



# Society & Natural Resources

An International Journal

ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/usnr20>

## Keepers of the Flame: Supporting the Revitalization of Indigenous Cultural Burning

Christopher Adlam, Diana Almendariz, Ron W. Goode, Deniss J. Martinez & Beth Rose Middleton


To cite this article: Christopher Adlam, Diana Almendariz, Ron W. Goode, Deniss J. Martinez & Beth Rose Middleton (2021): Keepers of the Flame: Supporting the Revitalization of Indigenous Cultural Burning, *Society & Natural Resources*, DOI: [10.1080/08941920.2021.2006385](https://doi.org/10.1080/08941920.2021.2006385)

To link to this article: <https://doi.org/10.1080/08941920.2021.2006385>



Published online: 24 Nov 2021.



[Submit your article to this journal](#) 



Article views: 313





[View related articles](#) 



[View Crossmark data](#) 



# Keepers of the Flame: Supporting the Revitalization of Indigenous Cultural Burning

Christopher Adlam<sup>a</sup> , Diana Almendariz<sup>b</sup>, Ron W. Goode<sup>c</sup>, Deniss J. Martinez<sup>a</sup> , and Beth Rose Middleton<sup>d</sup>

<sup>a</sup>Graduate Group in Ecology, University of California, Davis, CA, USA; <sup>b</sup>Strawberry Valley Rancheria Band of Pakan Yani Maidu, Sacramento, CA, USA; <sup>c</sup>North Fork Mono Tribe, Clovis, CA, USA; <sup>d</sup>Department of Native American Studies, University of California, Davis, CA, USA

## ABSTRACT

The revitalization of cultural burning is a priority for many Native American tribes and for agencies and organizations that recognize the cultural and ecological importance of this practice. Traditional fire practitioners are working to resist the impact of settler colonialism and reestablish cultural burning to promote traditional foods and materials, exercise their sovereignty in land management, and strengthen their communities' cultural, physical and emotional well-being. Despite broad support for cultural burning, the needs of practitioners are often poorly understood by non-Native people, limiting the potential for productive cross-cultural partnerships and programs and services that serve Indigenous nations and communities. This article describes lessons learned from two Indigenous Fire Workshops that brought together cultural fire practitioners, researchers, agency and NGO representatives and members of the public to learn about the use and benefits of cultural burning in California.

## MANAGEMENT IMPLICATIONS

- Through a community-based research project, we explore the practice of Native American cultural burning in two communities in California, its tangible and intangible benefits, and how it differs from non-Indigenous fire practices.
- We highlight specific cultural elements that are fundamental to these practices but are sometimes misunderstood by non-Native people.
- We describe the unique needs and challenges faced by practitioners and ways that different entities can support practitioners seeking to revitalize the use of cultural burning.

## ARTICLE HISTORY

Received 26 March 2021  
Accepted 12 October 2021

## KEYWORDS

Collaboration; cultural burning; wildland fire management; participatory research; traditional ecological knowledge; Indigenous land management

## Introduction

Since time immemorial, Indigenous peoples across North America have used fire to manage their landscapes and cultural resources (Roos et al. 2021; Taylor et al. 2016; White et al. 2011; Rossier and Lake 2014). Where these practices continue today, they provide important benefits to ecosystems and communities (Aldern and Goode 2014;

**CONTACT** Christopher Adlam  [chris.adlam@oregonstate.edu](mailto:chris.adlam@oregonstate.edu)  Oregon State University Forestry & Natural Resources Extension Fire Program, Southern Oregon Research & Extension Center, 569 Hanley Rd, Central Point, OR 97502, USA.

Lake and Christianson 2019). However, genocide, forced assimilation, and the criminalization of traditional fire management have collectively taken a toll on the ability of Tribal nations and individuals to deploy their knowledge (Norgaard 2014b, 2019; Lewis, Christianson, and Spinks 2018). Ecosystems dependent on cultural fire regimes have deteriorated as a result (Long et al. 2017; Halpern 2016). In turn, traditional subsistence livelihoods dependent on these ecosystems have become threatened (Turner, Deur, and Mellott 2011). Yet, catastrophic fires, loss of biodiversity, and increasing vulnerability of human communities to climate change are causing many people to call attention to such practices as alternatives to the dominant Western strategy of fire exclusion (Wyncoop et al. 2019; Lake et al. 2018; Long, Goode, and Lake 2020). The limits of fire exclusion policies are now apparent: dangerous levels of fuel build-up in fire-prone ecosystems are combining with climate change to produce conflagrations that threaten communities and forests alike (Moreira et al. 2020; Bowman et al. 2020). In this context, agencies, researchers, conservationists and landowners are increasingly interested in supporting efforts by Indigenous communities to revitalize cultural burning practices (Lake et al. 2017; Marks-Block and Tripp 2021).

Still, few resources exist to shed light on cultural burning practices due to their historical vilification and marginalization, perpetuating misunderstandings and stereotypes (Mason et al. 2012; Eriksen and Hankins 2014). This ignorance risks derailing efforts to reestablish cultural burning, particularly since any intentional use of fire typically requires the cooperation or goodwill of numerous parties, from neighbors to government agencies (Schultz et al. 2019). Meanwhile, potential allies such as university researchers, cooperative extension agents and non-governmental organizations (NGOs) lack critical information for developing programs, services and research that serve cultural fire practitioners (LeCompte 2018). Critical knowledge gaps include the needs of traditional fire practitioners, the nature of traditional fire knowledge, the optimal design of cross-cultural collaborations, and what distinguishes “cultural burns” from other kinds of intentional burns (Fitzwater 2021). Elucidating these issues will serve the current interest in developing intercultural partnerships that mobilize Indigenous-led solutions to the fire crisis while supporting the revitalization of cultural burning.

