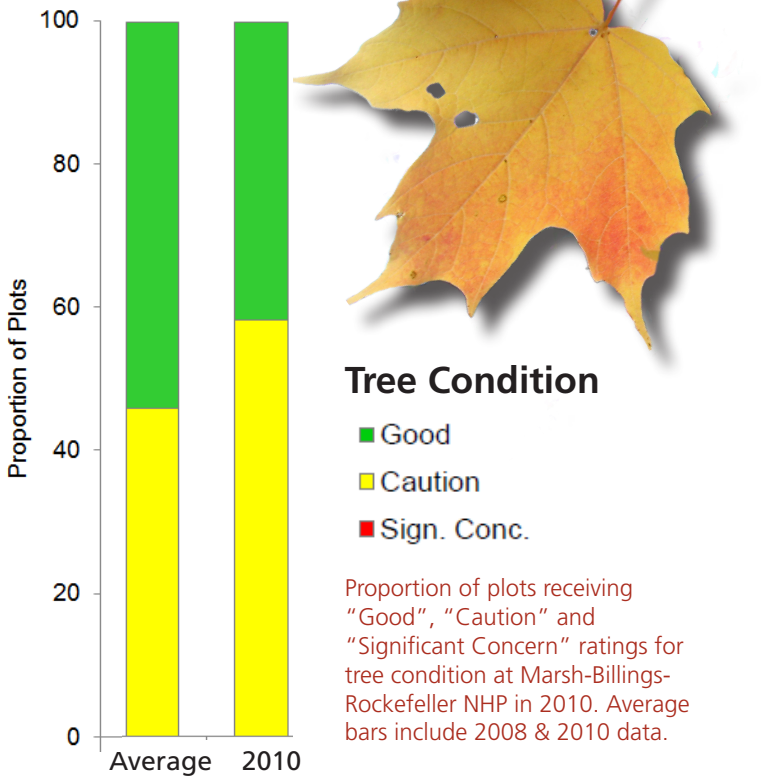
Purpose and Scope

One way the Network does this is through the use of an Ecological Integrity (EI) Scorecard to interpret the condition of forested ecosystems by assessing an array of ecological measurements and comparing them to their natural or historical range of variation. NETN recognizes that "ecological integrity" may not be the primary goal of park resource management, particularly at historical parks and historic sites where cultural resource management may take precedence. Even at these sites it is valuable to be able to compare the condition of park resources to ecological benchmarks because it provides a deeper understanding of park condition, as well as a consistent baseline for assessment of management goals. The Network is willing to work with parks individually to develop scorecards that track progress towards park management goals that differ from the benchmarks, in addition to reporting ecological integrity.

EI is ranked in one of three categories: Good, Caution and Significant Concern. "Good" represents acceptable or expected conditions; "Caution" indicates a problem may exist; and "Significant Concern" indicates undesired conditions that may need management action.

Results and Findings

Results for some selected forest health indicators are presented here. For the complete report, visit NETN's website.



Proportion of plots receiving "Good", "Caution" and "Significant Concern" ratings for tree condition at Marsh-Billings-Rockefeller NHP in 2010. Average bars include 2008 & 2010 data.

Dead wood, in the form of standing dead trees (snags) and fallen coarse woody debris (CWD), is an important element of forests that provides habitat for many plants and animals. Density of snags and volume of CWD in mature and late-successional forest stands vary substantially across ecosystems and with site conditions. Positive relationships between live and dead tree density can be used to indicate expected snag levels, and positive relationships between live tree volume and volume of CWD can be used to indicate expected CWD levels. The park will need some time to reach the "Good" benchmark for both of these categories. In 2010 it rated "Caution" for CWD, and "Significant Concern" for snag abundance.

