THESIS

UNDERSTANDING FOREST RECOVERY PRIORITIES, MANAGEMENT OPTIONS, AND POLICY NEEDS FOR TRIBES IN POST-FIRE LANDSCAPES

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ABSTRACT

UNDERSTANDING FOREST RECOVERY PRIORITIES, MANAGEMENT OPTIONS, AND POLICY NEEDS FOR TRIBES IN POST-FIRE LANDSCAPES

With the significant surge in severity and scope of wildfires across the Western United States, addressing post-fire recovery is emerging as a critical challenge in adapting to the changing climate. Increased occurrences of drought, rising temperatures, and prolonged fire seasons, particularly in Indigenous and rural communities, highlight the urgent need for post-fire recovery and wildfire mitigation strategies on a large scale. Federal post-wildfire recovery and response programs such as Burned Area Emergency Response (BAER), Burned Area Rehabilitation (BAR), Emergency Watershed Protection Program (EWP), Federal Emergency Management Agency (FEMA) Post-fire Hazard Mitigation Grant (HMG), and Reserved Treaty Rights Lands Program (RTRL) often pose challenges for Indigenous communities impacted by wildfires. Challenges include differences in landscape recovery priorities, funds, and limited coverage on Tribal lands. Reevaluation of current federal fire management is needed to address these disparities. In this thesis, I explore recovery priorities and management options to foster an understanding of policy needs for Indigenous communities in post-fire landscapes.

My thesis research is part of a larger project with the United States Geological Survey's (USGS) Southwest Climate Adaptation Science Center (SWCASC). The significance of this research is grounded in the recognition that, since time immemorial, Indigenous communities worldwide have utilized fire as an ecological resource to tend to their land (Lake & Christianson, 2020; Nikolakis and Roberts, 2020; Norgaard, 2019; Roos et al., 2022). Colonization disrupted

Indigenous land stewardship practices and criminalized Indigenous lifeways (Avalos, 2023; Farrell et al., 2021; Norgaard, 2019; Whyte, 2018). Existing research on federal fire management highlights the exclusion of fire from the land as a key factor in the rise of severe wildfires (Calkin et al., 2015; Doerr et al., 2016; Schweizer et al., 2019; Vinyeta, 2015). Nonetheless, there is limited research on post-wildfire policies and governance, particularly concerning Indigenous communities and Tribal Nations that are most affected (Christianson, 2015 and Lake et al., 2017). Post-fire is a critical time because of both the tremendous effects on ecocultural value and the opportunity to reconsider management approaches that align with Tribes' priorities.

For this thesis, I report on my work conducting a qualitative case study with the Karuk Tribe, using semi-structured interviews to achieve the following research objectives: (1) identify key wildfire recovery goals tailored explicitly to the Karuk Tribe; (2) explore management alternatives aligned with Tribal priorities while outlining current postfire governance structures affecting their communities; and (3) identify policy and governance system obstacles and facilitators. I utilized literature on Indigenous and settler colonial fire management, and Indigenous knowledge systems (IKS) centered around fire stewardship to guide my findings and add to the scholarly body of knowledge.

My thesis includes three chapters: (1) an introduction to my research and review of relevant literature, (2) a manuscript for a peer-reviewed journal that stems from my research, and (3) a conclusion, summarizing findings, discussing study limitations, and outlining future research directions.

Chapter One introduces the research study and highlights the histories of federal fire management and Indigenous fire stewardship in the United States, as well as Indigenous

Knowledge Systems (IKS) and exchange. Chapter Two is a written product that addresses forest recovery priorities, management options, and policy needs for Tribes in post-fire landscapes. This research was developed with the Karuk Department of Natural Resources (DNR) to focus on their recovery efforts following the 2020 Slater Fire. The Karuk Tribe views post-fire landscapes as opportunities for government-to-government collaboration to reintroduce cultural burning to the land, rather than excluding it. Participants described the benefits of intentional, low-intensity fire in mitigating catastrophic wildfires and protecting local communities and ecosystems. They also highlighted bureaucratic barriers to restoring fire practices, noting that these obstacles perpetuate harm and fuel high-intensity wildfires. In collaboration with the Karuk Tribe, we designed and adjusted our data collection. Findings were shared and verified with the community and interviewees before publication, per an approved Institutional Review Board (IRB) protocol and the Tribe's research agreements with us, allowing for tribal ownership of data and authority over how the data are utilized and how the Tribes are represented in our research products. At the time of this writing, this process is still in progress. Chapter Three offers' reflections on the research process, limitations, and future research directions.

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LIST OF ACRONYMS

AB642 - Assembly Bill 642

BAER - Burned Area Emergency Response

BAR - Burned Area Rehabilitation

BIL - Bipartisan Infrastructure Law

CFLRP - Collaborative Forest Landscape Restoration Program

CSU - Colorado State University

DNR - Department of Natural Resources

DOA - Department of Agriculture

DOI - Department of the Interior

FEMA - Federal Emergency Management Agency

FMAG - Fire Management Assistance Grant

GNA - Good Neighbor Authority

HFI - Healthy Forests Initiative

HFRA - Healthy Forests Restoration Act

IKS – Indigenous Knowledge System(s)

IRB - Institutional Review Board

ISAP - Incident Strategic Alignment Process

ISDEAA - Indian Self-Determination and Education Assistance Act

KFES - Karuk Fire Ecology Symposium

NEPA - National Environmental Policy Act

NFP - National Fire Plan

NFMA - National Forest Management Act

RTRL - Reserved Treaty Rights Lands

SB310 - Senate Bill 310

SB322 - Senate Bill 322

SB926 - Senate Bill 926

Stafford Act - Robert T. Stafford Disaster Relief and Emergency Assistance Act

STACC - Status of Tribes and Climate Change

SWCASC - Southwest Climate Adaptation Science

TFPA - Tribal Forest Protection Act

TREX - In-Fire Training Exchange

USGS - United States Geological Survey

CHAPTER ONE: INTRODUCTION

With the significant surge in severity and scope of wildfires across the Western United States, post-fire recovery is emerging as a critical challenge. To address this concern, understanding post-fire impacts on communities is vital for equitable decision-making, particularly for rural and Indigenous populations who often bear the brunt of these consequences (Palaiologou et al., 2019). Current post-fire recovery programs are federally organized and led, often overlooking the priorities of Tribal and Indigenous Peoples, which differ significantly from those of federal agencies and non-Indigenous people and communities (Blumm & Pennock, 2022; Maldonado et al., 2016). Revaluating current federal fire management practices is necessary to address post-fire disparities, especially given their deep-seated roots in a settler-colonial foundation (Vinyeta, 2021).

Building on this awareness, there is growing recognition that post-fire management must be fundamentally rethought. Guidance from Indigenous Knowledge Systems (IKS) has increasingly emerged as a national priority in the fire management community and under recent presidential administrations (Long and Lake 2018; OSTP-CEQ, 2022). In this thesis, IKS is recognized as based on centuries of observations, lived experiences, and deep relationships with the land that are unique to specific peoples and places. Recent federal advances to support IKS include White House Memos and Executive Orders (Office of Science and Technology Policy & Council on Environmental Quality, 2022 and Executive Order No. 13175, 2000). Specific to land management, other policies such as the Collaborative Forest Landscape Restoration Program (CFLRP) and Tribal Forest Protection Act (TFPA)/638 project authority aim to involve Tribal Nations throughout decision-making and proposed projects (see U.S. Forest Service 2024; Intertribal Timber Council & U.S. Forest Service, 2020). Yet, the United States Government

Accountability Office's (GAO, 2024) recommended solutions to address inefficiencies in post-fire management fail to mention Indigenous populations and land acknowledgement. The growing interest in IKS must be matched by a genuine commitment to support Indigenous rights and sovereignty (McGregor, 2004).

This research aimed to address gaps in policy and the existing literature by drawing on unique IKS concerning fire stewardship to help assess wildfire impacts and address recovery priorities. Indigenous Peoples across the globe have utilized fire as an ecological tool since time immemorial (Lake & Christianson, 2020; Nikolakis & Roberts, 2020; Roos et al., 2022). This practice is based on a multigenerational reciprocal relationship with the land. These fire practices are essential for food security, habitat management, and cultural continuity, shaping landscapes that support human and ecological resilience (Adams, 2015; Norgaard, 2019). However, with the onset of European colonization and settler expansion, fire was increasingly viewed as destructive rather than regenerative. Federal policies and suppression tactics criminalized cultural burning, (i.e., the intentional application of fire to the land by an Indigenous person or cultural group [e.g., family unit, Tribe, clan/moiety, or society] to achieve cultural goals or objectives and based in Tribal or Traditional Indigenous law) (Clark et al., 2024), disrupting Indigenous peoples' relationships with the land. As a result, fire was largely removed from many landscapes, leading to a buildup of fuels, ecosystem shifts, and creating conditions optimal for high-severity wildfires.

This research is also part of a larger project with the United States Geological Survey's (USGS) Southwest Climate Adaptation Science Center (SWCASC) and was conducted in collaboration with the Karuk Department of Natural Resources (DNR). It intends to address deficiencies in policy and existing literature through the following research objectives: (1)

identify key wildfire recovery goals, (2) explore management alternatives that align with priorities and detail current postfire governance structures affecting their communities, and (3) identify policy and broader governance system obstacles and facilitating factors.

This research is intended to inform federal agencies and offer tribal communities an opportunity to reflect and strengthen ongoing efforts to revitalize traditional stewardship practices, as exemplified by the Karuk Tribe. This is critical as federal agencies need to understand and support the role of IKS and governance in land stewardship and post-fire recovery. These systems cannot be implemented ethically or effectively without the leadership and authority of Indigenous peoples themselves, under their unique laws, traditions, and worldviews.

2. Literature Review

I proceed with a literature review of federal fire management and Indigenous fire stewardship in the United States (U.S), specifically focusing on post-fire policies, situating this research within a broader historical context. Then I explore IKS, their nature, importance to Indigenous communities, and opportunities for knowledge exchange with non-Indigenous partners, particularly within the realm of post-fire policy frameworks, which highlight why this work is both timely and significant.

2.1 Federal Fire Management and Indigenous Fire Stewardship in the United States (U.S.)

Wildfires have intensified globally in recent years, resulting in profound post-fire impacts on local communities and, sometimes, devastating effects on the landscape, water quality, and

human health (Paul et al., 2022; Angelo, 2023). Addressing these impacts is essential in the context of climate change, which has caused an increase in wildfire season length, frequency, and the amount of land burned (EPA 2022). The severity of recent wildfires leads to the release of harmful air pollutants such as Particulate Matter 2.5 (P.M 2.5), Nitrogen Dioxide (NO2), ozone, hydrocarbons, and even lead, damaging air quality and impacting health (WHO, 2024). High-intensity wildfires often result in loss of housing, infrastructure damage, and soil degradation and hydrophobicity, (i.e., when molecules repel water), causing runoff and erosion that can lead to severe flooding and debris flows within local areas (Moody et al., 2013). Post-fire management is a complex challenge that requires examining and reevaluating U.S. federal fire policy.

Recent studies have identified fire suppression in the U.S. as a major cause of today's extreme wildfires due to accumulation of fuels such as dry vegetation, dead wood, and leaf litter (Calkin et al., 2015; Schweizer et al., 2019; Steel et al., 2015; Stephens & Ruth, 2005). U.S. fire management and policies mandating suppression of all wildfires can be traced back to 1886 (Stephens & Ruth, 2005). The U.S. Army was responsible for fire suppression until 1916, when control was transferred to the U.S Forest Service, where fire suppression was the main objective for successful forestry (Stephens & Ruth, 2005). As a result, fires were aggressively extinguished rather than allowed to burn for ecological benefits, creating an era of fire exclusion. This has led to an unnatural buildup of flammable material across many landscapes, fueling wildfires to be more intense, destructive, and difficult to control when they do occur.

While current wildfire behavior is often attributed to U.S. fire suppression policies and climate change, its origins can be attributed to the forced removal of Indigenous peoples from their homelands and the disruption of their land stewardship practices (Farrell et al., 2021;

Whyte, 2017). Since time immemorial, Indigenous communities across the globe have used fire intentionally to shape and sustain their environments through practices such as cultural burning to reduce hazardous fuels and promote the growth of essential plant species used for food, medicine, and ceremony (Lake & Christianson, 2020; Nikolakis & Roberts, 2020; Norgaard, 2019; Roos et al., 2022). In what is now called the U.S., westward expansion was driven by the ideology of Manifest Destiny, which relied on violence and the dispossession of Indigenous Peoples to seize lands and resources (Stephanson, 1996). During this period of genocide, forced assimilation, and Indian removal (see Dunbar-Ortiz, 2023; Bose, 2014), federal fire suppression authorities prevented and criminalized Indigenous burning practices, going so far as to issue warrants against those who engaged in traditional fire stewardship (Norgaard, 2019). This hostility is portrayed in a statement by Orleans District Ranger F.W. Harley, who targeted Indigenous peoples in Northern California, particularly the Karuk Tribe: "some set fires out of pure cussedness… the only way is to kill them off… every time you catch one sneaking around in the brush like a coyote shoot at them." (Harley, 1918, p. 22)

Early U.S. policy initiatives expanded the government's land and fire management authority, further displacing Indigenous Peoples and disrupting stewardship practices (Stephens & Ruth, 2005). Policies such as the 1905 Forest Transfer Act and the 1911 Weeks Act expanded the U.S. government's role in fire management nationwide (Bramwell, 2012). The 1905 Forest Transfer Act reassigned forest management from the Department of the Interior (DOI) to the Department of Agriculture (DOA), placing it under the jurisdiction of the U.S. Forest Service (16 U.S.C. 472). The 1911 Weeks Act further empowered the agency by authorizing the U.S. government to acquire forested and degraded lands within key watersheds and enter cooperative

agreements with state and private landowners, creating a fire suppression-oriented approach to wildfire management across the U.S. (Bramwell, 2012).