### **Case Study: The Keepers of the Flame Project**

The Keepers of the Flame project is an ongoing collaboration between fire practitioners from several California Indian tribes, community organizations, and an interdisciplinary team of University of California, Davis faculty and graduate students. Tribal practitioners and their UC Davis partners were previously engaged in a range of collaborations centered on Native American Studies professor Beth Rose Middleton’s participatory work on Native American environmental policy, particularly water and land tenure issues (Dolan and Middleton 2015; Middleton 2011). To Indigenous practitioners, fire management is closely interconnected with these issues (Aldern and Goode 2014; Fitzwater 2021), and interest converged over time on cultural burning. This project therefore came about through the interest of long-standing Tribal partners and conversations with Dr. Middleton and her graduate students over several years. Meanwhile,



**Figure 1.** Cultural burning for deergrass at the Tending and Gathering Garden.

the growing climate and fire crisis in California further justified the need for this project in the eyes of institutional and agency partners.

From its inception, the project's philosophy has been to serve as a model of cross-cultural dialogue based on reciprocity and respect for diverse knowledge systems. Following this philosophy, the project has focused on supporting the revitalization of cultural burning and exploring the needs and perspectives of traditional fire practitioners in California through community-based research. The collaboration led to two Indigenous Fire Workshops organized in January and February 2020 with the goals of highlighting the benefits of Indigenous fire management, creating opportunities for exchanges of knowledge and experience among practitioners, and generating insights and momentum toward supporting cultural burning.

The first workshop took place at the Tending and Gathering Garden (Cache Creek Conservancy Preserve, Woodland, CA, Patwin lands) on January 20th, 2020, with 80 participants (Figure 1). For two decades, Diana Almendariz (Wintun/Maidu) and elders and basketweavers from the preserve's Stewardship Committee have been working with preserve personnel to manage a 2-acre ethnobotanical area that serves as a source of basketry materials for local cultural practitioners. Today, it is a vital space for gathering culturally important plants. While some fire use had taken place in the earlier phases of the ecocultural restoration project (Ross et al. 2008; Middleton 2011), many years had passed without cultural burning and fire-dependent species were declining. The Stewardship Committee and preserve personnel therefore identified a need for long-range planning that included cultural burning. Since the Stewardship Committee was an established governing body overseen by Native practitioners, Keepers of the Flame project partners from UC Davis relied on their leadership for decisions on using fire in the



**Figure 2.** Cultural burning of sourberry at the Jack Kirk Preserve.

Tending and Gathering Garden and educating members of the public in the process. Project partners helped to prepare the site, establish a cultural fire management plan, and secure the cooperation and commitment of preserve leadership and air quality regulators. The workshop was open to the public, with participants including local Native and non-Native community members, educators, and wildland fire professionals.

The second workshop took place over three days in February 2020. Over one hundred participants gathered at the Jack Kirk Estate (Mariposa, CA, Southern Sierra Miwuk lands) under the leadership of the Honorable Ron Goode (Tribal chair of the North Fork Mono Tribe) and cultural practitioners from the Southern Sierra Miwuk, North Fork Mono and Dunlap Mono Tribes (Figure 2). The site ranges over several hundred acres and falls within the territory of the Southern Sierra Miwuk, though Ron Goode and his family have been tending it for several decades for the benefit of cultural practitioners from several local tribes. Cultural burning is focused on sourberry bushes (*Rhus aromatica*, used for both food and basketry), redbud (*Cercis occidentalis*, used in basketry), and diverse herbaceous species. For the workshop, individual patches of sourberry were burned, and a broadcast burn was implemented on a 5-acre meadow. Meanwhile, weavers gathered and peeled sourberry and redbud shoots from previous burns and discussed this process with workshop participants. In contrast with the recent absence of fire use at the Tending and Gathering Garden, Ron Goode has conducted cultural management and burning at the Jack Kirk Estate for fifteen years. For the past three years, the list of collaborative partners grew through the Keepers of the Flame project to include the Native American Studies department at UC Davis and the

Southwest Climate Adaptation Center, a partnership that became further established with the 2020 Indigenous Fire Workshop. Participants were invited from Ron Goode's extensive network of collaborative partners with a few suggested additions from the UC Davis partners, and came from diverse backgrounds and included Native American youth, representatives from California's Forest Management Task Force, CalFire, the United States Forest Service, nonprofit organizations, and researchers, historians and archeologists from various universities.

## Methods

Because the goals of this project were decolonial in nature, our methods had to adhere to this same ethic (Smith 1999; Chilisa 2019). We centered our Indigenous partners' ecological and pedagogical methods rather than western academic priorities to foster conditions where we could co-create and learn about cultural burning practices together. In this way, we were able to acknowledge and subvert the power dynamic between western and Indigenous science. At both events, local cultural burning practitioners shared elements of their fire culture with Native and non-Native workshop attendees and led cultural burns with the attendees' participation. The structure of the workshops and the processes of knowledge co-production were the result of ongoing dialogue leading up to the events and were focused on the needs and plans of the local cultural leaders. In between demonstrations, practitioners led discussions with the whole group as well as smaller informal focus groups that gave insights into the state of cultural burning, the obstacles faced by those seeking its revitalization, and existing opportunities for supporting this task. Emphasis was placed on knowledge-sharing among practitioners and attendees rather than structured evaluations for the purpose of academic research. The reasoning was that systematic elicitation of information through written surveys, directed interviews, or similarly structured methods might cause discomfort for some participants, impede the practitioner-led structure of the workshops, or possibly detract from the learning and knowledge-sharing taking place between Indigenous community members (the primary objective of the workshops). This also allowed us to prioritize relationships first, allowing for greater trust upon which future efforts can be based. It was also reasoned that qualitative observations arising from this pilot project would yield important lessons, and that more formal inquiry using western science methodology could be pursued in the future if all organizers determined this to be beneficial. To further validate these qualitative observations, organizational partners (including cultural leaders from both workshop) compared notes and discussed lessons learned throughout the planning process and during and after the workshops. This article is the product of these discussions and focuses on three themes that the coauthors found to be particularly salient: the unique aspects of cultural burning relative to Western fire management, the needs of cultural practitioners today, and ways that researchers, agencies, organizations and others can better serve them.

## Analysis and Discussion

### *The Importance of Cultural Burning to Indigenous Cultures*

The long-standing use of fire to manage vegetation communities is central to the material culture of many Native American communities. Unlike Western prescribed burning, cultural burning is rarely primarily focused on hazard reduction (Marks-Block and Tripp 2021). Instead, practitioners at the Indigenous Fire Workshops described using fire to increase the quality and quantity of desired plant resources, to maintain healthy landscapes for all species, to fulfill a stewardship obligation, and to maintain their cultural identity.

