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Forest Health Update for Roosevelt-Vanderbilt NHS

Background

The Northeast Temperate Network (NETN) monitors a variety of natural resource indicators, which it calls “vital signs”, for 12 parks in the northeast and the Appalachian National Scenic Trail. Forest Vegetation is considered a high-priority vital sign and as such, the network developed a long-term monitoring program for forest resources. The program also provides data for three additional high-priority vital signs: Forest Soil Condition, White-tailed Deer Herbivory, and Landscape Context. The overall goal of the forest monitoring program is to assess status and trends in the composition, structure, and function of NETN forested ecosystems.

Methods

The forest health monitoring program tracks a representative sampling of site and vegetation measurements in a network of randomly located, permanent forest plots that are sampled every 4 years. As of the 2011 monitoring season, the network has resurveyed half of the forest plots. Most tree, stand, and diversity measurements are made within the fixed-area, 20 x 20 m² plots. Coarse woody debris is assessed using line intersect sampling along three 15-m transects that originate from the plot's center. Soil samples are obtained from a location just adjacent to the plot. For a more detailed description of the forest protocol, including background information, field methods, and sample design, download the NETN Forest Health Monitoring Protocol from the network's website. The website also offers the chance to do a fly over above all the park's forest plots using Google Earth, which will also allow users to view ground-level photos of each plot with NETN's new photo-browser (Google Earth Park Maps link is on the leftmost menu items on NETN's homepage).

An Ecological Integrity Scorecard is used to help simplify the reporting and interpretation of forest condition in NETN parks. The scorecard examines a host of compositional, structural, and functional data in relation to their natural or historical range, and assigns a rank of a rank of Good, Caution, or Significant Concern to each. “Good” represents acceptable or desired conditions, “Caution” indicates a problem may exist, and “Significant concern” indicates undesired conditions that may be in need of management actions. 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. But being able to compare the condition of park resources to ecological integrity benchmarks is still valuable because it allows for a deeper understanding of park condition, as well as a consistent baseline for assessment of management goals.

Results and Findings

Dead wood, in the form of fallen coarse woody debris (CWD) and standing dead trees (snags), is an important structural feature of forests that provides habitat for many forms of wildlife, fungi, and insects. Large-diameter snags provide habitat for a greater number of vertebrate species and persist longer than smaller-diameter snags. Whereas thoughtful land management can maintain or enhance snag and CWD quality and availability, certain forestry and land management practices can reduce these important forest features. Eleanor Roosevelt NHS and Home of Franklin D. Roosevelt NHS had CWD at expected levels, but snags are lacking both in overall abundance and in abundance of medium to large diameters. Vanderbilt Mansion NHS had the highest CWD volume and CWD ratio of any park in the network. Overall snag abundance is also relatively high, although medium to large snags are slightly below expected levels.

Early detection of invasive exotic plants is an important NETN vital sign that has been incorporated into several long-term monitoring protocols. 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. Although average percent cover of invasive exotic species is low for both Eleanor and Franklin D. Roosevelt sites, indicator invasive exotics occur in 21 out of 24 plots, and plots have an average of three indicator invasive exotic species.



The forests of Vanderbilt Mansion ranked highest out of all NETN parks for coarse woody debris availability. NPS photo.



The emerald ash borer poses a serious threat to the health of forests in the Northeast.

Several species of exotic pests pose serious threats to northeastern forests if they advance into the region; these NETN “Priority 1” pests are Asian longhorned beetle, emerald ash borer, hemlock woolly adelgid (HWA), and sudden oak death. Other

forest pests can cause problems that are not quite as severe, and/or may already be widespread in the NETN region. These NETN “Priority 2” pests are balsam woolly adelgid, beech bark disease, butternut canker, and elongate hemlock scale (EHS). Plots in these parks that rated Significant Concern are all the result of HWA detections. HWA and EHS were both more common in the Roosevelt sites than Vanderbilt Mansion NHS, mainly because hemlock is more common in those parks. Although HWA is still being seen, hemlock mortality has not been observed since sampling was initiated in 2007 in these parks. Had HWA and EHS not been detected in any park plots, most would have been rated Good, as only minor tree conditions were recorded for other tree species. Plots that rated Caution were mostly due to elevated levels of insect herbivory, necrotic leaves, and leaf loss.

