



Forest Monitoring Branches into Second Cycle

Results of 2010 Forest Health Survey at Saratoga NHP

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 Saratoga, 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.

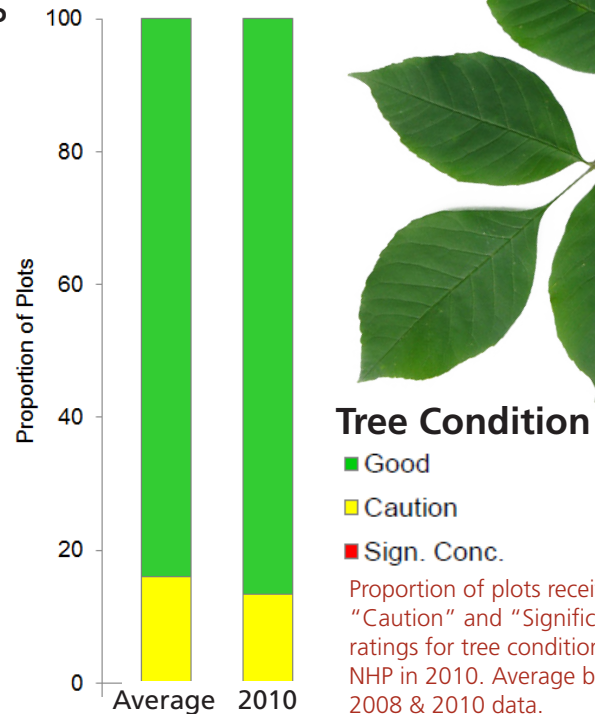
Purpose and Scope

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.



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. Saratoga rated “Caution” for both CWD and snag abundance (due to the low numbers of medium to large snags).

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. However, seedlings in height classes over 1-meter tall are relatively uncommon, sapling density is low, and the Saratoga also had the lowest seedling ratio of all NETN parks in the study. These indicators all suggest that deer browse pressure may be impacting forest regeneration. Competition from invasive exotic species may also be limiting tree regeneration. A suggested next step will be to quantify deer densities in the park. If densities are above 8.5 deer per km², the park may want to consider developing a deer management plan.



The emerald ash borer has been detected not far from Saratoga's borders in southern New York. Early detection will be vital to keep this pest at bay.

Invasive exotic species have the potential to impact the 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. 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.*

Saratoga narrowly missed the "Significant Concern" rating for indicator plant invasives by averaging 3.3 invasives per plot. The three most common in the park were woody shrub or vine species. Several large areas in the park are dominated by dense exotic bush honeysuckle thickets, which was the most prolific invasive, appearing in 29 of 31 total park plots. Common buckthorn was a close second (28/31) and multiflora rose (20/31) rounded out the top three. These woody species are all capable of forming dense thickets that can reduce understory diversity, depress forest regeneration, and are of particular concern where old fields are left to succeed to forest. Eradicating exotic shrub thickets can be costly, back-breaking work, but without management these thickets are likely to persist, spread, and continue to impact forest structure and understory diversity.

Perhaps the greatest concern about the exotic shrub thickets in the park relates to forest pests. White ash and American elm appear to be the only tree species in Saratoga capable of penetrating the shrub thicket to form a sparse canopy. The shade created by the sparse canopy may reduce shrub density enough for other tree species to become established and eventually form a continuous canopy. American elm mortality due to Dutch elm disease typically occurs by the time elms reach 15-20 cm diameter at breast height, and the 2010 NETN crew observed elm mortality that was likely due to Dutch elm disease in half of the elms that were measured and alive

in 2006. If emerald ash borer becomes established in the park, it is unclear if there are remaining tree species capable of penetrating the exotic shrub thicket and also persist long enough to form a canopy.

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 measure 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 Saratoga.

Forest habitat was considerably fragmented by fields and roads inside the park boundary, and agricultural lands dominated the area outside of the park. While 56% of forest patch area in Saratoga occurred in patches that were rated "Good", 32% of forest patch area was rated "Caution" and 12 % was rated "Significant Concern". Neighborhood anthropogenic land use (ALU) consisted primarily of open fields and was rated "Caution", averaging 11% per forest plot.

Habitat fragmentation may have contributed to the spread of invasive species in the park, and it appears that aggressive invaders, such as exotic bush honeysuckles, are maintaining habitat fragmentation by inhibiting forest succession.

Conclusions

The combined impacts of invasive species and deer pressure appear to be altering forest conditions in Saratoga. While NETN encourages continued eradication efforts by park staff, reduction in deer densities may be an important part of the solution. Deer are known to spread exotic species through their droppings and to promote non-palatable species, including many exotic species, ferns and graminoids (grasses). Exotic earthworms may also be impacting forest understories. Early detection and outreach efforts to prevent spread of emerald ash borer into the park are extremely important, especially considering its recent detection in southern NY.

More Information

Kate Miller
NETN Plant Ecologist

Phone/E-mail
207-288-8736
kathryn_miller@nps.gov

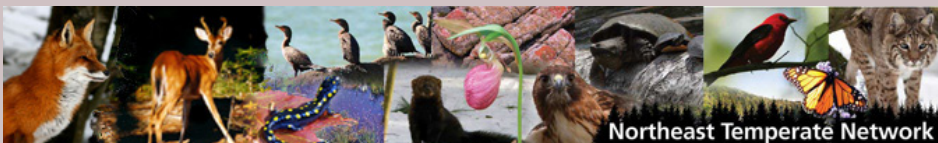
Brian Mitchell
NETN Program Manager

Phone/E-mail
802-457-3368 ext. 37
brian_mitchell@nps.gov

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



Northeast Temperate Network
54 Elm Street, Woodstock, Vermont 05091
802-457-3368
<http://www.science.nature.nps.gov/im/units/netn/>



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