Without fire, numerous plant resources either become unusable, diminish in quantity and quality, or are harder to gather and process (Anderson 2005; Norgaard 2014b). In California, basketry materials are an important focus of cultural burning practices (Marks-Block, Lake, and Curran 2019; Anderson 1996). During the two Indigenous Fire Workshops, basketry plants burned included redbud, sourberry, and deergrass (*Muhlenbergia rigens*). In the years following the burns, these plants produce numerous straight and pliable shoots that are used by basketweavers (Anderson 2005; Long, Goode, and Lake 2020). Dunlap Mono weavers present at the Mariposa workshop demonstrated gathering and processing previously burnt redbud and sourberry shoots for basketry classes they would be teaching in their communities. Without the use of fire, this important resource becomes unavailable, which not only threatens tribes' material culture but also puts Indigenous peoples' identity, social wellbeing and health at risk (Norgaard 2014b).

In addition, the quantity and quality of many important food sources increase with frequent burning. These "First Foods" include acorns (Anderson 2007; Halpern 2016; Long et al. 2017), berry-producing shrubs such as huckleberries (*Vaccinium* spp.), manzanita (*Arctostaphylos* spp.) and sourberries (Aldern and Goode 2014; Rossier and Lake 2014), and herbaceous food plants such as greens, edible seed-producing plants, and "Indian potatoes" (primarily geophytes in the family Themidaceae, Anderson 1997). Today, the suppression of traditional fire management contributes to a lack of access to traditional foods in many Native American communities (Sowerwine et al. 2019; Wires and LaRose 2019). This loss of First Foods diminishes Tribal food and cultural sovereignty and is considered to be the next edge of genocide due to the health effects of losing these traditional diets (Norgaard 2019; Goode et al. 2018). At the workshop sites, practitioners were interested in improving several food crops, including acorns (from oaks, *Quercus* spp.), sourberries and elderberries (*Sambucus nigra* ssp. *caerulea*).

While the tangible benefits of fire for improving resources are often mentioned in relation to Indigenous burning, they are not the sole motivation behind this practice. On several occasions workshop leaders and participants highlighted that burning is a spiritual and ethical obligation to care for the land. While specific items can be harvested for the benefit of the community after a burn, people also emphasized that fire's numerous ecological benefits were integral for maintaining a relationship with other species based on reciprocity (Kimmerer and Lake 2001; Zedler and Stevens 2018; Norgaard 2019). This is consistent with what Indigenous scholars have termed "radical relationality" (Yazzie and Baldy 2018). Within this framework, plants, water, and

landscapes are relatives with which Indigenous people engage in social and political relationships. As a result, fire practitioners feel a responsibility to bring back the use of fire throughout their ancestral lands, not just in areas where they currently gather. They emphasize that maintaining the health of the land and all species is at least as important as the material benefits secured by burning (Long, Lake, et al. 2020), and this continues to be the case despite the numerous obstacles they face. During a lecture associated with the workshops, Valentin Lopez, chairman of the Amah Mutsun Tribal Band, explained that despite removal from their ancestral lands and forced assimilation, “Creator never rescinded his instructions to us to take care of the land” (1/29/2020, quoted with permission).

Indeed, fire is understood as a keystone process through which Native culture, identity and emotional and physical wellbeing are tied to the health of the land (Norgaard and Reed 2017). Being unable to burn threatens the integrity of this feedback loop that still links Indigenous peoples and their homelands. Efforts to revitalize cultural burning, such as those showcased by the workshops, are critical for perpetuating this relationship based on reciprocity and responsibility, continuing to build and adapt knowledge and practices, and securing the transmission of knowledge and cultural identity to next generations.

### ***Indigenous Culture and “Fire Ethic”***

The term “cultural burning” appropriately highlights the foundational importance of culture in this practice. At the workshops, cultural practitioners mentioned connections between burning and words used in their languages. They talked about their relationship to specific plants, places and landscape features as they relate to fire. This cultural legacy is continuously revised and adapted as cultural practitioners walk the land and burn. Re-applying their knowledge and observing and discussing the effects, they adapt their ancestral legacy of information and approaches to current circumstances (Rossier and Lake 2014).

Cultural burning is therefore much more than a repository of techniques or a recipe handed down unchanged for countless generations. It is a dynamic system of land stewardship that is intertwined with values and ethics and nourished by the lifelong experiences of practitioners. Additionally, cultural burning is embedded in cultural institutions and social processes without which the knowledge loses meaning. Therefore, while non-Native partners and allies can learn much from their Indigenous counterparts about where to burn, when to burn, and how to burn to produce specific results, cultural burning is not a practice that can be replicated outside its cultural context (Norgaard 2014a). Instead, special consideration is needed to nurture the cultural foundations of a practice rooted in place, community, and Indigenous worldviews.

Workshop leaders Ron Goode and Diana Almendariz emphasized that respect forms the basis of Indigenous peoples’ relationship to fire. In contrast, most Western fire management is based on fear and a command-and-control mentality. Even when fire is used, the primary logic is often to prevent future (unplanned) fires. Diana Almendariz told workshop attendees that portraying fire as bad, catastrophic, or destructive was partly responsible for fire becoming angry. Instead, she and several participants shared



that it is important to use respectful language and attitudes toward fire. Recently, Western fire managers and scientists have echoed this call for a more nuanced relationship to fire (North et al. 2015; Schoennagel et al. 2017).

An Indigenous fire ethic is the basis of traditional fire knowledge systems and includes many intangible aspects, including spiritual and ethical elements that may be overlooked or misunderstood by non-Native people. For example, including traditional fire knowledge in Western management plans and funding applications presents significant challenges, because the latter are not designed to accommodate non-Western values. Yet this fire ethic, widely shared among cultural practitioners, is the cornerstone of Indigenous fire ecologies (Fowler 2013). Today, it serves as a guide for returning fire to the land, even in tribes that have not been able to use cultural burns in recent times. While fire had been absent from the Tending and Gathering Garden for years, the elders were able to recreate an active cultural fire program by following their inherited knowledge and value systems and their connection to the plants and to the land. This example of “indigenuity” –the ability of Indigenous people to adapt their local traditional knowledge to solve novel problems (Wildcat 2009)– shows that Native peoples’ fire ethic is a critical resource that can help guide the revitalization of cultural burning.