As the season progresses, most trees develop minor foliage problems. However, more extensive damage to canopy foliage may be indicative of tree health problems within a species or across a region, and could be related to any combination of soil chemistry, climate stress, pathogens, or other stressors. In particular, exotic pests and pathogens have the potential to severely impact forest tree composition as well as structure and function. Tree mortality rates are at expected levels for all tree species in all the parks. Tree growth rates are lower than the regional growth rates calculated from a regional Forest Service analysis, but the higher proportion of late successional stands in these parks may be influencing the lower growth rates.

Tree regeneration looks at the quantity and composition of regeneration in the forest understory, which will impact future canopy structure and composition. Regeneration can be affected by a variety of factors - including invasive species, acid deposition, and climate change. Tree regeneration and deer browse indicator species both suggest moderate deer browse impacts at Eleanor Roosevelt NHS and Home of Franklin D. Roosevelt NHS. With the highest average seedling density in NETN, tree regeneration in Vanderbilt Mansion NHS appears to be adequate. Tree regeneration in Vanderbilt Mansion also appears satisfactory, with 75% of plots rated Good or Caution, the highest density of seedlings across all height classes in NETN, and an average deer browse index well below 3 (out of a maximum of 5). Regeneration in the other two units is less

abundant. More plots are rated Significant Concern than Good or Caution, and the average deer browse index indicates moderate browse impacts.

NETN monitors soil chemistry to understand the effects of atmospheric deposition on forest health, which is a special concern for forests in the northeast that tend to have thin soils with low soil buffering capacity. Acid deposition occurs when emissions from the combustion of fossil fuels and industrial processes react with water and oxygen in the atmosphere to produce acidic anions of sulfur (S) and nitrogen (N), and then fall to earth in dry or wet form. Acid deposition has also dramatically increased inputs of N and S to forested ecosystems in the northeast, and concern has arisen that excess N may “saturate” forest soils, causing excess nitrification and N leaching and exacerbating the effects of acidification. All of these impacts can reduce plant growth and increase susceptibility of trees to other stresses. Soil plots in these parks were relatively evenly spread from a high risk of acidification to a low risk.

Conclusions

Forest condition, composition, and structure vary considerably between the Roosevelt sites and Vanderbilt Mansion - which has the highest average density of seedlings in NETN and deer browse impacts were minimal. In contrast, the majority of plots in the Roosevelt sites were rated as Significant Concern for regeneration, and moderate deer browse impacts were observed. If these trends worsen, managers may need to consider deer management. Invasive exotic species and forest pests are a concern in all three sites, and control and early detection should be a high priority. This is especially important, considering the moderate deer impacts, as high densities of deer largely favors invasive exotic species. Emerald ash borer continues to pose a threat to forests in these sites, although signs and impacts have not yet been observed in within the parks themselves. Continued early detection and outreach efforts to prevent its spread throughout the park, New York, and the Northeast are extremely important.

More Information

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Full Report online at:

<http://science.nature.nps.gov/im/units/NETN/>

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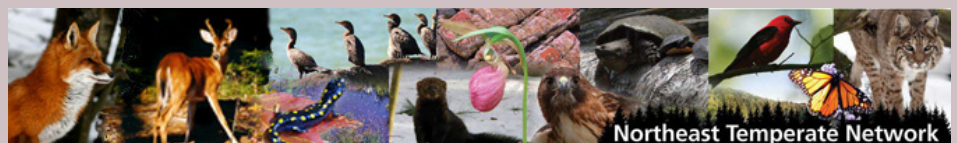
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