# Mountain Lakes

Mount Rainier, North Cascades, Olympic

I & M RESOURCE BRIEF

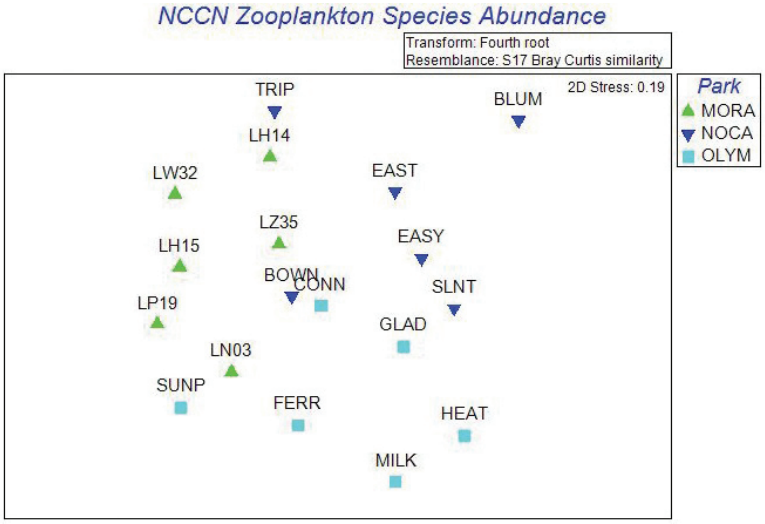
## Importance: Petri Dishes of the Pacific Northwest

Shrouded by clouds, mist, and snow for much of the year, high mountain lakes are ideal locations to assess environmental change affecting the high country of the Pacific Northwest. With over 1500 high elevation lakes, the mountainous parks of the North Coast and Cascades Network (NCCN) are exposed to both global stressors, such as climate change, and regional stressors, such as air pollution and visitor impacts. These parks, Olympic, Mount Rainier, and North Cascades, span a gradient of urban influence from the sparsely populated West Coast across Puget Sound and into Eastern Washington. Each park has its own landscape setting, with different geology, climate and connectivity to other mountain systems. Like living Petri dishes, each mountain lake is essentially a pristine membrane accumulating and responding to the chemical and biological influences of the surrounding area.

Zooplankton are monitored annually in NCCN mountain lakes. They are ubiquitous animals living in the water column of lakes worldwide. These organisms are a central link in lake food webs, eating microscopic plants and bacteria in the water, and being eaten themselves by amphibian and fish predators. Zooplankton community structure – the body size, number and density of distinct species, provides valuable insight into environmental perturbations affecting lake ecosystem function. Changes in zooplankton community structure can be linked to nutrient enrichment, sedimentation, and altered foodweb interactions, particularly changes in the presence and density of fish and amphibians.

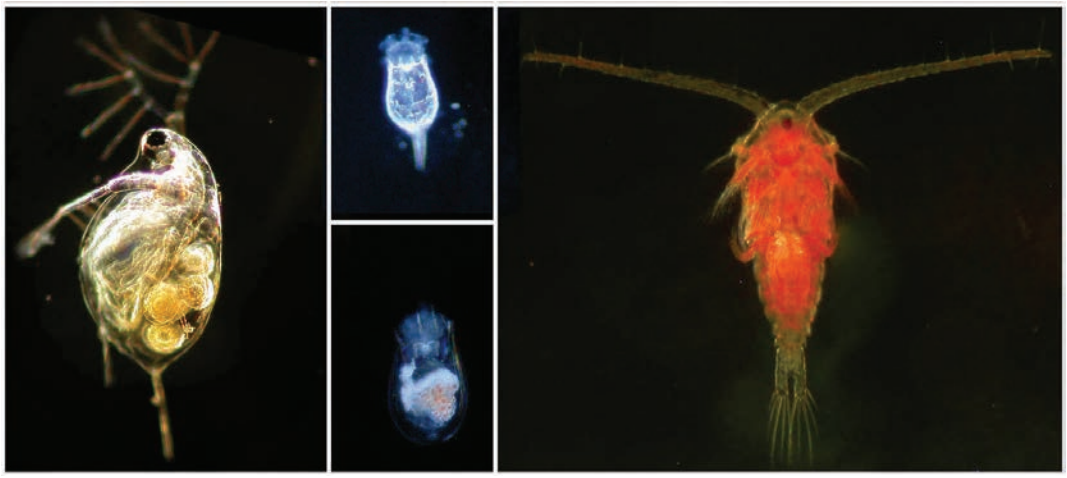
## Status and Tends

In 2009, Zooplankton communities of 18 subalpine lakes, six at Mount Rainier, six at North Cascades, and eight at Olympic were sampled between August and September. Samples were identified to the lowest possible taxonomic level and community data were analyzed via multivariate techniques. A key finding of this analysis illustrated that the zooplankton




**This Page** A non-metric multi-dimensional scaling plot of the zooplankton community structure of 18 NCCN lakes from 3 parks. Each symbol represents the community structure of a lake. The clustering of like park symbols illustrates the distinct nature of the park zooplankton communities.

**Opposite Above** Evergreen State College Intern Samantha Sadoski sampling zooplankton at Lake Louise, Mount Rainier National Park. NPS/MORA
**Opposite Below** Representative NCCN zooplankton clockwise from left: a cladoceran *Daphnia rosea;* rotifer *Hesperodiaptomus kenai;* copepod *Notholca michiganensis*; and rotifer *Keratella cochlearis.*



community structure of each park was distinctly different (graph below). Mount Rainier and North cascades communities were dominated by high densities of rotifers, whereas the Olympic communities were dominated by high densities of cladoceran crustaceans. Mount Rainier had the highest zooplankton richness with an average of 11.2 taxa, whereas Olympic had the lowest richness with an average of 7.2 taxa. North Cascades had an average of 9.0 taxa. These data suggest that regional differences exist in environmental conditions that structure zooplankton communities within the NCCN. Future analyses will examine lake physical and chemical parameters along with multi-year zooplankton data to determine the robustness of park differences and trends in condition.

## Management Applications

This monitoring Program will provide information to:

- Better understand the impacts of global climate change
- Better understand impacts of atmospheric pollution
- Develop criteria for restoring lake impacted by non-native species
- Identify impacts associated with backcountry visitation

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