Cultural burning practices shift and diversify as practitioners re-apply and adapt their local knowledge over time. This diversity manifests in the use of different protocols by different individuals, families or tribes, as they work to balance numerous objectives, landscape and weather variables, and cultural obligations (Huffman 2013; Trauernicht et al. 2015). Even for the same focal resource, practices can diverge. At the Mariposa workshop, Ron Goode demonstrated detailed methods for burning sourberry shrubs that differed from those employed by Diana Almendariz and the weavers of the Tending and Gathering Garden. This diversity in cultural practices is a fundamental driver of biological diversity (Minnis and Elisens 2000) and presents an opportunity for engagement and joint sense-making. Western scientists and managers hoping to find in traditional fire knowledge an objective, generalizable management approach might be dismayed by this variation. But rather than seeing the diversity in cultural management as a source of confusion or uncertainty, it should instead be valued for its contribution to developing diversified fire ecologies, locally adapted conservation solutions, and cross-cultural meaning.

Workshop leaders and participants highlighted the importance of partnerships that foster respectful cross-cultural dialogue, including collaborations with government agencies and outreach to the public. The Tending and Gathering Garden Stewardship Committee made specific efforts to reach out to neighbors, fire departments and wild-land fire professionals, and site visits were convened prior to the workshop with the local Air Quality Management District to discuss smoke management. Cultural practitioners present at the workshop in Mariposa discussed the importance of Native American contributions to agency firefighting and the need to keep working closely with agencies like CalFire and the US Forest Service. While important cultural differences exist in fire and land management, the emphasis at these events was clearly on finding and growing common ground. Collaborations that respect different cultural perspectives and support Indigenous leadership can make significant contributions to the revitalization of cultural burning. This issue was discussed at length given the

**Table 1.** Examples of ways to support cultural burning.

Entity	Ways to support cultural burning
University researchers	<ul style="list-style-type: none"> <li>• Investigate ecological and policy issues specific to cultural burning (eg. clarify sovereign right to burn; develop models for ethical research practices and data management; identify prescriptions for managing invasive species with fire)</li> <li>• Facilitate collaborative, capacity-building projects focused on cultural burning through Participatory Action Research by undergraduate and graduate students</li> <li>• Support community-based projects designed by Native American students, including ethnographic and archival research on historic cultural burning practices</li> <li>• Through collaborative experimentation, develop ways of adapting cultural burning practices to ecological changes and climate change</li> <li>• Develop models for predicting impact of climate change on cultural species and changes in fire weather and optimal burn windows</li> </ul>
Public land management agencies	<ul style="list-style-type: none"> <li>• Use collaborative agreements to support Tribal access and management on public lands</li> <li>• Create designated cultural management areas for family-based burning</li> <li>• Restore forest structure in these areas to allow for low-severity cultural burns</li> <li>• Co-produce knowledge through adaptive management and monitoring</li> <li>• Return land to tribes</li> </ul>
NGOs, Cooperative Extension	<ul style="list-style-type: none"> <li>• Educate policymakers, land managers and the public to build social license and support partnerships</li> <li>• Conduct educational outreach through pamphlets, signage, films and social media</li> <li>• Create cultural burn demonstration areas managed by Indigenous practitioners</li> <li>• Convene agency and Tribal representatives to facilitate partnership building</li> <li>• Provide support: technical (eg. design of fuel breaks, invasive species management), planning (eg. mapping, decision-support tools), logistical (eg. equipment)</li> <li>• Develop curriculum that includes Indigenous perspectives and culture</li> <li>• Support land restitution efforts and cultural easements that guarantee long-term access and management to cultural resources on private land</li> <li>• Share examples of successful collaborations</li> </ul>
Funding agencies and organizations	<ul style="list-style-type: none"> <li>• Clarify how existing grant opportunities can apply to cultural burning</li> <li>• Change the way grant applications are reviewed to account for the specific parameters of cultural burning (eg. per acre funding may be inadequate for small but culturally meaningful burns)</li> <li>• Prioritize projects that include Tribal leadership and/or meaningful Tribal involvement</li> </ul>
Regulators/policymakers	<ul style="list-style-type: none"> <li>• Address barriers to prescribed burning, including liability concerns, air quality issues, and permitting burden</li> <li>• Learn about and address issues specific to cultural burning</li> <li>• Allocate funding for Indigenous-led forest restoration/fire crews</li> </ul>

diverse roster of workshop participants, which included academic researchers, nonprofit organizations, and representatives of various agencies. These discussions highlighted the many forms such collaborations can take, and the role of non-Native partners in them (examples included in Table 1).

### ***Distinct Social Dimensions of Cultural Burning***

In order for the cultural foundations of Indigenous fire practices to be sustained, the social dynamics that uphold them must be considered. At the two Indigenous Fire Workshops, numerous participants observed the value of having multiple generations

present, from children to elders. Cultural burns serve as a chance to transmit important aspects of Indigenous culture, nourish a community's sense of place and connection to ancestral practices, and exercise Tribal sovereignty in land management. This creates distinct requirements and costs for cultural burning events and programs: funding and assistance may be needed for elders to travel; food and lodging may be needed for some or all attendees; programming may need to be inclusive of families; honoraria may be needed to recognize the time and expertise shared by guest speakers and cultural leaders (these elements were part of the planning for the Indigenous Fire Workshops, and their importance was further reinforced during discussions with collaborative partners and participants). Funding agencies and organizations interested in supporting cultural burning need to account for these considerations because funding and services aimed at Western prescribed burning might leave out these elements that are critical to cultural burn projects. Focusing narrowly on technical support and implementation costs (e.g. per acre cost-sharing programs) without holistically considering the social and cultural needs of practitioners will limit the impact of such programs, and thereby undermine the diverse benefits of cultural burning projects.