Originating with the U.S. Army, fire suppression efforts eventually evolved into a militarized system that effectively altered landscapes Indigenous Peoples depend on and have long stewarded (Stephens & Ruth, 2005). These efforts included introducing aerial attacks like water bombing and fire-retardant drops. The U.S. Forest Service used dichloro-diphenyl-trichloroethane (DDT) for vegetation and insect control in the interest of timber and fire protection qualities, altering local food resources and contributing to health issues such as miscarriages and birth defects in Indigenous populations (Norgaard, 2019). Reflecting on the impact, a member of the California Indian Basketweavers Association highlighted the concerning lack of consideration for traditional lifestyles in the use of chemicals:

> They're spraying about 100,000 pounds of this (DDT) in the country every year, and there is no drinking water safety limit. It is just totally under the radar for the Safe Drinking Water Act. The issue about it not being registered for use on food crops, when there are people getting food plants out of the forest is pretty disturbing, too. That is just one way that the traditional lifestyles aren't being taken into account when they register these chemicals (Norgaard, 2019, p.107).

The impacts of U.S. fire management extend beyond ecological concerns and food resources, deeply affecting cultural resources and community safety. Sacred sites have been subject to damage from federal fire operations, such as the construction of watch towers and the creation of fire lines, and restrictions on access to ceremonial areas (Norgaard, 2019). In post-fire contexts, sacred sites and culturally significant species have been further damaged by increased erosion and catastrophic wildfire, threatening communities and culture (Haring et al., 2021). In

addition, the suppression of low-intensity burns has led to the decline of fire-adapted plant species essential for cultural resources such as basketry material. Without regular fire, these plants become brittle, crooked, and unsuitable for use, contributing to a loss of cultural knowledge and materials (Norgaard, 2019). The buildup of dry, unburned vegetation degrades plant quality and increases wildfire risk for communities living in fire-prone regions (Anderson, 2006). The destruction of sacred areas and traditional materials results in lost opportunities to practice and pass down cultural lifeways, causing intergenerational impacts and further cultural loss (Haring, 2021).

The consequences of U.S. fire management have brought increased attention to the harmful effects of fire exclusion, including ecological degradation, increased wildfire severity, and community vulnerability (Burr, 2013; Lake et al., 2017; Norgaard, 2014; Steel et al., 2015; Stephens et al., 2016). Beginning with the 1995 Federal Wildland Fire Management Policy, federal agencies acknowledged the ecological benefits of fire and promoted the use of prescribed burns for fuel reduction (USDA, 1995). However, this policy shift was largely rhetorical; in practice, fire exclusion remained dominant. Subsequent policies such as the Healthy Forests Initiative (HFI), the National Fire Plan (NFP), and the Healthy Forests Restoration Act (HFRA) sought to accelerate forest thinning and restoration. However, these programs often struggled to meet their goals due to administrative and financial constraints (Stephens & Ruth, 2005). Researchers have suggested that HFRA weakened environmental oversight by reducing requirements under the National Environmental Policy Act (NEPA), diminishing public trust, and increasing fire suppression costs, ultimately diverting funding away from proactive, community-supported fuel reduction efforts (Schultz, Thompson, & McCaffery, 2019).

U.S. fire management strategies have historically prioritized economic development and land exploitation, particularly through the timber industry, over ecological health and community well-being, exacerbating wildfire risk, especially for Indigenous and Tribal communities (Palaiologou et al., 2019). During the era of U.S. expansion and fire suppression, ancestral territories were also converted into timber plantations on National Forest lands that fueled settler-colonial expansion and generated profit, another disruption of Indigenous land stewardship practices and ecological balance (Curtis, 2022). These plantations, often composed of densely packed, fire-prone tree species, increased fuel loads on the landscape, compounding the risks associated with fire suppression. In addition, many Indigenous communities were forcibly relocated to remote, rural areas that are now especially vulnerable to drought and extreme heat (Bose, 2014; Farrell et al., 2021). These challenges are further intensified by chronic disparities in funding and resources for fire mitigation, which restrict Indigenous communities' capacity to prepare for, respond to, and recover from wildfires (Palaiologou et al., 2019).

Studies investigating U.S. fire management have identified major discrepancies in the allocation of resources between fire suppression and fuels reduction, ultimately supporting a reactive rather than proactive approach to fire management. As North et al. note, "fire suppression is steadfastly financed through dedicated congressional appropriations, which are augmented with emergency funding, whereas fuels reduction and prescribed burning costs come out of a limited budget allotted to each National Forest and are often borrowed to cover wildfire suppression costs" (2015, p. 1281). While fire suppression is enforced and heavily funded, proactive treatments such as prescribed burning are frequently underfunded and delayed; the budgets are often reallocated to combat increasingly frequent and severe wildfires. This cycle

prevents meaningful fuels reduction, allowing hazardous buildup to persist and grow between fire seasons (Stephens & Ruth, 2005). A lack of consistent investment in proactive and ecologically focused fire management is compounded by minimal post-fire evaluation, where long-term ecological health is often overlooked in favor of short-term risk mitigation (Schultz, Thompson, & McCaffery, 2019). This reactive framework disproportionately impacts Indigenous ancestral territories, where cultural heritage and place-based knowledge are frequently disregarded to streamline firefighting logistics (Eriksen & Hankins, 2014). This approach reflects what Gsottbauer and van den Bergh (2010) describe as "bounded rationality," where decision-making is shaped by selective attention to information and short-term goals, ultimately serving individual interests rather than collective, community-based outcomes.

These ongoing policy inefficiencies eventually led to the creation of more collaborative efforts. like the Collaborative Forest Landscape Restoration Program (CFLRP) in 2009, which aims to involve local rights-holders, including Tribal Nations, throughout the planning and implementation of forest management projects (Schultz, 2012). The program encourages tribal involvement in landscape restoration efforts and offers opportunities for co-management and space for Indigenous knowledge in forest and fire planning. However, the degree to which Tribal voices are meaningfully listened to still varies across projects, highlighting the need for continued attention to sovereignty, consent, and equitable participation in land management (Clark et al., 2024)

Current post-fire recovery policies in the U.S. often overlook the specific needs of Tribal Nations, highlighting the need for stronger collaboration and support. (Blumm & Pennock, 2022; Maldonado et al., 2016). Two key federal post-fire initiatives that extend to Tribal lands include the Burned Area Emergency Response (BAER) program, which addresses immediate threats to

life, property, and critical natural and cultural resources following a wildfire (Napper, 2006), and the Burned Area Rehabilitation (BAR) program, which addresses post-fire landscapes "unlikely to recover without human intervention" (U.S G.P.O, 2005). Other federal efforts include the Emergency Watershed Protection Program, which focuses on stabilizing burned watersheds to minimize erosion and flooding risks (USDA, 2007), as well as USFS reforestation policies aimed at restoring forested landscapes damaged by wildfires (USDA, 2022). The Bureau of Indian Affair's Reserved Treaty Rights Lands (RTRL) program is a recent initiative that funds collaborative projects (including post-fire projects) between American Indian tribes, Alaska Natives, and other landowners (federal, state, private, and others) to improve the health and resilience of priority Tribal natural resources at high risk of wildland fire (Russel et al., 2021). The Federal Emergency Management Agency's (FEMA) Post-fire Hazard Mitigation Grant program aims to implement hazard mitigation measures following wildfire disasters in areas that receive a Fire Management Assistance Grant (FMAG) declaration (FEMA, 2020). However, challenges occur when federal and Tribal priorities differ, such as using foreign materials (concrete, cement, heavy machinery, invasive species planting) into the area that impact cultural resources (Curtis, 2022; Haring et al., 2021). Other challenges include under allocating funds, limited coverage on Tribal trust lands (i.e land parcel held by one party for the benefit of another), and limited resources for Tribal crews (Russell et al., 2021).

Policy initiatives centered on genuine collaboration are increasingly recognized as essential to creating more just and effective fire management systems in the U.S., particularly for Indigenous and Tribal communities. While collaboration broadly refers to cooperative efforts toward shared goals, co-management is a relatively new and more formalized approach that establishes shared responsibility, authority, and decision-making between Tribal Nations and

federal or state agencies (Blumm & Pennock, 2022; Burr, 2013). This shift is especially critical for recognizing Tribal sovereignty and ensuring that Indigenous Knowledge Systems (IKS) are welcomed in U.S. land and fire management. The Karuk Tribe exemplifies this through their leadership efforts to restore cultural burning practices and advance nature-based solutions rooted in IKS in federal and state agency spaces (Clark et al., 2024; Greenler et al., 2024; Haring et al., 2021). These efforts demonstrate how collaborative, co-management, and co-stewardship approaches can begin to heal relationships between people and place, offering a pathway to address longstanding disparities in wildfire response and recovery, disparities rooted in historical policies that excluded Indigenous fire stewardship and contributed to today's wildfire crisis.

2.2 Indigenous Knowledge Systems (IKS) and Exchange

The worldviews of individuals and societies often shape the policies and practices they follow. Worldviews refer to the unique values and beliefs that influence how people interpret the world and their relationship to it. In many governance systems, settler-colonial worldviews shape societal objectives and practices, typically reflecting the values and priorities of those in power. In settler colonial countries such as the Unites States, Canada, Australia and New Zealand, this often means settler worldviews are imposed on Indigenous peoples. Differences in worldview manifest as various challenges across management systems, including the dismissal of diverse perspectives, the exclusion of knowledge systems, and tensions between diverse ways of knowing, often resulting in unequal distribution of benefits (David-Chavez & Gavin, 2018; Smith et al., 2021; Wehrheim, 2023). Current governance systems in the U.S. fail to navigate the complexities of cross-jurisdictional land management and diverse worldview frameworks, while actively privileging settler worldviews as a means of legitimizing ongoing possession of stolen

Indigenous land. In this context, Indigenous Knowledge Systems are not merely alternative perspectives; they are treated as threats to the very foundations of settler colonial authority and land claims (Beggs & Dalley, 2023).

In the post-fire response and recovery context, a dominant settler colonial worldview shapes strategies across multiple land jurisdictions. These approaches prioritize property protection and land monetization over place-based stewardship (Curtis, 2022). This strategy alters landscapes Indigenous and Tribal communities rely on and contributes to the loss of knowledge that guides their lifeways. Although Indigenous communities, Tribal Nations, and research institutions continue to document governance failures and call for greater accountability, the absence of shared authority in decision-making prevents meaningful reform without the inclusion of diverse worldviews, post-fire recovery risks repeating the very patterns that have fueled today's wildfire crises (Tengö et al., 2014; Urzedo & Robinson, 2023).

Prior to European settlement, various Indigenous Knowledge Systems (IKS) guided the stewardship of ecosystems across what is now called North America (Cajete, 2004; Christianson, 2015; Lake et al., 2017; McGregor, 2004). IKS are place-based and vary across Indigenous communities, reflecting unique relationships to land, culturally significant species, and local ecosystems (Whyte, 2017). Although IKS are unique to people and place, these knowledge systems commonly prioritize ecological balance and generational health of both human and nonhuman communities (Kimmerer, 2018 and Whyte, 2017, 2018). IKS emphasize responsibility rather than ownership, where each human has a role in maintaining the land (Kimmerer, 2013). Historically, this approach understood fire and carefully used it to promote biodiversity, reduce fuels, and support the regeneration of culturally significant species (Christianson, 2015; Lake et al., 2017; Long & Lake, 2018; Norgaard, 2019; Whyte, 2017). As a

result, wildfires were less destructive because people fulfilled their responsibilities to the land (Curtis, 2022). The colonial systems that replaced these frameworks disrupted stewardship practices and responsibilities.

Currently, many U.S. agencies lack clear frameworks or administrative structures to ethically support and engage with Indigenous communities and Tribal Nations in post-fire response and recovery. While the value of IKS are increasingly recognized in all forms of land management, implementation is often hindered by limited institutional support, unfamiliarity with Tribal governance, and the absence of protocols that ensure ethical collaboration (David-Chavez, 2022). In practice, this results in extractive relationships where knowledge is taken without consent or reciprocity, and generalized policies are applied without regard for the cultural and ecological specificity of Indigenous Communities and Tribal Nations. Indigenous and non-Indigenous scholars and practitioners advocate for frameworks grounded in trust, consent, and accountability that safeguard Tribal sovereignty and ensure communities maintain control over how their knowledge is used (David-Chavez et al., 2024; Whyte, 2019). Without these ethical foundations, current systems risk reinforcing historical patterns of exclusion, colonialism, and continuing to overlook Indigenous and Tribal priorities in the recovery process.