Tree Regeneration assesses the quantity and composition of advance tree regeneration in the forest understory, which impacts future canopy structure and composition. Regeneration can be affected by a variety of factors, including invasive species, climate change, and sustained, selective browsing by a historically high population of white-tailed deer in parts of the northeast U.S. The 2010 report indicates that tree regeneration appears to be adequate in the park.

Holes in leaves and chlorosis (yellowing of leaf tissue due to a lack of chlorophyll) of the foliage were the most common reported tree conditions in park plots, and other than beech bark disease, no priority pests or pathogens were detected in a plot during the 2010 field season. *NOTE: the published 2007-2010 forest health*

report contains a graph that erroneously flipped the "2010" and "average" representations in the bar graph. The bar graph as it should appear is included in this brief.

Invasive exotic species have the potential to impact structure, composition, and function of forested ecosystems, and are one of the leading threats to biodiversity and ecological integrity of ecosystems worldwide. Early detection of invasive exotic plants is a NETN vital sign that has been incorporated into several long-term monitoring protocols. Status and trends of invasive species are monitored on NETN forest plots, and the Eastern Rivers and Mountains Network (ERMN) and NETN are implementing a separate protocol for early detection of invasive species and forest pests. Marsh-Billings-Rockefeller NHP has a bit of a unique situation in that some plots are located in natural stands and some are located in historic plantations, many of which were begun by the Billings family well over a century ago. Interestingly, natural stands ranked "Good" for indicator invasive exotic plant species, and plots located in plantations ranked "Caution". The most prolific invasive was common barberry (found in six out of 24 total park plots), followed closely by common buckthorn (4/24), and exotic bush honeysuckle (4/24).

NETN monitors soil chemistry to understand the effects of atmospheric deposition on the health of forest vegetation. Atmospheric deposition is a special concern for forests in the northeast on thin soils where soil buffering capacity is generally low. Atmospheric deposition alters forest soil chemistry by depleting soil nutrients and has dramatically increased inputs of nitrogen in soils of the northeast. Feedback from soil scientists has led NETN to realize that it needs to revise the way it measures and interprets soil chemistry to reflect the complexity of acid deposition and stress in forest soils. For what it's worth, 2010 measurements showed that all parks but Acadia ("Good") ranked "Significant Concern" for the Carbon-to-Nitrogen ratio, indicating that excess nitrogen may be an issue in those parks.

Over browsing by White-tail deer could be negatively impacting tree regeneration in Marsh-Billings-Rockefeller's forest. Sage photo.

Forest patch area was rated "Good" and delineated as one large, 455 hectare (1,100+ acre) patch. Over half of this patch extended beyond the park boundary, and included the town-owned Billings Park, portions of King Farm, and privately-owned land north of the park.

Averaging 11% anthropogenic land use (ALU), the park narrowly received a "Caution" rating. The two most common types of ALU were forest plantations composed of exotic tree species, and open fields. Over half of the plots had no ALU within a 200 meter radius. Increased development or clearing north of the park boundary and east of Prosper Road have the greatest potential to impact forest patch size and increase anthropogenic land use near forest plots.

Conclusions

Coarse woody debris and snag abundance continue to be lower than expected for late-successional hardwood stands in park plots. As long as forest pests and invasive species are kept at a minimum, and management activities do not reduce the potential for formation of dead wood, conditions are expected to improve as the stands mature and develop more structure. Alternatively, increased use of management techniques designed to maintain or enhance snags and CWD in this working forest may enhance desired structural features sooner.

Eradication of exotic shrub species is especially important. Exotic shrubs, such as bush honeysuckle and Japanese barberry have caused significant impacts to forest condition in other network parks, and once established eradication efforts can be expensive, labor intensive, and sometimes futile.

Tree regeneration and understory data are beginning to show potential deer impacts. In the end of this year (2011), NETN will help the park quantify deer densities with a pilot monitoring study which will be a helpful step to determine if densities are high enough to impact forest conditions.

More Information

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Full Report online at:
http://science.nature.nps.gov/im/units/NETN/index.cfm

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