



Magnificent Five-Needle Pines:

By Michael Kauffmann



Blister rust killed a stand of whitebark pine in the Esmeralda Basin of the Okanogan-Wenatchee National Forest in Washington. Photo by Richard Droker

Join a PCT Community Science Project



Western North America's five-needle pines are, in my opinion, among the most beautiful living creatures on Earth. They are also major contributors to the unique high-elevation aesthetic of the Pacific Crest Trail. A pine tree is a kind of conifer, and five-needle pines along the trail include the sugar pine, limber pine, foxtail pine, whitebark pine and western white pine. The sugar pine is the world's tallest and largest pine and also creates the longest cone of any conifer. Limber and foxtail pines are among the world's oldest living things and relatives of the ancient bristlecone pine, which can live for 5,000 years. The whitebark pine is, however, the most ubiquitous and iconic high mountain conifer in western North America. It is typically the highest-elevation pine tree found in the PCT's Sierra Nevada and Cascade ranges and often marks the tree line.

Threats to Five-Needle Pines



Bark beetles generally kill larger trees in various sized pockets.



White pine blister rust is rarely seen but symptoms include branch dieback.



With drought and climate change, mistletoes have more serious impacts.

The forests along the length of the PCT showcase unparalleled conifer diversity – for trail users who are tree aware – and are home to about 10% of the world’s conifer species. However, pines face an uncertain future, and scientists are trying to learn more. You can help and are invited to join an effort to better understand the rapidly changing conditions confronting five-needle pines by contributing your PCT observations.

Conifers have been on Earth for about 275 million years. The definition of a conifer is a plant (or tree) that produces cones. Thus, pine trees are conifers. Pinecones are meant for reproduction. Flowering plants, which use seeds from their flowers for reproduction, instead, are comparatively younger – only about 120 million years old.

Beginning from the southern end of the PCT and moving north (see map, page 14), the five-needle pines seen in order of appearance along the trail are sugar pine, limber pine, foxtail pine, whitebark pine and western white pine. Comparing these species, sugar pines prefer mid-elevations and have the longest needles and cones. Limber pines are only found in the high, arid regions of the Transverse Ranges, Peninsular Range and southern Sierra Nevada. Foxtail pines inhabit the high elevations of the southern Sierra Nevada and Klamath Mountains. Whitebark pines stick to the high elevations in the central Sierra and north to Canada. Western white pines are found in middle to upper elevations from the central Sierra northward. Western white pines’ cones and needles are medium in length, compared with those of the sugar pines and limber pines.

Ecology

Five-needle pines are crucial to their mountain ecosystems. Because they are often the largest and most dominant plant at higher elevations, they provide shade, helping snow

to melt slowly through the summer. In their understory, the trees also provide shelter for other annual and perennial plants as well as habitat for a variety of animals.

Products of five-needle pines can be food for animals and humans. Both sugar pine seeds and sap have been part of Indigenous Americans’ diets. First Americans also set fire to the plants below the trees – a regenerative fire practice that western forest managers and ecologists are increasingly turning (and returning) to today.

Five-needle pines rely on seed dispersal by squirrels and birds, especially the Clark’s nutcracker. These birds open cones with their pointed, crowlike beaks, collect the seeds, and bury small caches of them. They will do this with any of the five-needle pines’ cones, but they play a particularly significant role in the dispersal of whitebark pine seeds. Seeds that are not reclaimed by the nutcracker over the winter will often grow into seedling clumps. You can see the resulting clusters of trees in the high country along the PCT from the Sierra Nevada north into the Cascades, examples of the interconnectedness of mountain creatures.

Threats

All is not well with the five-needle pines of western North America. Climate change and human-caused disturbances are reshaping forests and mountains. Water in the mountains is drying up earlier each season. Snowpack levels are decreasing. Drought conditions and warmer annual average temperatures are driving species typically found at lower elevations upward. Among the five-needle pines, the foxtail and whitebark pines are particularly impacted as different species migrate higher, bringing with them pathogens that the high elevation trees don’t have many defenses against.