The 2020 Slater Fire, which burned through the homelands of the Karuk Tribe in Northern California, exemplifies these systemic failures. Despite warnings from the Tribe about cultural and ecological significance in the area, federal responders deployed heavy machinery that destroyed ceremonial resources, highlighting both a disregard for tribal knowledge and collaboration (Curtis, 2022). In the aftermath, rather than restoring cultural fire practices or reducing fuel loads to prevent future fires, land managers prioritized timber salvage operations, replanting dense conifer stands that increase fire risk and undermine Karuk stewardship goals

(Curtis, 2022). This response perpetuated the same extractive models that have historically disrupted Indigenous land relations and fueled recurring wildfire disasters.

As fire severity and frequency increase, scholars and practitioners increasingly view IKS as essential for reshaping federal land management systems toward more sustainable and just outcomes (Nakashima & Krupnik, 2018; Petzoid et al., 2020; Vinyeta, 2013; Whyte, 2017; Whyte et al., 2018). Literature reflecting on IKS highlights the role of Indigenous fire stewardship practices and understandings, particularly cultural burning, in reducing wildfire risk, protecting communities, and restoring ecological balance after a century of fire suppression (Adams, 2024; Wheeler et al., 2020; Whyte, 2017). Post-fire landscapes offer an opportunity to restore long-standing relationships with the land by reintroducing cultural burning practices.

Knowledge exchange between Indigenous and non-Indigenous partners is vital for more equitable fire management. Reciprocity, as defined by Robin Kimmerer (2011), forms the foundation of "cultures of gratitude," where humans recognize and uphold their caregiving responsibilities to ecosystems. Within various forms of IKS, reciprocity is exercised through self-determination and relationship-building, ensuring that knowledge sharing is guided by consent, mutual benefit, and respect (David-Chavez & Gavin, 2019; Whyte, 2017, 2019). These values have practical implications in post-wildfire response and recovery, where trust and accountability between Indigenous and non-Indigenous partners are essential for coordinating across diverse landscapes and governance systems. For example, the Karuk Tribe of Northern California has led knowledge-sharing initiatives grounded in cultural fire practices and Karuk values. These include the Practicing Pikyav research protocol unique to the Karuk Tribe that ensures ethical collaboration and protection against extractive practices (2017). The Karuk's Indigenous Women-In-Fire Training Exchange (TREX) program teaches fire stewardship rooted

in cultural knowledge and supports intergenerational and inter-tribal learning. Alongside these efforts, the Tribe advocates for policy change through *Good Fire Reports I and II: Current Barriers to the Expansion of Cultural Burning and Prescribed Fire in the United States and Recommended Solutions* at multiple governance levels to enable the revitalization of cultural burning and strengthen Tribal leadership in fire management. These initiatives show how reciprocal relationships can bridge knowledge gaps, repair past harms, and inform more just and sustainable fire governance (Clark et al., 2021; 2024).

In this study, I intended to explore aspects of IKS within post-fire response and recovery through a relational science model. Relational science models work from a basis of Indigenous rights, values, and priorities to guide institutional and cultural protocols that guide ethical knowledge exchange (David-Chavez et al., 2024). This model is rooted in respect, reciprocity, integrity, and humility, principles recognized across many cultural contexts and essential to building equitable partnerships in a settler colonial context. In the post-fire landscape, where decision-making spans multiple jurisdictions and worldviews, relational models offer a framework for navigating imbalances due to ongoing legacies of settler colonialism and fostering more just collaboration. Centering relational values to inform policy mechanisms can help establish more straightforward guidelines for engagement with Indigenous communities and Tribal Nations, support sovereignty, and encourage their land and knowledge stewardship. While relational science has been used to support other forms of research, it has not yet been broadly applied in post-wildfire governance, presenting a promising opportunity to bridge knowledge gaps and reshape federal approaches to fire management.

Effective post-wildfire response and recovery requires generational and place-based knowledge systems, ethical engagement practices that could foster a relationship-based

governance. At the federal level, recovery efforts often focus on building individual and community capacity through information, training, and resources to support decision-making (Schneider & Ingram, 1990). These strategies assume that, when properly informed, people will participate, understand risks, and utilize available programs. However, welcoming IKS in these efforts requires addressing fundamental worldview differences and honoring Indigenous rights. Internationally, countries have established research ethics frameworks, such as Kūlana Noiʻi (Hawaiʻi), the San Code of Ethics (South Africa), to guide ethical engagement and avoid extractive practices (Chennells & Schroeder, 2019 and Kūlana Noi'i Working Group, 2021). Relational values like respect, reciprocity, and accountability can help federal agencies build more equitable and effective partnerships with Tribal Nations. These values support obligations to the land and guide actions during uncertain federal leadership. Sustainable and just recovery policies must align with Indigenous communities' long-standing values and governance systems.

3. Methodology

A case study approach grounded in interview-based qualitative methods was used to meet the research objectives of this study. This approach suited the needs to understand the community's dynamics and priorities for post-wildfire response and recovery. It aligned with the values and communication styles of interviewees from Tribal Nations, which allowed storytelling to convey the challenges and build deeper understandings between researchers and communities (Archibald, 2019). I emphasized participatory research practices, including collaborative design and member checking (Birt el al., 2016), to avoid extractive methods and prioritize working alongside Tribal Nations rather than imposing external academic frameworks. A list of participants is provided in Chapter 2. Additionally, reflexivity played a significant role

in this project (Nicholls, 2009). As an Indigenous researcher working with an Indigenous tribe, my role and personal understandings were continuously considered throughout the research process. Indigenous Knowledge not only influenced the methods but also formed the foundation of the knowledge being presented. This was reflected in both the purpose and process of the work, not just in the content, but in the methodology itself. Indigenous practices shaped how I approached the analysis and guided the way the research was conducted. For example, when conducting interviews, I offered gifts when welcomed into participants' homes. During analysis, I imagined myself in their roles and community to better understand the weight of the knowledge being shared, as if it were my own.

3.1 Case study selection

This case study involved the Karuk Tribe and contributed to a broader research project under the United States Geological Survey's (USGS) with the Southwest Climate Adaptation Science Center (SWCASC). The selection of this case study aligned with the larger study's criteria, which included multiple case study Tribes interested in co-developing a comprehensive investigation and that have experienced significant impacts from large fires (>50,000 acres). Other case studies included in the larger project were Santa Clara Pueblo and the Washoe Tribe. Each case study was designed to possess distinct characteristics that enabled a cross-case or relational analysis, spanning different states and diverse legal relationships with ancestral territories. The diversity in community characteristics and contexts sheds light on policies that were more suitable for post-wildfire response and recovery based on specific community aspects. Interviews were conducted in person, preceded by virtual meetings that facilitated scheduling of

additional onsite visits, identified interviewees, and established rapport with the community. These preliminary meetings introduced myself as the researcher and fostered a collaborative relationship with the community to identify place-specific priorities and management strategies that could focus our research efforts.

3.2 Sampling & Data Collection Protocol

This research contributed to both the main SWCASC project and my master's thesis. As part of the overarching project, Institutional Review Board (IRB) approval was secured from the Karuk Tribe, and I completed interviews with individuals from the Karuk Tribe in May 2024. I conducted semi-structured interviews using purposive and snowball sampling methods, which were especially effective for working with tribal and Indigenous communities, where not all individuals were accessible online or had direct contact resources (Woodley & Lockard, 2016).

Prior to research initiatives, a research committee was formed in accordance with the *Practicing Pikyav* agreement, as outlined in *Practicing Pikyav: Policy for Collaborative Projects and Research Initiatives with the Karuk Tribe* (2017), which governs how the Karuk Tribe engages with outside researchers. This agreement is specific to the Karuk Tribe and guided our work to promote cultural sensitivity, support mutual learning, and prevent exploitative research practices. I held initial meetings with the Karuk Tribe Department of Natural Resources (DNR) to plan interviews and reach out interviewees from different departments, including managers, staff and tribal members.

My interviews included individuals with firsthand knowledge of fire response on federal lands relevant to the Karuk Tribe. Interview questions, developed from existing literature,

focused on relationships in fire management to understand the nature of existing collaborations and how these relationships might inform policy and governance recommendations. Participants represented various levels of fire management and various age groups, including youth and Elders.

I employed semi-structured interviews to collect qualitative data addressing the research objectives. This method was suitable for understanding Indigenous and Tribal recovery priorities, as these priorities vary significantly between communities (Long and Lake 2018). The information gathered is specific to each community's unique sense of place and culture and can even differ within the same community. Semi-structured interviews balanced a clear set of prompts and allowed for responses' depth and nuance (Adams, 2015). Moreover, they permitted slight deviations from the guided prompts and enabled capturing of individualized experiences (Adams, 2015). Interviews were completed in May 2024 with the Karuk Tribe, with 13 interviews conducted.

Interviews continued until saturation was reached, meaning no new information or themes emerged. Each interview lasted approximately 30 to 120 minutes. All interviews were conducted under an approved human subjects' research protocol from the IRB at Colorado State University (CSU) and per the Karuk Tribe's *Practicing Pikyav* agreement. Per Indian Health Service (IHS) IRB guidelines, any research conducted within a reservation, at a tribal facility, or using tribal resources requires Tribal Council review and approval (Freeman, 2005). Not all Tribal Nations have a fully developed research protocol or IRB process. The Karuk Tribe is a leader in how research is conducted with Tribal Nations. The *Practicing Pikyav* agreement requires approvals from a formed research committee, advisory board, and Tribal Council before publications. Details of the *Practicing Pikyav* agreement are further outlined in Chapter 2.

Below are examples of questions posed, which were further developed and refined in collaboration with the Karuk Tribe in preparation for interviews. Additionally, I offered gifts to each interviewee. This was particularly significant for Tribal Nations, which highly value reciprocal relationships and express gratitude by exchanging local or cultural resources. This practice further solidifies respect and trusting relationships within the community (Latai-Niusulu et al., 2020). This was particularly important to me, as a member of an Indigenous tribe. I was raised with the practice of gifting, both in ceremony and for special occasions, as an expression of my gratitude, respect, and offering a part of myself to the recipient.

In addition to interviews, I looked to sources such as news articles, public statements, informational videos, and lectures produced by the Karuk Tribe, and historical records to support the research. To validate findings, participants reviewed the final products, either approving, disapproving, or offering insights to ensure accurate representation through a process known as member-checking. Member checking was significant in this research as it reflects Indigenous practices of consensus, where knowledge that is shared publicly is accurately reflective of a population's understandings. By combining qualitative methods with a case study framework, this research comprehensively explored post-wildfire recovery priorities in Tribal and Indigenous communities.

3.3 Data analysis

The interview process involved recording and transcribing all sessions and coding using qualitative analysis software known as Dedoose. These codes encompassed broad themes (e.g., "Policy Challenges"), subsequently dissected into sub-themes (e.g., "Communication"). These codes were intended to be used across all case studies. Application of codes focused on larger

text excerpts for pragmatic efficiency. Initial code development stemmed from research questions and literature concepts and remained receptive to emergent themes from the data. To ensure consistency and reliability in our analysis, a researcher working on another case study and I collaboratively developed the codebook with guidance from two project advisors. Prior to coding interviews independently, we conducted an interrater reliability test to align our coding strategies and ensure a shared understanding of code application. All interviews with the Karuk Tribe underwent coding, a task I undertook. The organized codes were then exported to a spreadsheet, streamlining data analysis through memo writing, where I summarized participant responses to identify connections to emerging themes. Any participant cited in deliverables from data collections was anonymized unless attribution was explicitly requested through the member checking process.

4. Summary

This thesis research, part of a collaboration with the United States Geological Survey's (USGS) Southwest Climate Adaptation Science Center (SWCASC), addressed the critical need to understand Indigenous fire stewardship, which has been historically disrupted by colonization. Given the increase in high-severity wildfires in the western United States, this research aimed to fill gaps in post-wildfire policies affecting Tribal Nations, with a unique focus on the Karuk Tribe. The study employed qualitative case studies and semi-structured interviews to identify key recovery goals, explore management options that align with Tribal priorities, and assess governance challenges. This thesis was structured into three chapters: an introduction that reviewed relevant literature, a manuscript for peer review, and a conclusion that summarized findings, discussed study limitations, and outlined future research directions. This work

contributes to the scholarly understanding of Indigenous knowledge systems and their relevance in contemporary fire management.

CHAPTER TWO: UNDERSTANDING FOREST RECOVERY PRIORITIES, MANAGEMENT OPTIONS, AND POLICY NEEDS FOR TRIBES IN POST-FIRE LANDSCAPES

1. Introduction

As climate change is driving more frequent and intense wildfires (Jones et al. 2022 and Armenteras-Pascual et al., 2025), the revitalization of Indigenous fire stewardship has drawn increased attention and is becoming more urgent by the day (Whyte, 2017). The Karuk Tribe has practiced fire stewardship since the time of creation, guided by oral histories and songs, where fire is understood as an element to maintain ecosystem health, enhance biodiversity, and sustain their way of life (Norgaard, 2014a, 2014b, 2019; Clark et al. 2021, 2024). The onset of colonial practices like fire suppression, along with processes of land dispossession, have severely disrupted these practices, creating dense, fire-prone landscapes that place the Karuk People and their lifeways at risk of high-severity wildfires (Curtis, 2022). High-intensity fires threaten human and ecological health, while continued exclusion of Karuk fire stewardship enforces historical injustices.

