

Managing for Socio-Ecological Resilience First:

How a New Type of Indicator Enhances Wildfire Resilience Monitoring

By Colleen Rossier, University of California, Davis and Bill Tripp, Karuk Tribe

This article was adapted from a blog on fireadaptednetwork.org. Read the full blog post [here](#).

Socio-Ecological Resilience

Within the Karuk Tribe, it is a cultural teaching that “you do not harvest anything without first managing habitat for it to survive and reproduce.” This is a “socio-ecological first” approach to management.

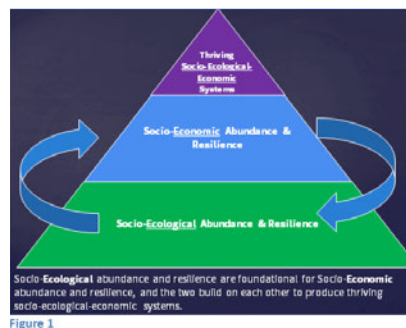
We say “socio-ecological” rather than purely “ecological” in recognition of the interdependence of human communities and ecosystems. What we do, how we live, and how we manage ecosystems profoundly impacts them — in either positive or negative ways. Likewise, plants, animals and fungi provide us with food, shelter, fibers, fuel, clean air, clean water, climate regulation and much more. Resilience in either context refers to the speed at which the system is able to re-form following disturbance, or a product of disturbance related to human interaction (or lack thereof).

Fire History and Huckleberry Ecology

In the past 150 years, Karuk people have not been able to manage their homeland in traditional ways because they have been [prohibited from conducting traditional burns](#), and many species have declined due to this lack of indigenous management ([Norgaard, 2014](#)).

The Karuk Tribe has called attention to this fact — and to the fact that humans and wildlife can coexist, and thrive, when we [manage for socio-ecological](#)

[resilience and abundance first](#) (PDF, 28.25), and let socio-economic resilience and abundance flow from there (Figure 1).



For example, the Karuk people manage their landscape such that there are enough berries and acorns to provide an abundance of food for wildlife and local families before using the remaining harvest to produce flour, soups, breads, jams, jellies and pies for ceremony, sale or trade.

One of the plants the Karuk people traditionally tend is evergreen huckleberry. It produces berries that they and many species of wildlife consume — including mice and woodrats: both of which are, in turn, food for the northern spotted owl. In our region, the huckleberry is an answer to the question: What is the food resource that links indigenous human stewardship and use to survival and reproductive rates of declining species?

While huckleberry plants are still prevalent, their berry production has declined due to the lack of indigenous stewardship, including intentional

burning. This decline has resulted in overgrown forests full of brush and small diameter trees as well as fewer canopy gaps, leaving less light for understory plants. In the case of huckleberry, this has resulted in denser brush with fewer berries and seeds for the Karuk people as well as mice and woodrats.

Additionally, huckleberries are likely important sources of food for migratory birds because of their high anthocyanin content ([Bolser et al., 2013](#); [Schaefer et al., 2008](#)). And underground, huckleberry bushes form associations with several types of fungi through common mycorrhizal networks ([Largent et al., 1980](#)). These co-created nutrient super-highways support other plants and trees and are essential for the health of the forest as a whole ([Egerton-Warburton et al., 2007](#); [Kennedy et al., 2003](#)). Large ungulates like Roosevelt Elk also forage on huckleberry brush when open enough to access. This indicates a food security connection to yet [another focal species](#) selected by the Karuk. Huckleberries are an excellent example of a species deeply entwined in an ecological food web.

When there are fewer huckleberries, people are directly, negatively impacted as well. Evergreen huckleberries are highly nutritious and medicinal, providing even more antioxidants and anthocyanins than their more commonly known and revered cousin: blueberries.

Huckleberries are also a significant traditional and ceremonial food for the Karuk people, and they are associated with other native species important to the Karuk such as acorns, mushrooms, deer, elk and other medicinal plants.

Huckleberry gathering areas essentially serve as grocery stores, pharmacies and outdoor classrooms for native people.

Thus, the decline in huckleberry quality and abundance is representative of an overall socio-ecological deficit.

Collaboration and Research

The Karuk Tribe is partnering with the U.S. Forest Service and others through the [Western Klamath Restoration Partnership](#) to revitalize fire and other indigenous stewardship practices throughout their aboriginal landscape. They have chosen the evergreen huckleberry to be an indicator of socio-ecological resilience. As part of their larger landscape restoration effort, they intend to return dense stands of huckleberry brush to the abundantly flowering and fruiting gardens that used to exist. Eventually, the Karuk would like to establish a percentage of the landscape with access to high-quality huckleberries, for both wildlife and humans, as an easily measurable performance metric for their shared stewardship activities. This species was selected for its apparent interconnection regarding the impacts of management actions of an entire living system.

Collecting the Data

In order to evaluate high-quality huckleberry habitat, we interviewed traditional huckleberry stewards of Karuk and Yurok descent to understand what makes high-quality huckleberry patches. This allowed us to define a quantitative metric to assess patch quality on a scale of 0-5 (0 meaning no berries present; 5 meaning a patch with abundant, dense clusters of berries). We then assigned huckleberry patch quality scores to 105 plots within Karuk aboriginal territory.

