Discovering California's Rarest Conifer

CNPS teams with the Klamath National Forest to map yellow-cedar (*Callitropsis nootkatensis*)

BY JULIE EVENS AND MICHAEL KAUFFMANN

California is home to some of the most diverse assemblages of plants in the world, and the interactions between these numerous species can be seen in patterns of vegetation. At CNPS, we've begun a multi-step process to identify, inventory, map, and track these natural communities throughout the state, with an emphasis on identifying rarity. Through this initiative, we're developing tools, training individuals and entities, and providing information to identify and protect rare vegetation types as key units of biodiversity. One recent example of this work is our yellow-cedar project with the Klamath National Forest.

With yellow-cedar in decline in the Pacific Northwest, the U.S. Forest Service wanted to understand what that might mean for the status of this rare species in its southernmost range, California's Klamath and Six Rivers National Forests. Representing the California Native Plant Society, we recently participated in a collaborative mapping and inventory project for the yellow-cedar in partnership with the Klamath National Forest.

To help answer the Forest Service's question about the yellow-cedar, we visited eight of California's 12 known populations — all in the Siskiyou Mountains. In each area we collected data on stand health, reproduction, and plant associations. This initial work will inform future studies across the range of this species and drive management practices in the Klamath Mountains.

Top: Michael Kauffmann explores yellow-cedar habitat.

Above: Part of a stand of yellow-cedar.

(Photos: Julie Evens)

Yellow-cedar: A natural history

Yellow-cedar (also called Nootka cypress) is a common tree of Alaska and British Columbia south to northern Oregon. The species reaches its southern range extension in California, represented by a few small, isolated groves. In this southern extent of its range, yellow-cedar has a unique ecological amplitude compared to habitats further north. Over most of Alaska and Canada, it is a tree of the coastal mountains, growing from sea level to 3,000 feet (915 m). As the species ranges southward into southern Washington and Oregon, it moves upslope into cool, wet, rocky, north-facing glades where subalpine conditions prevail. This is the case in the Siskiyou Mountains, where the species is a true relict, surviving in a handful of specific microsites that maintain a cool wet climate and late, persistent snow.

Research by Brian Buma from University of Alaska is finding that mature yellow-cedar at the northern extent of its range are in declining health and that little to no reproduction is occurring.

A total of four "cedars" call northwest California home, which makes documenting and identifying the rare yellow-cedar a challenge. Other regional cedars include western redcedar (*Thuja plicata*), incense-cedar (*Calocedrus decurrens*), and Port Orford-cedar (*Chamaecyparis lawsoniana*). While western redcedar is coastal and does not overlap in habitat, the others can be distinguished from yellow-cedar by having a leaf silhouette that can be described as lacy or flattened (Port Orford-cedar) and vertical and greener (incense-cedar). Yellow-cedar has droopy, yellow-green foliage that falls from a distinctly conical crown and jutting branches in a definable pattern, creating a wet and tired look. The drooping is an effective adaptation to slough off weighty winter snow without branch breakage.

The yellow-cedar has scale-like leaves and a spherical cone. (Photo: Michael Kauffmann)

The leaves of Port Orford-cedar are distinguishable by stomatal bloom in the shape of an X on the underside of the needles, while yellow-cedar has no bloom. The spherical cones are similar between the two conifers, but yellow-cedar has fewer than six cone scales, while Port Orford-cedar has more than six. The unopened cone looks like an armored ball because the end of each scale presents a sharply tipped umbo. Most of the year the cones remain closed, like cypresses. Though cone production does not occur every year, one may find remnants on the ground from previous years, greatly aiding proper identification. The bark is similar to the North American cypresses but thinner. It appears gray to brown to rarely black between scaly or shallow ridges. Only the juvenile bark characteristics are important in the region because trees do not get very old (or big) in this range.

These three "cedars" all occur in the Siskiyou Mountains, sometimes together. The real challenge lies in finding locations where the regionally uncommon yellow-cedars still survive.

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Early findings for California's yellow-cedars

The Klamath Mountains are home to more than 3,500 plant taxa, many of which are outliers of a broader range reaching their western, northern, or southern range extension in the area. With populations in only 12 known locations in California, yellow-cedar epitomizes the rarity that makes the Klamath Mountains special. For this project we started with collecting known locations using herbarium specimens from the Consortium of California Herbaria, CalPhotos, CalFlora, and iNaturalist reports. With these data, we created two maps: one for known locations and another for predicted locations.

Funding by the forest has allowed us to visit 10 known stands across the Siskiyou Mountains, managed mostly by the Klamath National Forest. In these stands we conducted 20 rapid assessments in which we looked at stand density, seedling and sapling presence, cone production, and health, among many other factors.

General trends within our surveys show that the trees at the southern extent of the species' range are healthy,

Left: Michael Kauffmann stands under the largest yellow-cedar in California, deep in the Siskiyou Wilderness.

Right: Next to Julie Evens is the world's southern-most stand of yellow-cedar, slightly burned in a 2016 fire.

(Photos: Michael Kauffmann)

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producing cones, and reproducing through both germination and cloning. In many cases, trees are expanding their range into newly accessible habitat including areas on north-facing slopes where persistent late snowpack is no longer remaining late in the growing season.

The growth and reproduction we are finding in California are the antithesis of what Buma and his colleagues are seeing in the northern range. For now, yellow-cedar appear to be thriving in California's Siskiyou Mountains. We hope our findings will aid in the development of a management plan as well as a better understanding of the species across its range.

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