Acknowledgement and support of Indigenous fire stewardship is essential for the preservation of Karuk culture, ecological health, and Indigenous sovereignty. After catastrophic fires, there is a unique opportunity for renewal. Fires often clear landscapes of species grown for commercial value and potentially create space for dialogue and restoration of Indigenous land management. This paper examines the Karuk Tribe's experiences with the ongoing impacts of settler colonialism and their efforts to reclaim their fire stewardship practices. Using the 2020 Slater Fire as a focal point, we, as authors and co-authors, explore the perspectives of the Karuk

Tribe on post-fire management and policy priorities, cultural burning, and pathways for restoring cultural fire. On September 8, 2020, near the town of Happy Camp in what is now designated as the Klamath National Forest in Northern California, a PacifiCorp powerline was blown down by strong winds and fell onto a nearby tree, igniting the fire. Over the span of two months, with most impacts occurring within the first 48 hours, the fire burned 157,000 acres, 200 homes, and killed two people, with most impacts occurring within the first 48 hours. This land is Karuk ancestral territory and of great importance to the Tribe, with tribal headquarters and many members and descendants living in Happy Camp that were directly affected by the fire.

2. Literature Review

2.1 Indigenous Fire Stewardship

Since time immemorial, Indigenous peoples across the globe have utilized fire to steward their ancestral lands. Indigenous ancestors observed the benefits of fire in the quality and abundance of local food, fibers, medicines, and cultural resources after low intensity fires (Christianson et al. 2022; Goode et al. 2022; Lake et al., 2017; Long & Lake, 2018). Introduction of low intensity fire within ecosystems provides many benefits, including removing underbrush for visibility, removing insects, stimulating dormant seeds, and attracting wildlife to local areas (Connor et al., 2022; Halpern, 2016; Halpern et al., 2022; Marks-Block et al., 2019). The practice of Indigenous Peoples applying fire to ecosystems is known as cultural burning, Indigenous fire management, or Indigenous burning (Kimmerer & Lake, 2001; Norgaard, 2019; Roos et al., 2022; Adams, 2024).

While fire stewardship methods vary across Indigenous communities, fire is a common element of cultural continuity and land stewardship. Indigenous fire stewardship, including the application of fire, is guided by place-based knowledge systems responsible for the survival of Indigenous ancestors and peoples today (Christianson, 2015; Lake et al., 2017; Long & Lake, 2018; Norgaard, 2019; Whyte, 2017). These knowledge systems also inform cultural practices and traditions that guide the timing and facilitation of ceremonies. Cultural ceremonies, including songs, dances, and regalia, serve as cultural indicators for Indigenous peoples, guiding when, where, why, and how to carry out land management practices (Kimmerer, 2013). For example, the Karuk Tribe utilizes fire in their Pikyaavish or world renewal ceremony, through which fire is used for ecocultural stewardship, community protection, forest and river ecosystem management, and cultivation of specific grasses and roots for basket weaving and regalia, which are essential for future ceremonies (Lake, Tripp & Reed, 2010).

Cultural burning for many Indigenous Peoples encourages the regeneration of key plant species that support survival needs. These practices help foster sustainable diets and landscapes that help combat illness through access to nutritional foods and medicinal plants (Lake & Christianson, 2020; Anderson, 2006; Roos et al., 2022; Adams, 2024). Fire also is used for protection against high intensity wildfires for communities, animals, and cultural resources, while promoting the quality of materials and habitats that sustain them. Smoke from fire is used to protect acorn quality and serve as a cooling agent for the river during salmon spawning (Norgaard, 2019). The Karuk Tribe managed vast quantities of land by delegating responsibility to specific groups within the community. The men traditionally manage the hunting grounds and landscapes further away from the community, while the women burn the areas around homes to promote important food and fiber species and culturally significant plants. Recent research has

shown that the Karuk Tribe may have started as many as 7,000 fires in a single year as part of their stewardship efforts (Greenler, 2023). Indigenous Peoples across the globe continue to recognize fire as a form of medicine, using intentional burning to clear what is unhealthy and promote growth across the landscape. In this way, fire is not only a tool for ecological management but is a means of survival and assertion of Indigenous sovereignty over their people, lands, and resources.

2.2 Impacts of Colonization on Forest Ecocultural Stewardship

Settler colonialism in North America, which shaped U.S. federal land management policies, led to the genocide of many Indigenous Peoples. The dispossession, murder, and criminalization of Indigenous People and their fire stewardship practices, when coupled with fire suppression, has increased the risk of high-severity wildfires nationwide (Stephenson & Ruth, 2005). In this section, we trace this history to illustrate the effects that endure today.

In the U.S. Federal policy and practices suggest land is a financial asset, valued based on its ability to generate capital through industries like mining and timber extraction (Anderson, 2006; Norgaard, Reed, & Van Hor, 2011; Curtis, 2022). Nichols explains how the development of the land market was critical to expanding the power of the US settler state (2018). Civilization and land ownership is founded upon the nation of man subduing land for production of resources that can be bought and sold. This worldview conceptualizes nature and civilized society as separate, with nature as a resource to be managed (Kimmerer, 2018; Whyte, 2017, 2018). By contrast, the Karuk worldview recognizes humans as an integral part of the ecosystem, responsible for maintaining balance through active stewardship. Kari Norgaard, who has written extensively about Karuk dispossession, oppression, and ecocultural revitalization, explains that Western constructions of race, grounded in these ideas about civilization, viewed humans who

are not dominating or subduing nature as simply part of the natural world, and hence as individuals to be subdued, but not as people with equal rights (2019). This logic and construction of race led to the justification of the genocide of Indigenous Peoples across what is not the United States and the rationalization of policies that suppress Indigenous stewardship, reinforcing colonial agendas and undermining Indigenous sovereignty and rights (Norgaard, 2019; Dunbar-Ortiz, 2023).

Following nationwide attempts at Indian removal through colonial processes of treaty making, reservations, land military invasion, the federal government expanded control over Indigenous lands through the establishment of the National Forest system in 1891. Under the Organic Act of 1897 and subsequent laws such as the National Forest Management Act (NFMA) of 1976, federal policy aimed to promote sustainable management of timber resources and ensure land conservation on National Forests for future generations. For the Karuk Tribe, this included the designation of Klamath National Forest in 1905 and its expansion in 1907 across their ancestral lands (Quinn, 2015). Additionally, the Six Rivers National Forest was established in 1947 further designating Karuk ancestral lands as U.S National Forest (U.S Forest Service, n.d). The establishment of Klamath and Six Rivers National Forests assumed authority over Karuk territory to rest with the U.S federal government, advancing settler colonial land management objectives in the absence of ratified treaties or designated reservation (i.e., trust) land (Clark et al., 2024). Thus, the vast majority of Karuk's ancestral territory today is designated federal/public lands by the U.S government. Without a treaty, the Karuk's rights to these lands and their management through cultural burning have never been ceded; nonetheless, while unceded rights are supposed to be retained. The Karuk hold inherent rights to steward their land

following their traditional practices, these rights are routinely disregarded by the federal government, limiting their ability to exercise them fully (Clark et al., 2021; 2024).

The stated purpose of National Forests is for multiple uses, which is a general mandate often coupled with incentives for timber production (Curtis, 2022). This has resulted in prioritization of timber extraction throughout Forest Service history, particularly on forests where species valuable for timber can be grown (Hirt, 1996). On Karuk ancestral lands, site conversion practices included mass plantations of Douglas fir (*Pseudotsuga menziesii)* trees throughout traditionally hardwood forests, altering landscape compositions (Norgaard, 2019). Timber production also served as the primary rationale for fire suppression (Curtis, 2022; Wilkinson, 2013). Multiple researchers acknowledge that timber production proceeded across National Forests at unsustainable rates as a result of various incentives (Hirt, 1996, Schultz et al., 2015). For instance, Knudsen-Vandenberg funds incentivize local units to focus on timber harvesting by providing local unit revenue for timber sales, even when these are conducted at a loss to the federal government and taxpayer (Wilkinson, 2013). These policies, along with fire suppression efforts, prioritized economic gain from the land, disrupting Karuk fire stewardship and lifeways (Curtis, 2022; Norgaard, 2019). Karuk fire stewardship practices were viewed as highly problematic by the Forest Service. This sentiment is exemplified in a 1918 statement by Orleans District Ranger F.W. Harley, who stated of the Karuk people, “Some set fires out of pure cussedness… the only way [to stop it] is to kill them off… every time you catch one sneaking around in the brush like a coyote, shoot at them” (Norgaard, 2019, p.98).

Early fire suppression policies in the U.S were based on the understanding that fire is purely destructive rather than a natural ecological process (Stephens & Ruth, 2005 and Pyne, 2015). Policies such as the Weeks Act (1911) and the 10 a.m. Policy (1935) prioritized

extinguishing wildfires to eliminate fire from the landscape and protect timber resources nationwide (Stephens & Ruther, 2005). Fire suppression tactics on Karuk ancestral territory included aerial attacks, such as water bombing and borate fire-retardant drops on forests and on gathering areas for mushrooms and acorns (Norgaard, 2019). Chemicals that make up agent orange (2,4-D and 2,4,5-T) were dropped throughout Karuk territory to kill deciduous species and promote the growth of conifers. This approach altered ecosystems and the phenotypes of all living beings, leading to contaminated deer meat, birth defects, and reproductive issues for Karuk women, including miscarriages (Norgaard, 2019). These losses were especially devastating for their community, already devastated by settler colonial violence, genocide, and forced displacement, which had reduced the Karuk population to fewer than a thousand individuals by the mid-20th century (Norgaard, 2019). Karuk access and interactions with ancestral land for traditional medicines and foods were and continue to be restricted by National Forest occupation, management, fire suppression, and timber policies, which in turn have led to hazardous fuel accumulations and negative impacts to well-being of all living things (Curtis, 2022). As a result, the landscape is primed for high-severity wildfires that further threaten Karuk communities and their ability to restore cultural burning practices.

The impacts of fire suppression are further compounded by the U.S education system, mainstream media, and training programs, which shape public understanding and policy support. Historically, fire suppression has been taught through widespread campaigns like the Smokey Bear advertisements, promoting the idea that fire is a threat to forest ecosystems and must be prevented (Vinyeta and Bacon, 2024). These forms of messaging and propaganda have gained public support for fire suppression tactics, overshadowing and excluding Indigenous history, knowledge, stewardship, and presence on the land (Vinyeta, 2021). The lack of Indigenous

perspectives in mainstream education contributes to misconceptions about fire's ecological role, making it more difficult for the Karuk Tribe to gain recognition and support for cultural burning as a legitimate and necessary land management practice (McKay, Vinyeta & Norgaard, 2020).

Today, wildfires have intensified globally, resulting in profound post-fire impacts on local communities, landscapes, water quality, and human health in post-fire areas (Paul et al., 2022; Angelo, 2023; Williams, 2021; Gellman and Wibbenmeyer, 2024). Addressing these impacts is necessary in the context of climate change, with prolonged drought and increased temperatures increasing wildfire season length, frequency, and the amount of land burned (Jones et al., 2022). In combination with over a century of fire suppression policies and practices, current landscape conditions across the globe are crowded with dry fuel and invasive species that fuel wildfires (Jones et al., 2022). These trends manifest in wildfire events like the Slater Fire, which burned through Karuk homelands.

Research has shown how the Slater Fire was an outcome of settler colonial policy and resource extraction practices (Curtis, 2022). The lack of federal recognition of the Tribe's land stewardship practices and criminalization of occupation and cultural burning by Karuk on National Forests led to a dramatic change in fire regimes and species composition. Curtis (2022) documents in detail a systematic disregard for and oppression of Karuk lifeways, resulting in a dramatic decrease in human-ignited and managed fire. Federal land management policies replaced Karuk cultural burning efforts and led to forest site conversion, invasive species, and fuels accumulation that contribute to high severity wildfires like the Slater Fire (Goode, 2022). In summary, these factors, together with fire suppression and a lack of cultural burning, have had significant impacts on Karuk ways of life. The criminalization and restriction of fire on Karuk ancestral lands have disrupted essential cultural practices, including basketry, ceremonies, and

the cultivation of traditional food sources necessary for survival (Curtis, 2022). Fire's absence has led to serious health consequences, including increased smoke exposure risks from high-severity fires and the decline of nutritious land-based foods and medicinal plants, often forcing communities to rely on processed or fast foods that contribute to long-term health issues (Reid, 2019; Norgaard, 2019). The absence of fire from the landscape has allowed invasive species to spread, outcompeting native species that Karuk People depend on for food, medicine, and cultural practices (Curtis, 20022; Norgaard, 2019; Seraphin, 2020). Additionally, site conversion has facilitated a wide spread of Douglas fir monocultures, reduced biodiversity and altering forest ecosystems (Norgaard, 2019). These changes have disrupted understory and canopy dynamics, leading to denser, more fire-prone forests (Marks-Block, 2019). Without regular low-intensity burns, fuel accumulates, increasing the likelihood of high-severity wildfires that threaten the safety and health of ecological and human communities (Anderson, 2006; Stephenson & Ruth, 2005; Pyne, 2015). In summary, the relationship between the Karuk People and the landscape has been severely disrupted throughout colonial settlement, federal land management, and the ongoing era of fire suppression, leading to an imbalance of the local ecosystem that had been cared by and cares for the people for generations (Curtis, 2022).