Cultural burns that bring together practitioners from different tribes also create opportunities for networking and mentorship. These ties foster the revitalization of cultural burning in a way that is led by Indigenous practitioners and communities themselves. At both workshops, members of multiple tribes discussed their fire knowledge and cultural fire initiatives. Events like prescribed fire training exchanges (Spencer, Schultz, and Hoffman 2015; Marks-Block et al. 2021) organized by the Yurok and Karuk tribes create opportunities to deploy fire for cultural purposes, while enabling Tribal people from across the country to learn about fire from other Indigenous knowledge holders. The preservation and revitalization of cultural fire knowledge and practices depends on the vitality of these intra- and inter-tribal exchanges. University researchers, NGOs and other partners in cultural burning efforts should consider how they can support this process, which is particularly important in this time of accelerated ecological change.

### ***Ecological Degradation and Climate Change***

Cultural fire practitioners contend with challenges including ecosystem fragmentation, invasive species, unprecedented fuel build-up, and climate change. These can complicate their efforts, although practitioners like Ron Goode emphasize that California Indian communities are no strangers to drought or climate shifts given the state's climatic past. However, new adaptations and site preparation techniques are sometimes needed to address invasive species that can't be managed with fire and the accumulation of fuels from lack of burning. In some cases, substantial fuels reduction work is needed before fire can play its ecological and cultural roles again. Support for cultural burning practitioners may involve creating designated management areas that are restored in such a way as to accommodate frequent low-severity burns set by communities, families and individuals.

In many cases, ongoing changes in the landscape require experimentation and inquiry. Research on prescribed burning is limited due to fire ecologists' focus on

wildfires (Hiers et al. 2020), and research on topics relevant to tribes' cultural interests is even sparser (but see, e.g., Long et al. 2017; Marks-Block, Lake, and Curran 2019; Hart-Fredeluces, Ticktin, and Lake 2021; Wynecoop et al. 2019; Hankins 2015; Shebitz, Reichard, and Dunwiddie 2009; Halpern 2016; Rossier 2019). Future collaborative knowledge-building efforts should focus on key cultural resources and indicators (Norgaard and Tripp 2019) as well as management approaches favored by tribes (eg. non-chemical control methods for invasive species). Such experimentation is taking place at the Tending and Gathering Garden, where habitat restoration manager Zack Emerson monitors the growth of native and non-native plants after each cultural burn and reports these findings to a Steering Committee including elders Diana Almendariz and Ardith Read.

## Conclusion

Tribal fire practitioners across North America continue to deploy detailed traditional fire knowledge to improve cultural resources, fulfill their responsibility to care for their ancestral lands, uphold social obligations and maintain spiritual, cultural and emotional connections to the landscape and each other. Their work requires overcoming numerous obstacles ranging from lack of understanding and respect for traditional fire knowledge to confusing permitting processes (Clark, Miller, and Hankins 2021). As agencies, scientists and managers seek to reform fire management, support for prescribed and cultural burning is growing (North et al. 2015; Lake et al. 2018). This interest was evident in the diverse audience at the Indigenous Fire Workshops, which included fire and land management agencies, environmental organizations, climate and fire scientists, historians, archeologists, cooperative extension specialists, foresters, and air quality regulators. These organizations and individuals all have a role to play in revitalizing the practice of cultural burning, which will benefit both Native and non-Native communities (Table 1).

Engaging with tribes is a process that takes time and commitment. Trust-building and face-to-face contact are needed to clarify expectations and for cultural practitioners to know that project partners will respect and protect the knowledge that is shared (Lake et al. 2017). The Keepers of the Flame project was developed over several years prior to the Indigenous Fire Workshops. In its design, we emphasized practical outcomes for the communities we worked with, including contributing physical labor, enhancing planning capacity, and building support for intertribal networking. In addition, we emphasized Tribal leadership and objectives in the project and prioritized direct exchanges among practitioners and community members. In this way, we were able to form a partnership based on reciprocity and respect for traditional knowledges.

Such partnerships also need to recognize that ongoing work to revitalize cultural burning practices takes on different forms from tribe to tribe, and even within a single tribe. In some tribes, the focus is on small-scale family burning to promote subsistence practices. In others, large-scale climate adaptation and forest restoration are the focus. Both of these can be taking place side-by-side within a single tribe (Lake and Christianson 2019). Partners in Tribal collaborations should embrace this variability

**Table 2.** Some characteristics of cultural burning, based on workshop discussions.

Ecological	<ul style="list-style-type: none"> <li>● Focus on renewal and health of cultural species/resources (hazard reduction usually not the primary objective)</li> <li>● Attention to relationships between species and sense of obligation to support the broader ecology (e.g. create food for other species)</li> <li>● Practices vary across tribes and even within tribes, depending on local ecosystems, uses, and cultures</li> <li>● Practitioners return to the site many times to monitor, gather and conduct cultural activities</li> </ul>
Social	<ul style="list-style-type: none"> <li>● Intergenerational learning and familial focus</li> <li>● Health benefits of being on the land, access to First Foods</li> <li>● Nurtures identity, sense of place, and connection to ancestral practices</li> </ul>
Cultural	<ul style="list-style-type: none"> <li>● Connection to language, place names, stories, ceremonies, and other forms of traditional knowledge</li> <li>● Based on an ethic of respect and reciprocity rather than command-and-control</li> <li>● Focus on the process and on cultural practitioners' own relationship with fire and the land (in contrast to outcome-focused burns conducted by a separate professional class)</li> </ul>

that reflects the underlying cultural diversity of Native American tribes and contributes to knowledge building, biological diversity, and social-ecological resilience.

Cultural burning is distinct from Western prescribed burning in several ways: it relies on the unique connection of Indigenous people to their lands and is woven with cultural meaning that anchors peoples' experience and identity; it is a system of knowledge and practice that demands practitioners' direct experience and continuous learning and experimentation; it is underpinned by complex social dynamics foreign to a professionalized fire management approach (Table 2). The cultural and social context of cultural burning is critical to disseminating these lessons and perpetuating values and ethics that give them their meaning. Understanding how the needs of practitioners differ from those of non-Native fire management professionals will help support their work and develop meaningful collaborations, programs and resources that serve the revitalization of this ecological and cultural keystone process.