Overall, we found that although we skewed our site selection toward higher quality habitat, 30 percent of the huckleberry patches had no berries at all (HPQ = 0), and 30 percent had little-to-no good quality berries (HPQ = 1-2). Only 12 percent of our sites had abundant huckleberries (HPQ = 4-5), and the majority of these were known gathering spots that were actively pruned by

Karuk and Yurok people. We believe it is likely that with a reintroduction of fire, pruning and targeted canopy thinning (either through fire, manual, or mechanical treatments), many of these huckleberry patches could be rejuvenated and once again produce higher yields of good quality berries.

Huckleberries and Wildfire Resilience

While huckleberry bushes are typically viewed as a fuel by forest managers, the Karuk approach to managing huckleberries suggests that creatively designed fuels reduction treatments (burning and thinning) may actually benefit a forest's overall wildfire resilience, and increase berry production — if done at appropriate intervals and in suitable habitat. We will evaluate our huckleberry plots before and after mechanical, hand and burn treatments in order to better understand that connection.

So far, we have tracked eight huckleberry plots before, during and after prescribed burns. While we do not have enough data to make scientific conclusions, we did make some anecdotal observations. For instance, unless the canopy closure drops below 75 percent, there is little-to-no increase in berry production. However, fire seems to revitalize the bushes by removing old unproductive branches and stimulating vigorous new growth. We have also



Frank K. Lake, Karuk descendant, and daughter, Ada, gathering evergreen huckleberries. Frank is carrying Ada in a traditional hazel stick baby basket. Photo Credit: Colleen Rossier, University of California, Davis

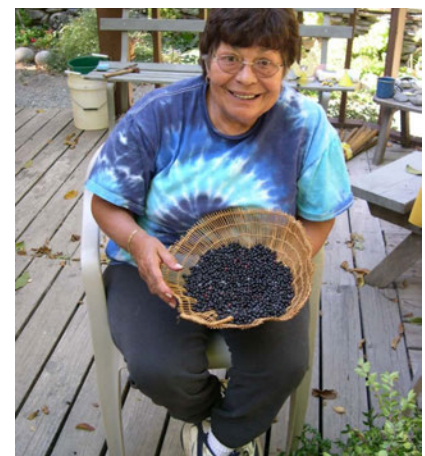
found that berry production generally takes about two or three years to get going after a fire.

Maintaining healthier huckleberry stands may have another relationship with wildfire mitigation, because as Karuk people gather from them each year, they also prune them — both as a part of harvesting and as a means to keep them lower, more condensed and traversable. This increases their productivity and accessibility while decreasing ladder fuel continuity.

The Big Picture

By using socio-ecological indicators, we can better understand the habitat requirements for plants and animals that have strong ties to our human communities and help our ecosystems function better. Working with indigenous peoples and studying how these indicators respond to wildfire and prescribed fire will help understand how to use fire to foster them. This kind of active management is inclusive of [indigenous stewardship practices](#), not only fostering fire-resilient landscapes and communities — but also abundant, prosperous ecosystems and economies.

If you're unsure what socio-ecological indicators are in your area, consider collaborating with local indigenous communities; the potential for collaboration may very well be ripening!



LaVerne Glaze, Karuk, cleaning evergreen huckleberries in her sifting basket. She picked the berries off of the tips she'd pruned earlier, which are sitting on the ground to her left. Pruning helps keep bushes compact. Photo Credit: Colleen Rossier, University of California, Davis



Colleen Rossier participating in a Prescribed Fire Training Exchange (TRES) in and around evergreen huckleberries on private land. Photo Credit: Frank K. Lake, USDA Forest Service

See another piece from the Fire Adapted Community Network titled **“Cultural Burning and TEK: How Can FAC Practitioners Leverage Indigenous Connections to Fire Without Exploiting Them?”** for advice directed at non-indigenous managers on working collaboratively with tribes to respectfully incorporate their long history with fire as a management tool in modern contexts.

Colleen Rossier is a PhD Candidate in Ecology at UC-Davis. She has been working with the Karuk and Yurok Tribes since 2014, and is currently writing her dissertation about their collaborative research integrating Western and Indigenous sciences with a particular focus on managing for the native understory forest food: evergreen huckleberries (*Vaccinium ovatum*) within a landscape-scale eco-cultural agroforestry context. She is originally from the East Coast (Virginia), and worked at USDA's Office of the Chief Scientist and National Agroforestry Center before moving out to California for graduate school. She has a deep love of plants, animals, forests, mountains, rivers, the ocean, fire, rock climbing, yoga, gardening, and herbal medicine, and also studies acupuncture and traditional East Asian medicine. She wishes to express love and gratitude to all the Karuk, Yurok, and Hupa people willing to extend their friendship, and to share their time, stories, teachings, and experiences; and to her friends and family near and far for all of their love and support.

Bill Tripp is the deputy director of Eco-Cultural Revitalization for the Karuk Tribe's Department of Natural Resources. Bill is also a co-lead for the Western Klamath Restoration Partnership. This collaborative group is embarking on a new era of shared stewardship. Together, they are changing the discussion regarding forest and fire management in the western Klamath Mountains and beyond.