2.3 Pathways for Restoring Indigenous Fire Stewardship

The impacts of colonization have forced the Karuk and many other Indigenous communities to navigate complex federal funding structures to defend and strengthen their land stewardship efforts. Programs such as the Tribal Forest Protection Act (TFPA), the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), and the Indian Self-Determination and Education Assistance Act (ISDEAA) affirm important rights and provide critical financial support for wildfire mitigation, ecosystem restoration, and self-governance.

Amendments in the 2018 Farm Bill and the 2023 Bipartisan Infrastructure Law (BIL) have expanded access for federally recognized Tribes to receive funding, allowing for greater autonomy in land management (U.S. Congress, 2018; U.S. Department of the Interior, 2021). Additionally, initiatives like the Collaborative Forest Landscape Restoration Program (CFLRP) and Good Neighbor Authority (GNA) help establish partnerships between federally recognized Tribes and federal agencies to restore fire-adapted landscapes (Schultz et al., 2012). However, challenges persist as many Indigenous communities, including the Karuk, often face barriers in securing and implementing funds due to lengthy bureaucratic application processes and limited staffing (U.S. Government Accountability Office, 2024). Federal funding timelines often conflict with traditional stewardship and seasonal responsibilities, making it difficult to meet deliverables and requirements that do not reflect community or ecological needs (Hoffman et al., 2022; U.S Commission on Civil rights, 2003). While these funding mechanisms offer critical support, the need for federal approval and partnerships can undermine Indigenous sovereignty. In addition, historical criminalization of cultural burning and the era of fire suppression policies has created significant barriers for the Karuk Tribe and other Indigenous communities seeking to restore traditional fire practices.

Through persistent advocacy, the Karuk Tribe has helped drive policy shifts that increase support for intentional fire, including changes to liability standards and financial protections (Clark et al. 2021, 2024). In 2021, California passed Assembly Bill 642 (AB642) and Senate Bill 332 (SB322). AB642 legally defined cultural burning and created a cultural burning liaison in the state government. Senate Bill 332 shifted liability standards from simple to gross negligence under specific conditions for prescribed fire and cultural burning. This means burners have protections from liability, except in cases of gross negligence, if a burn is intended for wildfire

hazard reduction, ecological restoration, cultural burning, silviculture, or agriculture, has landowner or tribal approval, and complies with burn and air quality permit requirements. While this increases support for intentionally applied fire, permits are still required. The Karuk Tribe explains that SB 322 does not fully account for tribal sovereignty, as cultural fire practitioners should not be required to obtain state permits. In response, Senate Bill 310 (SB310) was passed, supporting sovereign-to-sovereign agreements that recognize tribal authority over cultural burning, exempting them from state permit requirements (Clark et al. 2021, 2024). Additionally, Senate Bill 926 (SB926) in California created the Prescribed Fire Claims Fund Pilot to cover losses from prescribed and cultural burning, but access to the fund requires burn plans and permits, further creating barriers for Karuk fire practitioners. While these policy developments increase support for cultural fire, the Karuk Tribe continues advocating for legislation that furthers their rights. The tribe is also working to shift the shared responsibility for wildfire by holding land managers accountable for the fire hazards created by untended lands (Clark et al. 2021, 2024).

Without recognition of Indigenous sovereignty and stewardship in policy or practice, there remains ongoing environmental instabilities threatening both Indigenous and settler communities (Clark et al. 2021, 2024; Farrell et al., 2021; Eisenberg et al., 2024). As we noted, Tribal Nations' right to burn remains largely unrecognized in nationwide federal policy, reflecting the ongoing criminalization of Indigenous fire stewardship and presence on their ancestral lands. Because these efforts prevent Indigenous Peoples from practicing their ecocultural stewardship, which facilitates access to food and fiber and is a core component of their religious freedom, the criminalization of occupation and fire stewardship represents ongoing settler colonial processes that oppress Indigenous Peoples. Specifically, descendants of

the Karuk recognize their ancestral territory as unceded land, as it was never transferred through treaties, granting descendants an inherent right to cultural burning (Clark, Miller, & Hankins, 2021; Clark et al., 2024). However, when carrying out cultural burning, tribal members often face legal and bureaucratic obstacles, as federal and state agencies continue to regulate and suppress Indigenous fire stewardship (Varney et al., 2025; Norgaard, 2019). Historically, these agencies have framed Karuk cultural burning as a threat to the landscape rather than an ecological practice, reinforcing policies that criminalize Karuk land stewardship practices (Curtis, 2022). In response, the Karuk Tribe has actively advocated for their right to burn through collaborative research, climate change projects, and policy recommendations (Clark, Miller, & Hankins, 2021and Clark et al., 2024).

Karuk cultural burning advocacy is part of a growing recognition of Indigenous fire stewardship amidst the climate crisis, reflecting a paradigm shift toward understanding humans as a part of the ecosystem rather than separate (Tom et al., 2023; Vinyeta, 2013; Whyte, 2017; Whyte, 2018). Increased recognition and guidance of knowledge systems centered around Indigenous fire stewardship require tribes to create protective measures around data collection, ownership, and applications (Hudson et al., 2023; David-Chavez, 2019; David-Chavez et al., 2020; David-Chavez & Gavin, 2018; Jennings et al., 2023). This stems from Indigenous communities' "inherent right to govern their communities, land, and resources" (Hudson et al., 2023; Adams, 2024). Efforts across the globe are being taken to define, create, and support Indigenous data sovereignty (the right of Indigenous Peoples to govern and steward the collection, ownership, and application of its data), in all aspects of Indigenous land stewardship (Adams, 2024; United Nations General Assembly, 2007; Kukutai et al., 2023; U.S. Department of the Interior, 2025). The Karuk Tribe has been at the forefront of this movement, actively

working to restore cultural burning practices while protecting Indigenous data sovereignty and advancing their right to burn.

Documented efforts to expand and protect Karuk data sovereignty include protocols and collaborations with researchers, the development of research guidelines, and the assertion of knowledge sovereignty to ensure that "information remains tied to the practices that generate and sustain it" (Norgaard, 2014a, 2014b; Murveit et al., 2023). These efforts shape what Indigenous data sovereignty looks like in practice and what it means for Karuk Tribal governance and cultural continuity. This ensures that Karuk Tribe values are upheld, credibility is maintained, and extractive research practices are prevented (Sipnuuk Advisory Committee, 2017). Research centered on the benefits of intentional fire within ecosystems simultaneously advocates for cultural burning, highlighting enhanced wildlife habitat, promotion of understory growth, reduced pest infestations, black oak and tanoak regeneration support, willow habitat restoration, increased acorn yields, and improved soil health (Connor et al., 2022; Marks-Block, Lake, & Curran, 2019; Halpern et al., 2022; Thoreson, 2023; Lake, 2007).

In summary, pathways for restoring Indigenous Fire Stewardship are gaining momentum despite challenges due to a legacy of colonialism in policy and practice. Tribal Nations everywhere must navigate complex structures to ensure community and cultural survival, combating issues like liability and financial protections that were unnecessary prior to colonization. However, the Karuk Tribe is leading efforts to educate, protect, and heal the well-being of their people, culture, and landscape. Through advocacy and collaboration, the Karuk Tribe provides a model for other Indigenous communities striving to restore stewardship of their lands. These efforts help the Karuk Tribe exercise sovereignty over their people, land, and resources, emphasizing that sovereignty does not rely on obtaining permission or permits from

government agencies that have historically excluded and erased them (Coulthard, 2014). A paradigm shift in worldview in land management is necessary to address issues of climate change and high-severity wildfire. Colonial worldviews informing policy and practice on forests nationwide have contributed to fire-prone landscapes after effectively removing and excluding Indigenous perspectives that understand humans as a part of the ecosystem. Absence of fire stewardship and Karuk presence on the land threatens all living beings, human and non-human, regardless of race or origin. As this paradigm shift is made, the protections and rights of tribal nations and their knowledge must be taken seriously and welcomed.

These understandings have informed the following research objectives for this project with the intent to develop a better understanding of Karuk perspectives specifically regarding post-fire recovery after the Slater Fire. Our research objectives were to: 1) Identify post-fire recovery priorities for Karuk Tribe; 2) Identify post-fire management options to address Karuk priorities, and 3) Characterize post-fire governance systems affecting Karuk Tribe.

3. Methods

This case study is part of a broader Southwest Climate Adaptation Science Center (SWCASC) project, focusing on post-fire recovery priorities, management options, and policy needs for tribes in post-fire landscapes. The project employs a case study approach intended to understand the unique experiences of federally recognized tribes dealing with wildfire recovery. For this project, we worked with tribes in western US states that have been significantly impacted by large wildfires (over 50,000 acres) and were interested in co-developing research tailored to their unique circumstances and recovery needs. These efforts were developed with guidance from SWCASC collaborators, including Dr. David-Chavez and Lindsey Schnieder. In

this paper, we report on a single case study, which we will also use for future cross-case analysis.

The case study presented herein is based on a collaboration between Colorado State University (CSU) and the Karuk Department of Natural Resources (DNR). During the proposal stage, Dr. Schultz approached the Karuk Tribe Research Coordinator to determine their interest in the project. The Tribe discussed the research and subsequently wrote a letter of support for the project, indicating their interest in the topic, its importance, and their willingness to work together should the project be funded. Once the project was funded, a research committee was formed based on a Practicing Pikyav agreement, as outlined in *Practicing Pikyav: Policy for Collaborative Projects and Research Initiatives with the Karuk Tribe* (2017) which outlines how the Karuk Tribe will interact with outside researchers.

Initial efforts began in 2022, led by Schultz, who met with the Karuk advisory research team, which included Heather Rickard and Shay Bourque from the Karuk Department of Natural Resources (DNR), Kathy McCovey as a Karuk elder, knowledge holder, and community-based liaison, and Bruno Seraphin, as an experienced outside researcher who works with the Karuk Tribe. The first visits to Karuk territory took place in 2023, when Schultz traveled to Karuk ancestral territory, including Orleans and Happy Camp, CA, to meet the advisory team in person, learn about the history and landscape in more detail, and conduct an initial round of interviews. This phase was important to establish an initial relationship between researchers and with people working with and for the Tribe. A second visit occurred in 2024 (by both Schultz and graduate student Cruz) during which we conducted most of the interviews at people's homes, with their permission, or at the Karuk DNR. Additional interviews were conducted online after visits to Karuk territory with those who could not meet with us due to scheduling and time constraints.

Further visits occurred in July 2024, to present our initial findings and continue to learn, and will occur in June of 2025 to present final findings.

The Practicing Pikyav agreement guided our work to facilitate learning about the Karuk Tribe, be culturally sensitive, and prevent exploitative relationships in research and project development. We agreed, as did our Institutional Review Board (IRB) in its approval of our human subject's research protocol, that we would archive all interview data (audio and transcripts) with the Karuk Tribe as well as at CSU. Our consent documents gave participants the choice to be recorded or not, and we confirmed with them their willingness to have their interviews archived with the Tribe and CSU. We also discussed with all participants that they would have the right to check the content of their quotes and how they are used in our products; all products from this case study will be reviewed and revised for accuracy by Karuk DNR collaborators. These steps are essential to ensuring that representatives of the Karuk Tribe maintain governance of the data coming from the study and that individuals and the Tribe are represented accurately on a project led by outside individuals.

Schultz and Cruz, coordinated directly with the Karuk DNR's Pikyav Field Institute Research Coordinator, Shay Bourque, to recruit participants and address any questions before reaching out to Tribal members. Bourque's role is to manage the many incoming research requests to Karuk Tribal staff members and other individuals with limited availability (e.g., Tribal leadership and elders) and to connect researchers with the people who were most able to speak to our research questions; we also asked participants for recommendations and followed up with those individuals with permission. Participation was open to anyone with knowledge of fire response on federal lands relevant to the Karuk Tribe. In total, 13 interviews were conducted with Karuk Tribal members and staff. While this sample size brings valuable insights, we

recognize it likely does not capture the full range of experiences. The following is a list of all interviewees by Name, Occupation, and Participant #:

- Will Harling, Mid Klamath Watershed Council Restoration Director, #1
- Anonymous, Karuk Department of Natural Resources Employee, #2
- Alex Watts-Tobin, Karuk Tribal Historic Preservation Officer, #3
- Earl Crosby, Retired Karuk Department of Natural Resources Employee, #4
- Leaf Hillman, Karuk Ceremonial Leader, #5
- Lisa Hillman, Karuk Tribal Member, #6
- Michael Sanchez, Karuk Prescribed Fire and Fuels Specialist, #7
- Erin Hillman, Karuk Tribe Director of Operations, #8
- Vikki Preston, Karuk Tribe Cultural Resource Technician, #9
- Anonymous, Karuk Tribal Employee, #10
- Kathy McCovey, Karuk Cultural Practitioner, #11
- Anonymous, Karuk Department of Natural Resources Employee, #12
- Colleen Rossier, Karuk Tribe Senior Research and Policy Advisor, #13

Schultz and Cruz conducted semi-structured interviews, encouraging participants to lead the conversation and share their experiences related to fire in general, and the Slater Fire in particular. Participants included Tribal members, retired employees of the Tribe and the Forest Service, cultural practitioners, and fire and fisheries specialists. While an interview guide was developed to address topics aligned with the overall SWCASC project goals, participants were encouraged to speak about what they believed was important or what they identified as the actual issues that should be addressed. After each interview, participants were gifted pastries, based on

recommendations from Seraphin who worked with the Karuk Tribe previously, and piñon pine nuts from Cruz's home community to show a measure of reciprocity for people's generosity for their time and knowledge (Bouvier & MacDonald, 2019). We offered all non-governmental employees a $40.00 Amazon gift card and a donation was made to Karuk DNR in recognition of the time spent by DNR staff members, who could not accept gift cards.

