

Life Between Footsteps: Uncovering the Lichens and Bryophytes of Mount Rainier National Park



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Mount Rainier National Park is famous for its glaciers, wildflower meadows, and soaring alpine views. But some of the mountain's most important residents are hiding in plain sight. Look around on rocks, soil, logs, or trees, and you might spot a patch of moss or a splash of color. These organisms often go unnoticed, yet they play a big role in keeping the park's landscape stable and healthy. Now, scientists and park managers are paying closer attention to them.



Look closely at this alpine rock outcrop to spot resilient lichens and bryophytes clinging to the surface. Photo credit: NPS/Dave Kofranek

The Problem Beneath Our Feet

Each year, more and more people visit Mount Rainier to hike, camp, and enjoy its natural beauty. With more footsteps, however, comes more pressure on delicate environments.

Some of the most easily overlooked life forms—lichens and bryophytes—are especially vulnerable and can be easily crushed underfoot.

So, what exactly are [lichens and bryophytes](#)? Bryophytes, which include mosses, liverworts, and hornworts, are simple plants that often thrive in damp areas, though some species are adapted to dry, harsh mountain environments. [Lichens](#) are unique organisms made of fungi living closely with algae or bacteria. The fungus provides a structure to live in, while the algae or bacteria make food through photosynthesis. You'll find lichens throughout the park, clinging to trees, rocks, and bare soil.

These tiny life forms play big roles. They help build soil, trap moisture, and provide shelter for insects and other small animals. They also serve as nesting material for birds and small mammals. Some species even pull nitrogen from the air and share it with the soil, supporting forest growth. They develop slowly, and when disturbed, many can take **decades** to recover.



Hummingbirds often use lichens as nesting material, blending their nests into the surrounding bark and branches. Photo credit: © Patricia McInroy

Studying Life at Ground Level

Park staff monitor, protect, and restore forests and wildflowers, but before they can do the same for lichens and bryophytes, they first need to understand which species are in the park and how they are doing. "There's sort of a hidden world that we still haven't fully catalogued," said Beth Fallon, vegetation ecologist at Mount Rainier. "If we don't protect them, we could lose species without even knowing they were there."

To fill in this knowledge gap, the National Park Service launched a study in 2024 partnering with researchers from Siskiyou BioSurvey, Dave Kofranek Botany, and Greentop Planning, Development, Research. The team set out to map where lichens and bryophytes live, identify sensitive

or rare species, and understand how direct impacts from visitors, like trampling near trails and campsites, affect them. For bryophytes, the study focused on mosses and liverworts.



Researchers examining lichens and bryophytes in a lowland forest habitat. Photo credit: NPS/Dave Kofranek

Researchers studied four areas across the park, from muddy rainforests to dry alpine ridges. They surveyed sites close to trails as well as locations farther from visitor traffic, using three approaches. Along trails, they surveyed at increasing distances from the path to help determine how far the effects of trampling reached. In other areas, they chose random survey locations to get a big-picture view of what species were around. For the rarest species, they used historical records and habitat clues to find likely locations. Habitat clues included features like fallen trees and canopy gaps in the forest, and late-snowmelt zones and small alpine streams in the high country.

Many species could be identified in the field, but some needed closer examination in the lab. Researchers used microscopes to study tiny structures that help tell one species from another.

Signs of Stress, Signs of Hope

Altogether, the team recorded 475 species: 203 lichens, 195 mosses, and 77 liverworts. They found species never before recorded in the park and documented others in places they hadn't been seen before. Some were extremely rare, with only a handful of global records.



Three alpine lichens found in the park: *Cornicularia normoerica*, *Umbilicaria cylindrica*, and *Umbilicaria lyngei*. Photo credit: NPS/Dave Kofranek

They also found clear signs that visitor use is taking a toll on these species. Many rare finds came from less-traveled areas, and species diversity dropped near heavily used trails. In alpine zones, where lichens and bryophytes often grow on thin, rocky soils, trampling had the biggest impact. In contrast, the rainforest's soft, muddy soils help absorb the pressure from footsteps, and many lichens and bryophytes there grow on trees, where they are less likely to be stepped on.

There were also encouraging findings. Lichen species known to indicate old-growth forest health were present, suggesting these systems are in good condition. "The fact that these old-growth lichens are still here leaves us hopeful that protecting our intact forests will keep these pockets of biodiversity alive and healthy," said Fallon.



The results offer the first broad view of lichen and bryophyte diversity in the park and how foot

Living on this tree is *Nephroma occultum*, a rare lichen species native to the old-growth forests of western North America. Photo credit: NPS/John Villella

traffic impacts these fragile communities. By finding where these species thrive and where they're most at risk, the study will help guide future protection efforts.

A Step Toward Protection

This new information is already helping park managers take a more conservation-minded approach to decision-making. Knowing where sensitive species live helps them plan trail maintenance, design restoration projects, and steer visitors away from high-risk zones. "We know what to look for now," said Fallon. "And we can factor that into how we care for the landscape."

The public can help too. By staying on marked trails, visitors can protect the hidden diversity beneath their feet. As Fallon puts it, "Footsteps off the trail can have an impact on something we never even saw."

This study is a reminder that even the most well-loved landscapes still hold mysteries. At Mount Rainier, where dramatic peaks draw your eyes to the sky, there is just as much wonder waiting down below.

Want to learn more?

Check out the [full report](#) from this study to explore the findings in more detail.