## Implications

In Indigenous cultures, the use of fire to manage cultural resources and landscapes involves cultural and social elements that may be misunderstood or overlooked by non-Native people. Fire and land managers, funding organizations, and researchers seeking to partner with Indigenous communities need to understand how cultural burning differs from non-Native fire management practices in order to effectively support the work of practitioners. Such projects will benefit from a deeper understanding of the ethics and social dimensions associated with these practices, the unique needs and obstacles faced by those seeking their revitalization, and the existing opportunities for collaborative engagement.

## Acknowledgements

We are deeply grateful to the elders and practitioners who made the Indigenous Fire Workshops possible, including Ardith Read, Dirk Charley, Jesse Valdez, and Danny Manning, and the many guests who contributed to this collective effort. We also thank the UC Davis Department of Plant

Sciences, the Yocha Dehe Wintun Nation Endowed Chair in the Native American Studies Department at UC Davis, the John Muir Institute of the Environment at UC Davis, and the Southwest Climate Adaptation Science Center for multifaceted support.

## ORCID

Christopher Adlam  <http://orcid.org/0000-0002-6537-237X>

Deniss J. Martinez  <http://orcid.org/0000-0001-6502-7130>

## References

- Aldern, J. D., and R. W. Goode. 2014. The Stories Hold Water: Learning and Burning in North Fork Mono Homelands. *Decolonization: Indigeneity, Education & Society* 3 (3), 228. <http://decolonization.org/index.php/des/article/view/21228>.
- Anderson, M. K. 1996. The Ethnobotany of Deergrass, *Muhlenbergia Rigens* (Poaceae): Its uses and fire management by California Indian Tribes. *Economic Botany* 50 (4):409–22. doi: [10.1007/BF02866523](https://doi.org/10.1007/BF02866523).
- Anderson, M. K. 1997. From tillage to table: The indigenous cultivation of geophytes for food in California. *Journal of Ethnobiology* 17 (2):149–69.
- Anderson, M. K. 2005. *Tending the Wild: Native American Knowledge and the Management of California's Natural Resources*. Berkeley: University of California Press.
- Anderson, M. K. 2007. *Indigenous uses, management, and restoration of Oaks of the Far Western United States*. Washington DC, USA: Technical Note, United States Department of Agriculture Natural Resources Conservation Service.
- Bowman, D. M. J. S., C. A. Kolden, J. T. Abatzoglou, F. H. Johnston, G. R. van der Werf, and M. Flannigan. 2020. Vegetation fires in the anthropocene. *Nature Reviews Earth & Environment* 1 (10):500–16. doi: [10.1038/s43017-020-0085-3](https://doi.org/10.1038/s43017-020-0085-3).
- Chilisa, B. 2019. *Indigenous research methodologies*. New York: SAGE Publications.
- Clark, S. A., A. Miller, and D. L. Hankins. 2021. Good fire: Current barriers to the expansion of cultural burning and prescribed fire in California and Recommended Solutions. Karuk Tribe. <https://karuktribeclimatechangeprojects.com/good-fire/>.
- Dolan, D. V., and B. R. Middleton. 2015. Improving tribal collaboration in California's Integrated Regional Water Management Program. *Natural Resources Journal* 55 (2):361–408.
- Eriksen, C., and D. L. Hankins. 2014. The retention, revival, and subjugation of indigenous fire knowledge through agency fire fighting in Eastern Australia and California. *Society & Natural Resources* 27 (12):1288–303. doi: [10.1080/08941920.2014.918226](https://doi.org/10.1080/08941920.2014.918226).
- Fitzwater, D. E. 2021. Fire in the Nisenan Homeland: The politics of traditional ecological knowledge for the Nevada City Rancheria. UCLA. <https://escholarship.org/uc/item/7hx3n4nv>.
- Fowler, C. 2013. *Ignition stories: Indigenous fire ecology in the Indo-Australian Monsoon Zone*. Durham: Carolina Academic Press.
- Goode, R. W., S. Gaughen, M. Fierro, D. L. Hankins, K. Johnson-Reyes, B. R. Middleton, T. Red Owl, and R. Yonemura. 2018. *Summary report from tribal and indigenous communities within California*. California's Fourth Climate Change Assessment. [https://www.energy.ca.gov/sites/default/files/2019-11/Statewide\\_Reports-SUM-CCCA4-2018-010\\_TribalCommunitySummary\\_ADA.pdf](https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-010_TribalCommunitySummary_ADA.pdf)
- Halpern, A. 2016. Prescribed fire and Tanoak (*Notholithocarpus Densiflorus*) associated cultural plant resources of the Karuk and Yurok Peoples of California. <http://escholarship.org/uc/item/02r7x8r6.pdf>.
- Hankins, D. L. 2015. Restoring indigenous prescribed fires to California Oak Woodlands. In: Standiford, Richard B.; Purcell, Kathryn L., tech. cords. Proceedings of the seventh California oak symposium: managing oak woodlands in a dynamic world (pp 123-129). Berkeley, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station.