With participants' consent obtained at both the beginning and end of the process, interviews were recorded, transcribed, and cleaned to ensure proper archival of the data with CSU and the Tribe. Audio recordings were transcribed using Otter.ai software. Cruz then reviewed and cleaned the transcriptions. A codebook was developed early in the analysis process through an emergent coding approach to organize and analyze qualitative data, allowing researchers to identify patterns and draw meaningful insights. Russell and Cruz began by reviewing an interview and identifying recurring themes in the data. From this process, parent codes were developed to represent overarching themes, such as 'Governance,' and then subcodes created to capture more specific subthemes, like 'Collaboration,' 'Consultation,' and 'Trust.' The finalized codebook, created with guidance from Drs. Schultz, David-Chavez, and Russell, was developed through an inter-rater agreement process that received an 82% (see Campbell et al. 2013), and applies to the overall SWCASC study. Using this finalized codebook, Cruz coded all 13 interviews. Codes were applied to participants' statements that aligned with the themes outlined in the codebook. The coded data was exported to an Excel sheet, and memos were created summarizing the content of each code, capturing the key points participants shared. Findings were derived from these memos by identifying the most frequently discussed themes based on frequency counts. Preliminary findings were presented at the Karuk Tribe's 2024 Karuk Fire Ecology Symposium (KFES) from July 1–3, 2024. A final presentation with Karuk Tribal

members was delivered at the Southwest Fire Ecology Conference in Santa Fe, NM, on November 19, 2024. An additional presentation is planned for the Karuk Pikyav Lecture Series in the summer of 2025.

All quotations used in this study will be approved by the participants and Karuk Tribal leadership prior to publication. Participant identities remained anonymous unless explicitly stated otherwise, with quotes identified by participant numbers and all identifiers removed to ensure confidentiality. Member-checking ensures that participants have the opportunity to verify that the research process respects and accurately reflects their knowledge and experiences, in alignment with the practicing Pikyav agreement. Research deliverables were tailored to align with what the Tribe identified as beneficial, including a research journal publication, a presentation at the 2024 Association of Fire Ecology conference, and a presentation for the Tribe's Pikyáv Lecture Series.

Although the study began with specific research questions in mind, researchers intentionally allowed participants to guide the conversation and emphasize what was most important to them. In our findings, many participants focused on broader, big-picture perspectives regarding their goals for fire management, with the Slater Fire often serving as a starting point for those discussions. Our findings, therefore, are not presented as directly answering the research questions but rather to convey broader insights and themes that emerged during the conversations.

4. Findings

While we designed our interview guide based on our research objectives, the results of this study were categorized based on what interviewees emphasized in our interviews. This section is

organized into two primary emergent themes that we identified during data analysis: 1) On-going impacts of colonization in forest and fire management and 2) Revitalization of Karuk fire stewardship. We present these here in two sections for organizational purposes, recognizing that these themes together are interrelated and tell a more holistic story, which we reflect upon in the discussion.

4.1 On-going impacts of colonization in forest and fire management

The on-going impacts of colonization were a key theme identified by participants and how those impacts manifest in events like the Slater Fire. We begin with Karuk fire stewardship, the dispossession of Karuk people and ancestral homelands, the criminalization of living and burning on Karuk ancestral territory, the influence of the settler-colonialism on the US government's land management practices, and how these contributed to the severity of the Slater Fire and continue through today.

In our interviews, participants spoke about the relationship between fire and Karuk Peoples. They explained that fire is a significant aspect of their identity and landscape. They talked about fire as a foundation for their ceremonies that have been passed down through generations. Participants referred to ceremonies, songs, and constellations as cultural indicators, communicating when, where, why or how Karuk People apply fire to land. Will Harling, Restoration Director of Mid Klamath Watershed Council, stated, "The mountain where the Karuk peoples' creation story says people emerged from the earth was also the site of a ceremonial burn that took place at the new moon in September, marking the close of their World Renewal ceremonies. These ceremonies included a series of high dances along the river and a

ceremonial ignition of fire on the mountain, which would burn down from the top and spread across the landscape" (#1).

Participants described fire stewardship traditions as preparing the landscape for upcoming seasons, cultivating desired species to provide for their well-being, and being foundational to ceremonial practices. They explained that, historically, applying fire in the landscape was timed according to cultural practices and when specific plants or species thrived. Vikki Preston, Cultural Resource Technician for the Karuk Tribe explained, "With cultural [fire], you're looking for cultural species, right? The burning times are different. Some are in the spring, some are in the fall. You have to be mindful about all of those things" (#9). Leaf Hillman, a Karuk Ceremonial Leader stated, "That's the way we've managed for thousands of years...[is] by favoring certain species that we depend on. We want to foster and discourage those that we don't depend on, [but it's] not that we're trying to rub those species out" (#5).

Throughout multiple interviews, participants referred to impacts of settler colonialism on Karuk ancestral territory that have and continue to disrupt Karuk fire stewardship practices. They explained that the arrival of European settlers in the Klamath River Basin led to the forced removal and criminalization of Karuk people, preventing them accessing the land and practicing their traditions of fire and land stewardship. An employee at Karuk DNR explained, "We had the richest fields of the gold rush in the Klamath mountains. The desire of miners to Native exterminate native people was strong" (#2). Karuk ancestral territory was claimed as National Forest System lands, with no treaty in place, effectively preventing Karuk people from legally inhabiting their ancestral land or managing it with fire. The result was the establishment of a settler-colonial land management regime based on the exclusion of Karuk people and their lifeways, including their occupancy and their extensive, traditional use of fire. This disruption,

they explained, is on-going and has resulted in profound consequences for forest ecosystems and Karuk people.

One participant recalled an early Forest Service policy requiring Karuk people to apply for immunity allotments. This policy was intended for Karuk Peoples to avoid accusations of trespassing on their ancestral territories and was necessary for their survival on what had become National Forest land. Hillman explained:

> The people didn't want land allotted to them because they didn't need someone to say, "You can own this land." The [Karuk] never owned the land. They had a responsibility to manage a much larger place. The whole hillsides behind their entire mountainside were their responsibility to manage.... From that day forward, these forests have suffered from the lack of human touch. It's been purposely rubbed out (#5).

Participants went on to emphasize the criminalization of Karuk cultural burning and presence on ancestral territory under settler colonial policies that have contributed to the landscape's current vulnerability to wildfire. Over time, they have observed their forest becoming overcrowded and overrun by invasive species, standing dead trees, and dense vegetation, due to exclusion of human- and lightning-ignited fire. They described the current ecological state of their ancestral territory as unhealthy, severely out of balance, and highly vulnerable to wildfire. They emphasized that the Karuk people have always sought to care for the land, but their stewardship practices have been systematically suppressed and threatened by the current legal system. Hillman further expressed, "I know how to do [cultural burning], but…I need to count on the fact that the sheriff isn't going to show up and try to arrest me, or the Forest Service isn't going to roll on it and suppress it" (#5). He continued, saying that "If you don't intentionally set out to [burn] and you let the damn thing grow back however it wants to without human intervention,

what you're going to get is a conifer dominated forest. That isn't the nature of these forests around here. It hasn't been for 10,000 years" (#5). All participants echoed this, often describing humans and fire as a keystone species and essential elements for ecosystems, noting how this contrasts with Western worldviews.

One participant explained that prior to European contact, fuel accumulation was not as dangerous as it is today. Hillman explained:

> There were different parties that were responsible for managing those resources. The doctor people, the healers, they managed the medicinal plants. Basket weavers managed the hazels and willows, all those kinds of things. The men managed the hunting grounds in the high country. Men and women managed the acorn groves in the middle elevations. We didn't have to protect our community from escaped wildfire because there was no escaped wildfire. There was no buildup of fuels that was unattended because it was somebody's business to manage those fuels (#5).

Many participants spoke on how Karuk people must continually seek external approval to carry out their cultural heritage, emphasizing that burning is an unceded right, but one that is not recognized by the US government. They explained that fire is intertwined with Karuk identity, serving not only as a tool for ecological restoration but also an element of their religion, one that is neither recognized nor protected, despite freedom of religion provisions in the U.S. Constitution. Hillman explained that, despite those provisions, "Our religion isn't protected under the Constitution. Our religion isn't protected because fire is part of our religion" (#5). They explained that this connection to fire underscores the Tribe's definition of cultural burning, which intentionally eschews requirements to seek permission from federal agencies like the Forest Service when it is an unceded right on unceded territory and fundamental to their religious

freedom. Current bureaucratic barriers to cultural burning are highlighted in *Good Fire Reports I and II: Current Barriers to the Expansion of Cultural Burning and Prescribed Fire Use in the United States and Recommended Solutions* produced by the Karuk Tribe in collaboration with outside partners (Clark et al., 2024). In addition, these reports offer policy and practice recommendations to expand and support cultural burning in California at the state and federal level.

Participants went on to discuss the Forest Service's significant impact on the landscape particularly when they initiated site conversion for timber production in the region, fundamentally altering the landscape's natural ecology. Many current and former Karuk DNR employees discussed the broader federal management system that prioritizes economic and developmental gains through the timber industry. An employee at Karuk DNR explained, "That's why [the Forest Service] is putting out fires. So, they can have a perpetual supply of timber resources for a developing nation. That's what the agency was founded on" (#2). They specifically described this prioritization as highly detrimental, as the practice of site conversion involves replacing native hardwood forests with Douglas fir. According to participants and other historical accounts (see Norgaard, 2019), the Forest Service suppressed and killed native oak species while planting and facilitating the growth of Douglas fir for timber production. Along with fire suppression, this site conversion effort was successful in promoting Douglas firs and excluding fire. They said that Douglas fir, without fire, outcompetes native vegetation like black oaks, which are crucial for the Karuk community's diet and the ecosystem's balance. The abundance of Douglas fir makes the landscape prone to more intense and extensive fire behavior. Participants explained that native oaks provide shelter for animals, support root systems, and contribute to the overstory canopy which they said are key components in maintaining the

landscape's health. The introduction of Douglas fir disrupted these natural processes, leading to a shift in the ecosystem's composition and function. Kathy McCovey, a Karuk cultural practitioner and retired Forest Service employee explained that this practice stemmed from congressional mandates requiring timber harvest quotas and targeted regeneration of Douglas fir trees on their ancestral lands. McCovey shared:

> The Forest Service is always trying to kill oaks… These trees are here for a reason, they want to grow here... I was a silviculturist for the Forest Service. My job was to go out and do timber sales. I would get a letter from Congress via the Forest Service, "You are to cut between 2 million and 4 million board feet of timber, you are to regenerate 200 acres of land into Douglas fir trees for the future. They had a plan they were going to do (#11).

Despite reoccurring wildfires in the region, participants explained that the Forest Service continues to practice timber extraction and site conversion during post-fire restoration efforts, perpetuating a cycle of wildfire vulnerability. An employee at Karuk DNR explained, "Looking at this landscape, you can see where small fires were, you can see where big fires where, you can see hardwood stands in those old footprints and you can see them surrounded by sea of conifers. You can just imagine how long it will be before that burns, takes out this whole side of town with it, it is just a matter of time" (#2).

They further explained that within seven to ten years, other competing vegetation would be removed to maintain the Douglas fir plantations for future harvests, typically scheduled every 75 years. Yet, according to participants, major fires have occurred more frequently in the area, often burning trees prior to them reaching maturity for harvest (Odion et al., 2004; Shatford et al., 2007). Will Harling shared,

> Seventy percent of the plantations in the Salmon River watershed, which is 751 square miles, have burned before they reached merchantable age, and yet they continue those practices. So when do we realize that this is a failed fire management strategy, and we change course? So today we hear the Forest Service saying they're interested in putting fire back into recent fire footprints; however, we have yet to see it happen (#1).

When we asked why this practice continues, McCovey said "It's all about the trees and growing trees. That's a mission. That's what [federal forest management employees] went to school for. That's why the Forest Service hired them. I went to forestry school, they teach you how to grow trees, everything else is miscellaneous to the mission" (#11). This participant also observed that many federal employees leave the area before they learn about the broader ecology and fire behavior, never truly realizing the impacts of their practices.

Leaf Hillman explained, "You've got to be in diverse forests with different species. [Now] it's basically a single species that dominates, and everything underneath it, it's dead" (#5). Another Karuk DNR employee explained:

> We should be looking at what's trying to come back on its own before we just start thinking we know better than nature…. That first seven years [after fire] should be about "Okay, where do we need to get fire back in?" If you go planting trees [then, the forest] becomes an investment to protect. The next time there's a fire; it becomes a justification to put the fire out. We need the management justification to be like, 'How are we doing things that are [supporting] putting fire back in?' That is going to be the only solution (#2).

During interviews, Karuk DNR employees explained, however, that congressional orders often prioritize timber production. They noted that National Forests with higher timber yields typically receive increased budgets and staffing from the Washington office, while critical fire management practices, such as prescribed burning, are deprioritized.