Bugs such as bark beetles are moving upslope and feasting on tree species that, in colder times, were inaccessible to them. Climate change also enables other plants to more significantly damage the pines. For example, native dwarf

mistletoes historically could usually live as a parasite on western white pines without killing them. But, now, competition for water is causing the decline of more and more trees. Additionally, a non-native rust fungus, white pine blister rust, is wreaking havoc on western white, foxtail and whitebark pines, which have no natural protections against it.

The Future of Five-Needle Pines

In many ways, the future looks bleak for five-needle pines. But forward-thinking folks are taking notice and taking action.

Grassroots nonprofits like the Whitebark Pine Ecosystem Foundation have developed rust-resistant breeding nurseries that select more resilient seedlings to become the next generation of five-needle pines. They plant them in forests decimated by high-intensity wildfire or bark beetle infestations.

PCT iNaturalist Community Science Project Partners



Whitebark Pine Ecosystem Foundation

This foundation promotes the conservation of five-needle pine ecosystems by supporting restoration, education, management and research to enhance knowledge and stewardship of these valuable ecosystems (<https://whitebarkfound.org>).



CALIFORNIA NATIVE PLANT SOCIETY

The California Native Plant Society's mission is to protect California's native plants and their natural habitats through science, education, stewardship, gardening, and advocacy (www.cnps.org).



Pacific Crest Trail Association

The mission of the Pacific Crest Trail Association is to protect, preserve and promote the Pacific Crest National Scenic Trail as a world-class experience for hikers and equestrians and for all the values provided by wild and scenic lands (www.pcta.org).

Join the "5-Needle Pines Along the Pacific Crest Trail" Project

Here's how:

iNaturalist

1. Join iNaturalist (www.iNaturalist.org) and put the app on your phone. You can upload photos from your phone to the app or from a camera to iNaturalist using your computer at home.

2. Join the "5-Needle Pines Along the Pacific Crest Trail" project at:

<https://www.inaturalist.org/projects/5-needle-pines-along-the-pacific-crest-trail>.

3. Take pictures of five-needle pines along the PCT. Include the whole tree, bark, and needle close-ups clearly showing the number of needles per bundle and cones (if present). If you don't see cones, look closely around the base of the tree for cone fragments and photograph those (if present). If the tree is showing signs of decline like top or branch die-back, include a picture of that, too.

4. Upload the photos for each of your tree observations to **iNaturalist**. Once an observation is uploaded, scroll down on the observation page and click on "Projects" on the right hand side of the screen. Select the "5-Needle Pines Along the Pacific Crest Trail Project". You can learn more about adding observations to iNaturalist projects here:

<https://forum.inaturalist.org/t/adding-observations-to-a-traditional-project-wiki/13190>

iNatForum

5. Do your best to identify trees to the species level – but don't worry, experts and iNaturalist can help with the right pictures.

6. Hike more of the trail and add more observations.

Thank you!

Additionally, various efforts to map, count, monitor and manage whitebark pines are starting up across various national forests and national parks.

You can help, too. The Pacific Crest Trail Association is partnering with the California Native Plant Society and Whitebark Pine Ecosystem Foundation to raise awareness about the plight of five-needle pines and conduct a community science project. The goal is to get thru- and section-hikers to map and inventory five-needle pines along the Pacific Crest Trail. Once trail users learn how to identify the

trees, they can note them on their PCT journeys and upload observations to the iNaturalist Project called “5-Needle Pines Along the Pacific Crest Trail.” The reports should feature multiple photographs, including pictures of the tree, cones, needles, and any unusual symptoms such as branch die-

back, whole-tree mortality, or mistletoe infestations. By participating, trail users will help increase awareness of the changes affecting our world while improving connections to nature. Working together to document what’s happening is a positive step toward recovery. 🌲

Finding Five-Needle Pines Along the PCT