- Hart-Fredeluces, G. M., T. Ticktin, and F. K. Lake. 2021. Simulated indigenous fire stewardship increases the population growth rate of an Understorey Herb. *Journal of Ecology* 109 (3): 1133–47. doi: [10.1111/1365-2745.13542](https://doi.org/10.1111/1365-2745.13542).
- Hiers, J. K., J. J. O'Brien, J. M. Varner, B. W. Butler, M. Dickinson, J. Furman, M. Gallagher, D. Godwin, S. L. Goodrick, S. M. Hood, et al. 2020. Prescribed fire science: The case for a refined Research Agenda. *Fire Ecology* 16 (1):11. doi: [10.1186/s42408-020-0070-8](https://doi.org/10.1186/s42408-020-0070-8).
- Huffman, M. R. 2013. The many elements of traditional fire knowledge: Synthesis, classification, and aids to cross-cultural problem solving in Fire-Dependent Systems Around the World. *Ecology and Society* 18 (4), 403. doi: [10.5751/ES-05843-180403](https://doi.org/10.5751/ES-05843-180403).
- Kimmerer, R. W., and F. K. Lake. 2001. The role of indigenous burning in land management. *Journal of Forestry* 99 (11):36–41. doi: [10.1093/jof/99.11.36](https://doi.org/10.1093/jof/99.11.36).
- Lake, F. K., and A. C. Christianson. 2019. Indigenous fire stewardship. In *Encyclopedia of Wildfires and Wildland-Urban Interface (WUI) Fires*, edited by Samuel L. Manzello, 1–9. Cham: Springer International Publishing. doi: [10.1007/978-3-319-51727-8\\_225-1](https://doi.org/10.1007/978-3-319-51727-8_225-1).
- Lake, F. K., J. Parrotta, C. Giardina, I. Hunt-Davidson, and Y. Upreti. 2018. Integration of traditional and western knowledge in forest landscape restoration. *Forest Landscape Restoration: Integrated Approaches to Support Effective Implementation 2018*:198–226.
- Lake, F. K., V. Wright, P. Morgan, M. McFadzen, D. McWethy, and C. Stevens-Rumann. 2017. Returning fire to the land: Celebrating traditional knowledge and fire. *Journal of Forestry* 115 (5):343–53. doi: [10.5849/jof.2016-043R2](https://doi.org/10.5849/jof.2016-043R2).
- LeCompte, J. K. 2018. Restoration, risk, and the (Non) Reintroduction of Coast Salish Fire ecologies in Washington State. In *Fire Otherwise: Ethnobiology of Burning for a Changing World*, ed. Cynthia T. Fowler and James R. Welch, 1st ed. Salt Lake City: University of Utah Press.
- Lewis, M., A. Christianson, and M. Spinks. 2018. Return to flame: Reasons for burning in Lytton First Nation, British Columbia. *Journal of Forestry* 116 (2):143–50. doi: [10.1093/jofore/fvx007](https://doi.org/10.1093/jofore/fvx007).
- Long, J. W., R. W. Goode, R. J. Gutteriez, J. J. Lackey, and M. K. Anderson. 2017. Managing California Black Oak for tribal ecocultural restoration. *Journal of Forestry* 115 (5):426–34. doi: [10.5849/jof.16-033](https://doi.org/10.5849/jof.16-033).
- Long, J. W., R. W. Goode, and F. K. Lake. 2020. Recentering ecological restoration with tribal perspectives. *Fremontia* 48 (1):14–9.
- Long, J. W., F. K. Lake, R. W. Goode, and B. M. Burnette. 2020. How traditional tribal perspectives influence ecosystem restoration. *Ecopsychology* 12 (2):71–82. doi: [10.1089/eco.2019.0055](https://doi.org/10.1089/eco.2019.0055).
- Marks-Block, T., F. K. Lake, R. Bliege Bird, and L. M. Curran. 2021. Revitalized Karuk and Yurok cultural burning to enhance California Hazelnut for Basketweaving in Northwestern California, USA. *Fire Ecology* 17 (1):6. doi: [10.1186/s42408-021-00092-6](https://doi.org/10.1186/s42408-021-00092-6).
- Marks-Block, T., F. K. Lake, and L. M. Curran. 2019. Effects of understory fire management treatments on California Hazelnut, an ecocultural resource of the Karuk and Yurok Indians in the Pacific Northwest. *Forest Ecology and Management* 450 (October):117517. doi: [10.1016/j.foreco.2019.117517](https://doi.org/10.1016/j.foreco.2019.117517).
- Marks-Block, T., and W. Tripp. 2021. Facilitating prescribed fire in Northern California through Indigenous Governance and interagency partnerships. *Fire* 4 (3):37. doi: [10.3390/fire4030037](https://doi.org/10.3390/fire4030037).
- Mason, L., G. White, G. Morishima, E. Alvarado, L. Andrew, F. Clark, M. Durglo, J. Durglo, J. Eneas, J. Erickson, et al. 2012. Listening and learning from traditional knowledge and Western Science: A dialogue on contemporary challenges of forest health and wildfire. *Journal of Forestry* 110 (4):187–93. doi: [10.5849/jof.11-006](https://doi.org/10.5849/jof.11-006).
- Middleton, B. R. 2011. Partnerships for native land management: Cache Creek Conservancy Tending and Gathering Garden (California). In *Trust in the Land: New Directions in Tribal Conservation*. Tucson: University of Arizona Press.
- Minnis, Paul E., and W. J. Elisens. 2000. *Biodiversity & Native America*. Norman: University of Oklahoma Press.
- Moreira, F., D. Ascoli, H. Safford, M. A. Adams, J. M. Moreno, J. M. C. Pereira, F. X. Catry, J. Armesto, W. Bond, M. E. González, et al. 2020. Wildfire management in mediterranean-type regions: Paradigm change needed. *Environmental Research Letters* 15 (1):011001. doi: [10.1088/1748-9326/ab541e](https://doi.org/10.1088/1748-9326/ab541e).