Lisa Hillman, a Karuk Tribal member also expressed frustration that fire mitigation and burning efforts that would benefit the land and improve community safety are only addressed if there is leftover funding after timber production and fire suppression efforts: “The [Forest Service staff] go and they harvest, and slash. [Then they say] they'll come back later if there's resources, if there's time and money for it but, no. It sets us up for another catastrophic fire” (#6). They said this prioritization of timber production over fire management and fuels reduction reflects a systematic neglect of landscape health and community, resulting in disregard for Karuk lifeways, increased wildfire risk to the lands due to fire, and decreased safety for residents. They continued explaining, “Now we’re a tinderbox. We can’t get fire insurance. Those who did have fire insurance were dropped right before the Slater Fire. So, what happens is I’m homeless, but it’s not my fault” (#6).

Participants specifically attributed the Slater Fire’s severity to Forest Service land management practices. Leaf Hillman stated:

> Slater Fire, lay that one 100% at the feet of the Forest Service and their fire suppression policy and timber management policy…. Classic timber town. They cut every stick of timber for miles around, creating even-aged forests, densely packed. They've suppressed every fire, every fire that popped up in that zone has been attacked and snuffed out (#5).

Another said:

> This is the type of event we're going to be seeing more of in the future. A lot of people say, Oh, that's climate change.' [But] we've always had northeast wind events. [What] we haven't had is 100 years of fuel loading, and we haven't had a sea of plantations on the northeast side of town that align with those wind events. That just makes fires huge, throw embers two miles and burn completely, all at once. Our solution is to revitalize our cultural knowledge and practice and belief systems across the territorial landscape. Which these budget formulas don't really match up with. (#2)

Reflecting upon the Slater Fire and other fires, many participants described federal land management as an ongoing colonial settler project that disconnects Karuk people from their lands. They explained that fire suppression tactics, coupled with increased drought and fire conditions exacerbated by climate change, have reduced the quality and abundance of vital cultural resources used for ceremonies and everyday needs, such as basket materials, foods, and medicine. As one participant noted, when the Karuk are absent, the human connection to the land is lost, leaving the land unmanaged and in need of care. Leaf Hillman explained:

> That's one of the hardest things about it…that fire burns so hot, you are under threat of losing connection to those plants. When the materials are no good, that disincentivizes people from going up there and tending and harvesting. The further down the road we get away from the actual event, hoping that those species will recover and once again produce good materials, we'll foster those relationships into the future because that's what's needed (#5).

Most participants attributed this to a contrast in worldview surrounding cultural burning and federal land management policy. They explained cultural burning considers other ecosystem factors such as biodiversity, watershed stability, and the health of culturally significant species,

while standard fire suppression and federal policies like the Endangered Species Act (ESA) focus on a single species or variable at a time. Will Harling explained, “Western science looks at the world through the lens of an individual species at a time, it misses the lessons of deep time, generations of animals, plants, or the type of knowledge that you only get by living in a place for millennia. And so, what we see across the board is a lot of short-sighted management objectives based on a flawed way of seeing and knowing the world” (#1).

They explained that single-resource management objectives can result in harm to their communities and contribute to broader impacts to their people and resources. High-severity wildfires have forced many Karuk families to leave their ancestral lands, often relocating to more affordable areas where they can rebuild or gather essential resources, a situation they view as a continuation of historical displacement. Erin Hillman, Director of Operations for the Karuk Tribe and Tribal member who lost their home stated, “It's like being chased out of your homeland. It's like, nobody respects how important that is, a people that is from this area, wants to stay in this area…. But people have had to leave because they can't stay. So, what does that do to our Tribal culture?” (#8). Several participants observed that in addition to the privatization of land and the criminalization of cultural burning, the current land management paradigm and resulting fires continue to drive Karuk people away from their traditional lifeways and homelands.

They explained that, although federal agencies have made some strides towards using intentional fire for fuels reduction, the season that burning is allowed in and the time to fulfill mandated protocols often results in missing seasonal burning windows. One participant explained, “According to the law, it is flat out illegal to burn in our traditional time of year. The only thing that will burn in [Forest Service burning seasons] are those extremely dry locations. The whole system is designed to work against what we need to do” (#2). Michael Sanchez, a

Prescribed Fire and Fuels Specialist for Karuk DNR, “The lack of allowing fires to burn during suitable windows has created an intense footprint once the fires pass through. It’s progressively gotten worse, every year brings a new 'biggest fire.' In the summers, there's miles without a green tree” (#7). They went on to explain other bureaucratic barriers, such as the Limited Operating Periods (LOPs) for Northern Spotted Owls (Strix occidentalis), which restricts burning. They stated:

> One of the biggest issues [the Tribe] has is the LOPs. That winter burn window and the spotted owl cuts [burning] off at February 1 to the end of March where we could do a lot of positive burning. The spotted owl, for the tribe, isn't a focal species. We don't have a Karuk name and vocabulary for the spotted owl, it doesn't have huge importance to us... We've been really trying to push towards cultural burning, trying to get past the policies and the hiccups of being able to go out and do burning with a lot less resources than their law requires (#7).”

Individuals note too that they did not believe their burning efforts would be detrimental to the species overall and would benefit the ecosystem more broadly.

Many interviewees expressed that post fire is an opportunity for federal land management systems to recognize Karuk rights and knowledge systems and to work with Karuk to reintroduce fire to their ancestral lands. However, following the Slater Fire, participants said the only action taken by the Forest Service was the clearing of trees along the roadside. They noticed that private landowners have taken action to manage the land, but Forest Service land remains largely untouched and overgrown, except for some instances of salvage logging (see Peterson et al., 2009). Karuk DNR employees explained rather than burning or establishing fuel breaks, the Forest Service exploits the emergency status of wildfires to bypass environmental compliance

like the National Environmental Policy Act (NEPA), fast-tracking timber extraction projects under emergency declarations. One person explained:

> The 2020 Slater fire and the 2022 McKinney fire both had extensive salvage logging efforts afterwards. Heavy equipment on severely impacted and sensitive soils from high severity fires is never a good combination.... Post-Slater fire, they logged a 600-foot-wide swath along the Gray Back Road that goes from Happy Camp over into Oregon, 600-feet wide by, 30 miles long. It's a lot of trees, way more than they get out during their planned timber sales and without any environmental compliance. They're utilizing that emergency loophole created by wildfires to get out the cut in a large way on Klamath National Forest (#12).

They explained how the Forest Service can also use post-fire management funds to support timber sales. Earl Crosby, a retired DNR employee stated:

> They have people out there on the ground laying these timber sales out before the fire is out. You want to talk about their recovery and all that stuff, it's all complete bullshit. All they're doing with those funds, suppression repair costs and the BAER funds, are supporting timber sales every year for the last four years. I know nothing has changed. Still to this day: same thing (#4).

A Karuk DNR employee also highlighted that federal post-fire practices meant to prioritize hazard tree removal for road clearing and salvage logging can often disregard the ecological balance of sensitive stream channels. They explained that tree removal destabilizes soils that support water channels utilized by the Karuk and local species, leading to erosion, muddy waters and damaging freshwater ecosystems. The expert explained, “You don’t

necessarily need to remove these trees, you can directionally fell them into the channels and still mitigate the hazard. These stream channels need to recover, and we're setting them back by having post-fire suppression repair that doesn't consider the health of the stream channels" (#12).

In summary, participants explained that federal forest and fire management, rooted in the exclusion of fire and Indigenous Peoples, enforces practices that compromise the safety and well-being of the Karuk People and landscape. Karuk participants argued that large and destructive fires, such as the Slater Fire, could have been prevented and can still be prevented with proper fire management practices and proactive burning. However, the lack of recognition of Karuk knowledge and rights continues, which perpetuates not just fire danger but the oppression of the Karuk people and traditions. As one Karuk member explained, "Every time they exclude a fire, they're causing more fuel to build up, and so everybody ties liability to the ignition. That gives agencies a free pass. Where [by contrast] the cause of the impact can be tied more directly to the fact that fire has been excluded, more than the fact that a fire has occurred" (#2). In the discussion, we return to this point, which others have argued as well (see Clark et al. 2021, 2024).

4.2 Revitalizing Karuk Fire Stewardship

Today, the Karuk Tribe is working to restore their sovereign right to burn without federal oversight. For the Karuk, this work involves voicing who they are and what proper land management is. As Leaf Hillman put it, "We can't sit by and allow it to be mismanaged the way that it has been. We have to speak out loud, say it often, and to anyone who will listen" (#5). Participants continuously shared how returning fire is linked to their cultural identity. One elder stated, "We're very lucky that we have retained so much of that traditional knowledge about our

ceremonies. We've brought those back. The pieces that we haven't brought back are the fire pieces that are critical components to those annual ceremonies" (#5).

Many participants linked their eco-cultural revitalization to the need for federal agencies to recognize Karuk sovereignty and their inherent right to burn as Karuk people. They stressed that for both their land and community to heal after high severity wildfires, Karuk-led burning practices must be restored without criminalization or external constraints. Leaf Hillman further shared, "There's a lot of [natural] resources that people will manage if they're not afraid to do it." (#5). Participants described post-fire landscapes as an opportunity to start over. Will Harling explained, "every wildfire is an opportunity to restore cultural fire and to prepare for the next wildfire on that landscape in a way that is accepting the frequent fire instead of excluding it" (#1).

Efforts to restore cultural fire practices and strengthen connections to ancestral lands include land management practices such as coppicing. While in the field for an interview, Kathy McCovey explained current efforts to coppice hardwood trees throughout a portion of Karuk ancestral territory. They explained that coppicing is intended for fire preparation, by cutting tree stems down to their stumps and clearing tree stems up to four feet off the ground. They explained coppicing promotes the growth of new and stronger stems for native hardwoods, potentially making them more resilient to wildfire. In collaboration with the Indigenous Stewardship Network (ISN), a grant received helped coppice 200 hardwood stumps on ancestral territory, purchase three chainsaws and pay for labor. McCovey explained that these efforts not only prepare and strengthen the landscape for wildfire but also repair their connection to the land. They explained, "This is going to become an area where we bring our kids. Our kids are scared of fire now because half the town burned up, but, if we come in and we start [coppicing], we

have [cultural] burns that prepare for fires coming towards us, if we prepare our areas to receive fire it may not be such a traumatic event" (#11).

However, the restoration of Karuk cultural burning practices and the revitalization of ancestral knowledge are significantly challenged by the need to collaborate with federal agencies, as the vast majority of Karuk ancestral territory falls under federal jurisdiction. Employees of the Karuk DNR explained that their ancestral lands span two National Forests, Klamath and Six Rivers, requiring them to work with federal agencies to implement land management projects. DNR employees noted that they have initiated plans for small-scale burns within the Slater Fire footprint as part of their broader strategy to revive fire stewardship. These efforts are hindered, however, on federal lands by the lengthy NEPA process required to burn, which can take up to five years to complete. Environmental assessments under NEPA are required by federal agencies prior to any burns on federal lands, which members explained often delays or prevent the Tribe from meeting specific burn windows. In addition to NEPA, cultural practitioners must complete detailed burn plans, that outline objectives, methods, safety protocols, and environmental considerations. These federal requirements are barriers to fire stewardship work.

Participants explained that the Tribe's collaboration efforts proceed differently on the two forests, complicating the Tribe's ability to manage the land effectively. On the one hand, the Six Rivers National Forest was described as more supportive of Tribal fire stewardship, with more engagement from leadership and experience more cooperative relationships in general with their staff. In contrast, participants described collaboration experiences with the Klamath National Forest as "box-checking" exercises by the agency, whereby the National Forest notifies the Tribe of predetermined plans without meaningful dialogue or consideration of Tribal input. Will

Harling explained the reality of federal acknowledgement and welcoming of Indigenous Knowledges in land management saying, “They’ll praise [collaboration] in their public presentations, but when actually implementing it into their practices, it just doesn't seem to exist and I think that gets to litigation too, there doesn't seem to be any legal language that would account for Indigenous practices. It's just not there” (#1). Participants explained that a lack of engagement hinders the co-development of any innovative land management project on ancestral lands. Earl Crosby explained that by the time the Karuk Tribe is engaged, “The [Forest Service] is so far down the pipe on the planning that they are not willing to reverse gears and think about a different approach. They always have something in their head, and you’re fighting tooth and nail to get some concessions out of it” (#4). Participants consistently attributed this perspective as a reflection of the conservative politics in Siskiyou County, where the Klamath National Forest is, versus Humboldt County, where the Six Rivers National Forest is, and a larger mining and timber production emphasis on the Klamath.

Participants noted that restoring ancestral knowledge and cultural burning on their ancestral lands is also hindered by individual understanding and attitudes of federal employees. As a result, Forest Service personnel with a Tribal background or history of working with the Tribe often are more cooperative during collaboration matters. DNR employees explained that during fire-related incidents on Karuk ancestral lands, authority is typically granted to the Forest Service or state fire departments like California Department of Forestry and Fire Protection (Cal Fire). They noted that these agencies often deploy personnel or fire crews unfamiliar with the local area, its unique ecological conditions, or even the existence of the Tribe. Participants attributed lack of awareness to the absence and acknowledgement of Karuk history and land stewardship in education and training programs. Many participants explained these dynamics

shape the attitudes and approaches of decision-makers and collaborators, further excluding Karuk knowledge systems and practices in federal fire management. Several participants noted encountering resistance or a lack of willingness to collaborate from agency decision-makers. Highlighting this challenge, Earl Crosby reflected on his Forest Service colleagues, stating:

> Some of them get it, but most of them you can see… the gears are just spinning, they couldn't wrap their head around [Karuk land stewardship]. It's a cultural thing too. It's not just how they were raised or where they're raised; it's cultural from not being deeply embedded with Tribes. Also, not wanting to learn. Not willing to have those conversations and understand (#4).

