Climate
RESOURCE MONITORING BRIEF

National Park Service
U.S. Department of the Interior

North Coast and Cascades Network
Inventory & Monitoring Network

IMPORTANCE

Climate can be described as the prevailing weather conditions of a region averaged over a series of years. A region's climate acts as a "system driver," an overarching set of ecological and physical phenomena including wind, precipitation, temperature, and other variables associated with the global movements of vast air masses.

Climate is a primary factor regulating all biological processes and it ultimately controls the distribution of species of plants and animals. The elevation of treeline and the location of prairies, rainforests and associated species is one example. Climate affects the behavior and reproduction of individual organisms. These effects can be subtle, pushing a bird's breeding season forward or back by days or weeks, or they can be dramatic, for example, stream temperatures above a certain threshold may result in the elimination of certain species of fish. In addition, extreme weather, an aspect of a region's climate, is one of the primary causes of disturbance such as forest fires, avalanches, and floods.

The North Coast and Cascades Network (NCCN) monitors climate to: understand variations in other park resources being monitored; compare current and historic data to understand long-term trends; and to provide data for modeling impacts to park facilities and resources in the future. The NCCN climate monitoring program compiles data from over 40 weather stations in and adjacent to the parks, 12 of which are actually operated by the National Park Service.

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Monitored at:

Ebey's Landing *National Historical Reserve*

Fort Vancouver *National Historic Site*

Lewis and Clark *National Historical Park*

Mount Rainier *National Park*

North Cascades *National Park Service Complex*

Olympic *National Park*

San Juan Island *National Historical Park*

Old growth trees toppled by high winds in the Quinault Valley.

STATUS and TRENDS

In 2006 and 2007 the NCCN monitoring program collected climate data from extreme weather events which greatly influenced the landscapes of NCCN national parks. Among the highlights:

- In November 2006, a massive storm, commonly known as a "pineapple express" for the warm moist air mass inbound from the tropics, dropped as much as 18 inches of rain on the northwest in a 2 day period. This warm rain melted the early winter snowpack and caused record flooding on many rivers. Roads, campgrounds and trails were washed out or damaged at Mount Rainier, North Cascades and Olympic National Parks. Pummeled by storms, the month's rainfall was over 200% average for all NCCN parks and broke all time records in many locations throughout the state.

- Several windstorms with recorded speeds in excess of 100 mph occurred in December of 2006 and 2007. These were the largest wind events in 15 years. A storm on December 3rd, 2007 dropped 17 inches of rain in the Quinault Valley and sustained high winds toppled stands of old growth trees in swaths nearly a mile in length.

These were just a few of many landscape altering events in our parks over the last two winters. Newly formed forest clearings, river channels and log jams eliminated and created habitats for park organisms. Damage to park infrastructure impacted visitors and park staffs.

DISCUSSION

The severe weather events witnessed over the last few years could become more commonplace in the future. Climate scientists have documented an increase in the frequency and intensity of extreme wintertime cyclones in the North Pacific over the last 50 years (Graham and Diaz 2001) and models suggest that this could continue with global warming. Models also predict the greatest increase in the frequency of extreme precipitation events (140%) in the Pacific Northwest.

The December 2007 rainfall event provided an excellent opportunity to understand the benefits of having a relatively dense network of climate instruments in areas of climate complexity. During this event, a National Weather Service station near the Lake Quinault park boundary recorded 9.9 inches of rainfall. National Park Service instruments only 10 miles away but closer to constricted valley bottoms recorded 17.5 inches. This second measurement was much more consistent with flooding and debris flow damage witnessed after the event.

The North Coast & Cascades Network