- Norgaard, K. M. 2014a. Retaining knowledge sovereignty: Practical steps towards expanding the application of Karuk Traditional knowledge in the face of climate change. Karuk Tribe. <https://karuktribeclimatechangeprojects.wordpress.com/retaining-knowledge-sovereignty/>.
- Norgaard, K. M. 2014b. The politics of fire and the social impacts of fire exclusion on the Klamath. *Humboldt Journal of Social Relations* 36:77–101.
- Norgaard, K. M. 2019. *Salmon and acorns feed our people: Colonialism, nature, and social action*. New Brunswick: Rutgers University Press.
- Norgaard, K. M., and R. Reed. 2017. Emotional impacts of environmental decline: What can native cosmologies teach sociology about emotions and environmental justice? *Theory and Society* 46 (6):463–33. doi: [10.1007/s11186-017-9302-6](https://doi.org/10.1007/s11186-017-9302-6).
- Norgaard, K. M., and B. Tripp. 2019. *Karuk climate adaptation plan*. Orleans: Karuk Tribe Department of Natural Resources.
- North, M. P., S. L. Stephens, B. M. Collins, J. K. Agee, G. Aplet, J. F. Franklin, and P. Z. Fulé. 2015. Environmental science. Reform forest fire management. *Science* 349 (6254):1280–1. doi: [10.1126/science.aab2356](https://doi.org/10.1126/science.aab2356).
- Roos, C. I., T. W. Swetnam, T. J. Ferguson, M. J. Liebmann, R. A. Loehman, J. R. Welch, E. Q. Margolis, C. H. Guiterman, W. C. Hockaday, M. J. Aiuvalasit, et al. 2021. Native American fire management at an ancient Wildland–Urban Interface in the Southwest United States. *Proceedings of the National Academy of Sciences* 118 (4):e2018733118. doi: [10.1073/pnas.2018733118](https://doi.org/10.1073/pnas.2018733118).
- Ross, J., S. Brawley, J. Lowrey, and D. L. Hankins. 2008. Creating common ground: A collaborative approach to environmental reclamation and cultural preservation. In *Partnerships for Empowerment: Participatory Research for Community-Based Natural Resource Management*, 105–26. London, UK: Earthscan.
- Rossier, C. E. 2019. Forests, fire, and food: Integrating indigenous and Western Sciences to Revitalize Evergreen Huckleberries (*Vaccinium Ovatum*) and enhance socio-ecological resilience in collaboration with Karuk, Yurok, and Hupa People. PhD Thesis., University of California, Davis.
- Rossier, C. E., and F. Lake. 2014. *Indigenous Traditional Ecological Knowledge in Agroforestry*. Agroforestry Note 44, General 14. U.S. Department of Agriculture, Forest Service, Washington Office Research and Development, National Agroforestry Center and U.S. Department of Agriculture, Natural Resource Conservation Service. <http://www.treearch.fs.fed.us/pubs/47452>.
- Schoennagel, T., J. K. Balch, H. Brenkert-Smith, P. E. Dennison, B. J. Harvey, M. A. Krawchuk, N. Mietkiewicz, P. Morgan, M. A. Moritz, R. Rasker, et al. 2017. Adapt to more wildfire in Western North American Forests as Climate Changes. *Proceedings of the National Academy of Sciences of the United States of America* 114 (18):4582–90. doi: [10.1073/pnas.1617464114](https://doi.org/10.1073/pnas.1617464114).
- Schultz, Courtney A., Sarah M. McCaffrey, Heidi R. Huber-Stearns, C. A. Schultz, Sarah M. McCaffrey, and H. R. Huber-Stearns. 2019. Policy barriers and opportunities for prescribed fire application in the Western United States. *International Journal of Wildland Fire* 28 (11): 874–84. doi: [10.1071/WF19040](https://doi.org/10.1071/WF19040).
- Shebitz, D. J., S. H. Reichard, and P. W. Dunwiddie. 2009. Ecological and cultural significance of burning Beargrass Habitat on the Olympic Peninsula, Washington. *Ecological Restoration* 27 (3):306–19. doi: [10.3368/er.27.3.306](https://doi.org/10.3368/er.27.3.306).
- Smith, L. T. 1999. *Decolonizing methodologies: Research and indigenous peoples*. New York: Zed Books Ltd.
- Sowerwine, J., M. Mucioki, D. Sarna-Wojcicki, and L. Hillman. 2019. Reframing food security by and for native American Communities: A case study among tribes in the Klamath River Basin of Oregon and California. *Food Security* 11 (3):579–607. doi: [10.1007/s12571-019-00925-y](https://doi.org/10.1007/s12571-019-00925-y).
- Spencer, A. G., C. A. Schultz, and C. M. Hoffman. 2015. Enhancing adaptive capacity for restoring fire-dependent ecosystems: The fire learning network's prescribed fire training exchanges. *Ecology and Society* 20 (3):38. doi: [10.5751/ES-07847-200338](https://doi.org/10.5751/ES-07847-200338).
- Taylor, A. H., V. Trouet, C. N. Skinner, and S. Stephens. 2016. Socioecological transitions trigger fire regime shifts and modulate fire-climate interactions in the Sierra Nevada, USA, 1600–2015



- CE. *Proceedings of the National Academy of Sciences* 113 (48):13684–9. doi: [10.1073/pnas.1609775113](https://doi.org/10.1073/pnas.1609775113).
- Trauernicht, C., B. W. Brook, B. P. Murphy, G. J. Williamson, and D. M. J. S. Bowman. 2015. Local and global pyrogeographic evidence that indigenous fire management creates pyrodiversity. *Ecology and Evolution* 5 (9):1908–18. doi: [10.1002/ece3.1494](https://doi.org/10.1002/ece3.1494).
- Turner, N. J., D. Deur, and C. R. Mellott. 2011. Up on the mountain': Ethnobotanical importance of montane sites in Pacific Coastal North America. *Journal of Ethnobiology* 31 (1):4–43. doi: [10.2993/0278-0771-31.1.4](https://doi.org/10.2993/0278-0771-31.1.4).
- White, C. A., D. D. B. Perrakis, V. G. Kafka, and T. Ennis. 2011. Burning at the edge: Integrating biophysical and eco-cultural fire processes in Canada's Parks and Protected Areas. *Fire Ecology* 7 (1):74–106. doi: [10.4996/fireecology.0701074](https://doi.org/10.4996/fireecology.0701074).
- Wildcat, D. 2009. *Red alert: Saving the planet with indigenous knowledge*. Golden: Fulcrum Publishing.
- Wires, K. N., and J. LaRose. 2019. Sogorea Te land trust and indigenous food sovereignty in the San Francisco Bay Area. *Journal of Agriculture, Food Systems, and Community Development* 9 (B):1–4. doi: [10.5304/jafscd.2019.09B.003](https://doi.org/10.5304/jafscd.2019.09B.003).
- Wynecoop, M. D., P. Morgan, E. K. Strand, and F. Sanchez Trigueros. 2019. Getting back to fire Sumés: Exploring a multi-disciplinary approach to incorporating traditional knowledge into fuels treatments. *Fire Ecology* 15 (1):17. doi: [10.1186/s42408-019-0030-3](https://doi.org/10.1186/s42408-019-0030-3).
- Yazzie, M. K., and C. R. Baldy. 2018. *Introduction: Indigenous peoples and the politics of water*. Decolonization: Indigeneity, Education & Society. 7 (1):1-18. <https://jps.library.utoronto.ca/index.php/des/article/view/30378/23031>
- Zedler, J. B., and M. L. Stevens. 2018. Western and traditional ecological knowledge in ecocultural restoration. *San Francisco Estuary and Watershed Science* 16 (3), 7463cf. <https://escholarship.org/uc/item/8p7463cf>. doi: [10.15447/sfew.2018v16iss3art2](https://doi.org/10.15447/sfew.2018v16iss3art2).