



Vital Sign Update: 2019 Results for Mountain Ponds and Lakes Monitoring at Crater Lake National Park

Importance

Ponds and lakes support varied aquatic life and are vital watering holes for Crater Lake National Park's terrestrial wildlife. Snow and rain feed these ponds and lakes but can also introduce atmospheric pollutants. Exotic plant and animal species are also a threat. Since 2013, we've been monitoring ponds and lakes as a vital sign of the park's health to inform managers about current conditions and any concerning changes. This brief describes how we determine the *trophic state* and *biological diversity* of lake fauna from monitoring done in 2019.

What is trophic state?

Trophic state describes a lake's productivity – the amount of biomass (all living organisms) produced in a given time period. The higher the biomass, the more productive the pond or lake is. Productivity is affected by many factors, including geology and the shape of the lake basin. However, land use and climate (temperature and precipitation) are especially important factors for management. For example, a steep rise in lake productivity due to fertilizer or other human impacts, called "eutrophication," is a problem. We measure biomass and trophic state by sampling algal production, specifically the concentration of Chlorophyll a in the water. Chlorophyll comes from phytoplankton: generally green algae, cyanobacteria, or diatoms. A lake's trophic state can be **oligotrophic** (low production), **mesotrophic** (medium production), **eutrophic** (high production), and **hypereutrophic** (very high production).

What are zooplankton?

Zooplankton are microscopic animals that float or swim passively in lake or pond water. They eat phytoplankton (microscopic plants) in the pond or lake, or other zooplankton, and they become food for fish and am-

phibians. Though still small, some can be seen with the naked eye. Zooplankton are generally crustaceans (like *Daphnia*, the "water flea"), rotifers, some insect larvae, and aquatic mites. We track zooplankton as a vital part of a lake or pond's biodiversity, and also because they respond to nutrient enrichment (like fertilizer).

What is the littoral zone and why count macroinvertebrates?

The littoral zone is generally the shallow zone around the edge of a lake where enough light penetrates so that aquatic plants can grow. In a shallow pond, the littoral zone may include the entire pond. We sample the edge of lakes and ponds for aquatic macroinvertebrates that inhabit this zone: insects, mites, leeches, snails, and worms. Important to biodiversity, they eat algae, plants, zooplankton, and each other. They are eaten by amphibians, fish, spiders, birds, and bats. Aquatic insects that emerge from the water as flying adults also provide energy to the surrounding landscape.

About amphibians

Amphibians need water to breed. They are some of the world's most imperiled animals because they are extremely sensitive to pollution, pathogens, and changes in water chemistry. As such, they are an early warning system for park managers. We count the overall density of amphibians in a pond or lake, regardless of species, as few species naturally occur in the park's waters.

Results and Future Monitoring

In September of 2019, we sampled 6 perennial ponds outside the caldera at Crater Lake. View the map and table on the following page for detailed results. We'll sample Crater Lake ponds again in 2023.

Collecting water and phytoplankton from a hypereutrophic pond in the park in 2016.

