

Forest Vegetation

Lewis and Clark, Mount Rainier
North Cascades, Olympic,
San Juan Island

I & M RESOURCE BRIEF



Importance

Mature and old-growth forests are icons of the Pacific Northwest. In the parks of the North Coast and Cascades Network (NCCN) forests range from coastal rainforests with massive trees draped with mosses and ferns and surrounded by dense understories; to areas with drought-adapted Ponderosa pines; to high-elevation subalpine fir forests interspersed with meadows just below treeline. These forests, in turn, are the foundation for other biotic communities constituting Pacific Northwest ecosystems. Climate change, air pollution, invasive species and other stressors threaten forest structure, species composition and abundance, thereby threatening the quality and quantity of habitat for terrestrial birds and wildlife. In particular, climate change and air pollution are expected to be the greatest threats to national parks in the Pacific Northwest. Changes in forest structure and composition will also alter the chemistry of water moving from terrestrial to aquatic systems. Consequently, forest monitoring is a fundamental part of the overall monitoring plan for the parks of NCCN. Tree recruitment, growth, and mortality are sensitive indicators of ecological change that can only be documented and understood through detailed, long-term observations. Increases in tree mortality have recently been reported for western North America, demonstrating the utility of long-term forest monitoring.

Status and Trends

The NCCN monitoring program has established 45 permanent forest plots at Lewis & Clark (LEWI), Mount Rainier (MORA), North Cascades (NOCA), and Olympic (OLYM), at elevations from sea-level to 1800 meters. The plots at LEWI are 0.25 hectares (0.6 acres); the plots at the other three parks are one hectare (2.5 acres). Plots established to date include 23 tree species, representing most of the diversity of species in the parks. Additional plots will be established at San Juan Island (SAJH) in the next few years. The specific forest types selected capture the extremes and the middle of the temperature and precipitation gradients for forests in the network. Sitka spruce forests at OLYM and LEWI comprise the warm and wet end of the gradient. These forests are important winter feeding grounds for Roosevelt Elk. The cold and dry end of the gradient consists of subalpine fir forests at NOCA and MORA. The middle of the gradient is represented by western hemlock with a salal and/or Oregon grape understory, measured at MORA, NOCA, and OLYM. These forest types are common throughout the region and monitoring results will provide benchmark information for managed forests. Target vegetation communities for SAJH have not yet been identified.

Tree mortality will be assessed annually and tree recruitment and growth will be recorded every five years. Thirty-five of the plots were established in 2008, allowing for the first evaluation of mortality trends in 2011. Most of these plots (25) showed no consistent trend in tree mortality, with five plots each showing decreasing and increasing trends. Trends in tree recruitment and growth will be reported after 15 years and trends in stem densities and tree basal area will be reported after 10 years.



Opposite Biological science technician Shea McDonald and project lead Steve Acker review procedures while establishing a new forest monitoring plot in the Carbon River drainage of Mount Rainier National Park. NPS/NCCN

Above Rachel Brunner and Mark Anderson in a monitoring plot at Mount Rainier National Park. O'Brien/Rejman

Discussion

A recent report in the journal *Science* estimated that in recent decades the rate of tree mortality in old-growth forests in the Pacific Northwest has doubled every 17 years, probably due to regional warming and consequent stress caused by drought. This could lead to fewer large trees, less carbon storage, and forests predisposed to abrupt dieback. Forest monitoring in the NCCN will determine whether or not the recently-observed trend in tree mortality is continuing. It will also provide information about:

- Changes in historic conditions
- Types of habitat the forests provide for other plants and animals
- The forest's ability to capture CO₂
- Susceptibility to pests and pathogens.

This and other information will assist managers in protecting the forests and related park ecosystems.

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