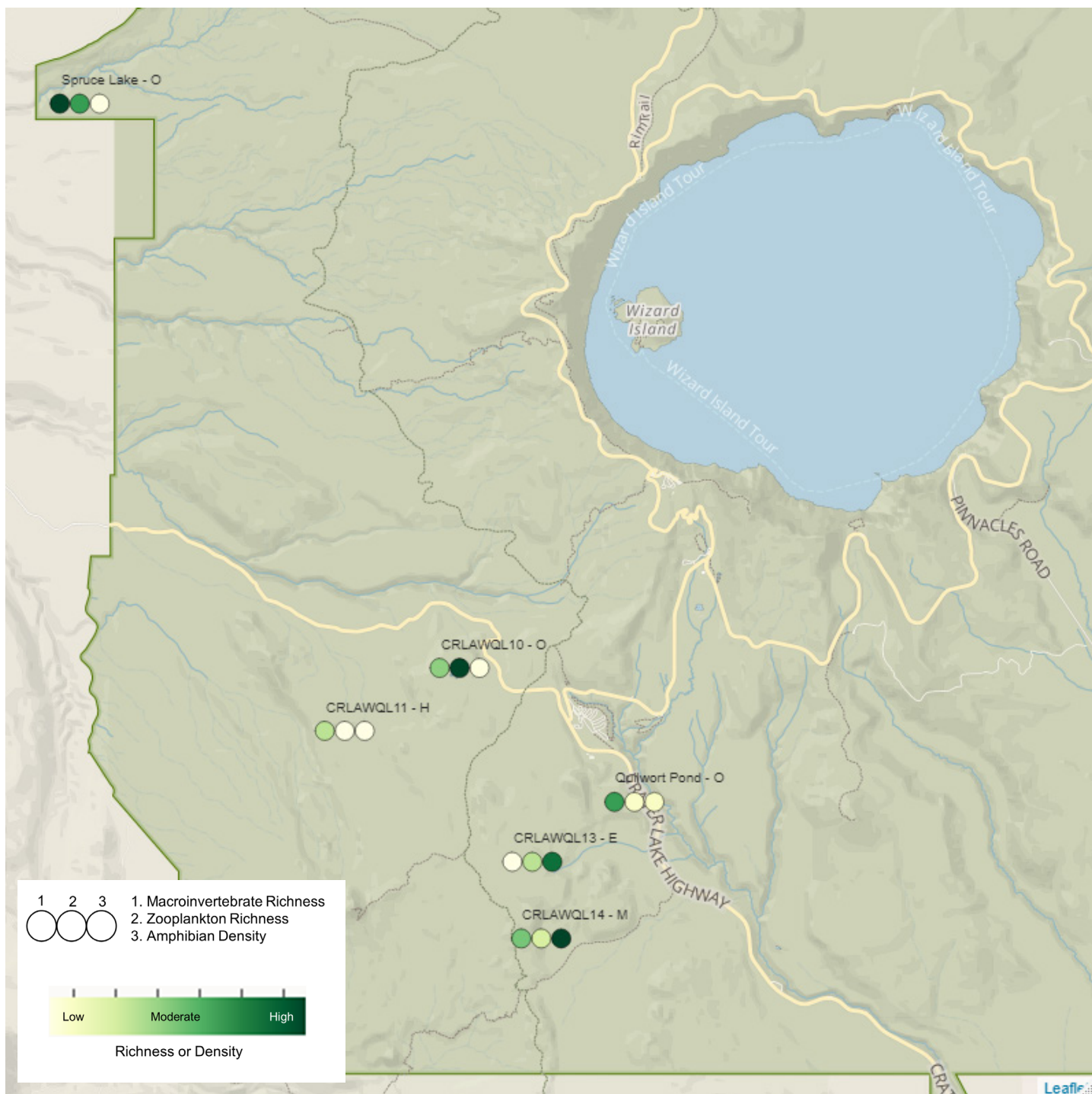


More Information

Eric Dinger, Aquatic Ecologist
Klamath Inventory and Monitoring Network
eric_dinger@nps.gov; 541-552-8574

Project overview, reports, and protocol:
<https://www.nps.gov/im/klmn/lakes.htm>

Datasets and all related publications:
<https://irma.nps.gov/DataStore/Reference/Profile/2171801>



Site Code	Date Sampled	Zooplankton Taxa Richness	Macroinvertebrate Taxa Richness	Total Number of Amphibians	Chlorophyll $\mu\text{g/L}$	Trophic State
Spruce Lake	9/10/2019	17	27	10	1.82	Oligotrophic
CRLAWQL10	9/11/2019	21	17	11	1.14	Oligotrophic
CRLAWQL11	9/11/2019	9	15	9	33.69	Hypereutrophic
Quilwort Pond	9/16/2019	10	21	20	0.65	Oligotrophic
CRLAWQL13	9/12/2019	13	9	110	14.44	Eutrophic
CRLAWQL14	9/12/2019	12	18	130	2.66	Mesotrophic