Most participants attributed challenges to people's lack of understanding and experience with the Tribe, but a few interviewees mentioned some specific examples of explicit racism. One example occurred on a fire line in Happy Camp where a bulldozer damaged a cultural site. When asked why they think that happened, the participant stated that it was intentional based on identification of the cultural sites during fire management briefings. The participant explained,

> The older cadre firmly believed that it was their forest. We, as the Tribe, had no say in how they managed their forest, they figured it was their land. The old timers [say], "This is our land. This is federal government land and we're going to do what we think is best. You guys are just another party, interested public." They couldn't wrap it around their head that the Tribe was interested more than what was on the reservation, they are interested in the whole landscape within the Aboriginal territory (#4).

Other participants shared observations of sexism during wildfire incidents, explaining that outside collaborators typically speak and engage only with male counterparts. This dynamic goes

beyond conventional workplace sexism; it reflects how gender is a specific target of settler colonialism, where the authority and knowledge of Indigenous women and Two-Spirit people are systematically undermined to reinforce settler control over land, leadership, and knowledge systems. Leaf Hillman recalled numerous encounters with an incident management team where the Tribal Representative, a woman, was ignored by agency personnel. They continued to explain that misogyny in wildfire incidents is not just at the local level but is an agency issue. They stated:

> It's not a place for women to be. Women get harassed and get driven out of those kind of places and spaces. It's not a friendly place. We need more people thinking, not just making decisions based on their testosterone levels... The whole apparatus is a male-dominated, adrenaline-fueled mess. We need more women to be in decision making spaces on the forests and in these incident management teams (#5).

Participants explained that collaboration challenges are compounded by frequent turnovers in leadership, particularly during wildfire incidents. This constant rotation forces the Tribe to repeatedly educate decision-makers, some of whom fail to take the Tribe's input seriously, causing delays or disregard for the Tribe's priorities. Another participant noted that the Tribe was able to influence the Incident Management Team on a fire, but it required persistent repetition. They said, "After a while, we did it, but you get tired. Every 14 days, a new team would come in. You'd have to do the same thing all over again and go through your spiel, fight the same fights, all over again" (#4).

Additionally, participants highlighted challenges with outsiders who join the Forest Service primarily for career advancement, rather than with a genuine commitment to supporting and collaborating with the Karuk people on whose ancestral lands they are working. Kathy

McCovey observed that many Forest Service employees see their positions as steppingstones to advance their careers rather than as long-term commitments to caring for a particular landscape or community. This mindset, they explained, undermines the role of those who genuinely wish to live on and steward the land. “People don’t come because they want to be here; they come here for [advancement] in their job. They're disassociated with the community. They're sometimes even disassociated with the agency where they work because they're only going to be here for a while” (#11). They explained Forest Service authority over Karuk ancestral territory “takes away [the Karuk Tribe’s] agency to be land stewards [because the Forest Service is] not managing for the way this ecology functions here and this ecosystem. They're managing for resource extraction, fiber extraction (#11). Participants emphasized that decision-makers with Tribal backgrounds or ties to the local community can foster safer, and more effective long-term collaboration efforts.

Another participant emphasized that lawsuits against the Klamath National Forest are often the Tribe's only means of having their input considered in land management decisions. They referenced the Memorandum of Understanding (MOU) between the Karuk Tribe and both the Six Rivers and Klamath National Forests, which outlines a shared commitment to “jointly identify, plan, and accomplish mutually beneficial projects, such as watershed restoration, job creation, and community economic development” (Karuk Tribe & U.S. Forest Service, 2000). The participants also discussed the interdisciplinary team responsible for developing the forest plan for these National Forests. Reflecting on their years of experience in Karuk DNR, Leaf Hillman explained:

> The successes we’ve had all started during times when they [the Forest Service] were under a lawsuit. That’s how we ended up with a fire MOU in the first place, on the tail

> end of a lawsuit. That's how we got someone on the ID [interdisciplinary] team for the forest plan. Anytime we made progress in our relationship, it was because of a lawsuit. We had their attention for a while, but it wears off, and they have to be reminded pretty frequently (#5).

Although collaboration with non-Tribal entities often presents challenges, participants shared a positive outcome that occurred during the 2023 Six Rivers Lightning Complex. Through the Integrated Strategic Action Plan (ISAP) process, the Karuk Tribe worked with federal agency leaders to transition from fire suppression tactics to strategic fire use during the incident. Leaf Hillman explained that these fires were caused by lightning and were burning far from communities. With resources already stretched thin due to other wildfires, the Tribe and leaders in the Forest Service who were deployed to manage the fire saw an opportunity to utilize the natural ignitions to reduce fuels in those areas.

> It's really an anomaly that happened, right people...right time, right place. It wasn't easy to take advantage of that opportunity. The biggest obstacle to it was their own fire fighting forces. We had people on the incident who were, these hotshot crews particularly, just shake their heads, like, "What are we doing? Why are we not suppressing this fire? We have an opportunity. We can go direct and we can put this thing out." It's like, you're missing the point. That's not what we want to do. We're getting good burning; we're getting good fire on the ground. Why would we defer that risk? It's a lack of understanding and they've been educated to do, and trained, and drummed into them, that this is the way you do it (#5).

The Karuk DNR documented these efforts during the Lightning Complex in a short video, intentionally wanting to use it as a teaching tool to advocate for cultural fire practices in the

future. Hillman reflected, “We need to take the opportunity, take advantage of something good that happened, and document it. Then use it to teach these teams” (#5). For a link to the video, see here: Shifting The Fire Paradigm in Karuk Aboriginal Territory – 2023 SRF Lightning Complex

Participants also highlighted the critical role of funding in revitalizing Karuk fire stewardship, noting the Tribe faces significant challenges in securing and implementing adequate funding needed for resources used in land management projects. DNR employees explained that the Tribe relies heavily on grants because existing funding from the federal government, often calculated based on acreage or tied to specific constraints and deliverables, is insufficient to meet their land management and staffing needs. Will Harling described the limitations of this funding, stating:

> [The Karuk Tribe] gets about $1,200 a year for community wildfire coordination. It’s National Fire Plan money, based on some formula they established using acres. So, we get $1,200 a year as our base funding for our fire program. You can’t even pay the heating bill with that, basically. We’re forced to depend on grants because all of these federal programs have allocations and budgets tied to them. We try to align our staffing at commensurate levels, but our staff has to do a lot more work than the federal staff, because we have to write grants, we have to do all these other things. And so, there's a significant equity issue there (#1).

Participants explained that, therefore, Karuk DNR relies heavily on a combination of state, federal, and private grants to sustain their fire programs and staff to return fire to the landscape. The primary funding sources included CalFire Forest Health grants, the TFPA and interagency agreements with the Forest Service. Federal programs, including the Bureau of

Indian Affairs (BIA) Reserved Treaty Rights Lands (RTRL) program, also contribute to Karuk land management funding.

A few participants mentioned that TFPA funding is particularly helpful in returning fire, as it supports both planning and implementation efforts and provides liability coverage for burn bosses under the 638-contracting authority, resulting in Tribal workers being treated as federal employees. The 638-contract, established under the ISDEAA, enables Tribes to have authority over federal programs and services, like fire management, enhancing overall self-governance and workforce protections. In contrast, they explained that the CFLRP funding they receive is more implementation-focused and less flexible in terms of who can access or utilize the funding. CFLRP is a federal initiative intended to help restoration efforts across large, fire-adapted landscapes through collaborative projects with various stakeholders, federal agencies, and rights-holders, such as Tribal Nations. One participant explained,

> We're building in [TFPA] funding for our burn bosses that are going to be implementing prescribed fire and for our folks that are going to be overseeing or coordinating with cultural practitioners to help govern the actions of our membership or our citizen base. This is so cultural fire practitioners can do what they need to do outside of those systems with NWCG qualifications and permits and all that. Hopefully we can work directly with the feds and the states on the coordination of that and make sure that we've got proper notification procedures going on, everyone knows what's happening, and we're not just having a bunch of crazy things happening that scare everybody, but ultimately, we have to live with some level of cautiousness as well (#2).

Participants also recounted a recent event where Karuk DNR received $11.5 million through the Wildfire Crisis Strategy, which was begun by the US Forest Service after passage of

BIL. The Klamath River Basin was designated as a priority area for investment in 2022 (FS-1187b). Participants explained that $1.5 million was allocated for Forest-wide NEPA planning related to fire, fuels, and aquatic systems, while $4 million was designated for hazardous fuels reduction projects, such as cut-and-pile treatments and future broadcast burning in the Klamath National Forest. We note, however, that all WCS funds were put on hold during federal fiscal year 2025 and that multiple sources of federal funding are currently in flux in response to Trump administration executive orders.

Participants stated that Karuk DNR also benefits from programs like the BIA's RTRL program, which provides funding to federally recognized Tribes for collaborations with federal, state, private, and other landowners for land management projects aimed to treat areas of ancestral territory with high wildfire risk (Russel et al., 2021). However, they explained BIA funding intended for fire related projects is usually minimal and is calculated based on the acreage of trust land the Karuk Tribe only has 900 acres of their ancestral territory in trust and this land had to be acquired first and then worked through the fee-to-trust land program. The fee-to-trust land program helps federally recognized Tribe's place "fee simple" lands into trust lands intended to benefit the Tribe with protections and programs under the BIA (Quinn, 2015). They mentioned that BIA funds are helpful for training, burn plans, and overtime costs for Tribal workers. However, BIA's involvement in daily operations is minimal due to low capacity which slows down the burn approval process, according to participants.

Despite significant challenges with funding and collaboration, participants highlighted the Karuk Tribe's ongoing efforts to restore cultural fire practices and strengthen their connection to ancestral lands. A product of their efforts includes *Good Fire I and II.* The documents cover bureaucratic barriers, management options and ecological benefits to cultural

burning in California, advocating for policy reform at the state and federal level. The documents also emphasize a difference between prescribed fire and cultural burning, a topic that was mentioned throughout multiple participants. Although the primary difference between prescribed fire and cultural burning can be seen as applying fire to the landscape for fuels reduction versus its holistic benefits, participants pointed out that cultural burning does not include government resources, approvals or permits while prescribed fire does. One participant stated, "Cultural burning is done within the sovereign authority of the Karuk people, or the sovereign responsibility of the Karuk people. Prescribed fire fits within the context of those other governance systems" (#2). Michael Sanchez further stated:

> People have different definitions of cultural burning. Each Tribe has their own definition. Ours is strict, we're not going to ask the Forest Service for anything. We're not going to do a permit or anything like that. We don't need to ask. We don't need to fill out this form to do cultural burning. We're at a standstill about progressing... where we need to be is in black oak stands in February and March, and be able to burn it with one person, not spend all the money on putting a line around it and having engines all over, people all over. It's not cost effective. You can go up to a black oak stand surrounded by fir trees, light it, and it'll go out once it goes into the fir trees (#7).

In addition to *Good Fire I and II*, participants noted that the Karuk Tribe works to provide opportunities to learn and practice cultural burning through the Karuk Indigenous Women-in-Fire Training Exchange (TREX). The Karuk TREX began in 2022 and has been held annually on Karuk ancestral territory. The Karuk TREX invites members of marginalized groups, with a focus on Indigenous women, to be trained in prescribed fire programs by local fire and cultural practitioners. The program is in collaboration with outside organizations like the

Nature Conservancy, the Mid Klamath Watershed Council and Fire Networks Women-in-Fire Prescribed Fire Training Exchanges (WTREX) to certify participants in varying aspects of prescribed fire. In this training program, participants are involved in all steps of the prescribed fire process, including landscape preparation, briefings, igniting, mop up (breaking up debris or stirring material to extinguish heat), and postfire monitoring.

Throughout interviews, participants referred to the roles Karuk people have in the landscape. Some participants explained that women were most likely responsible for managing basket materials, acorn groves, and medicinal plants for their families, communities, and ceremonies. They explained that women are needed in fire programs, offering a different perspective and holding valuable roles in sustaining the health and culture in their communities. This perspective is emphasized throughout the Karuk TREX program. The purpose of the program is to offer a safe and comfortable environment for Indigenous women to actively learn and build a relationship with fire, intending to reconnect participants with people and place. Leaf Hillman noted that with this program, "We can also empower basketweaver's, ceremonial people, to manage the ceremonial areas with fire because they always have and they have continued to do it" (#5). For a link to the short video, see here: The Women They Are Carrying Fire – Pa'asik'tavaansas Kuniktáamvunatuh (2023)

Another part of Karuk's advocacy to restore cultural burning and preserve traditions is to partner with researchers in academia, the Forest Service, and other Tribes. The Karuk are a leading Tribe in revitalizing cultural burning, sharing their knowledge of fire on the landscape, establishing research protocols and continuously advocating for their inherent right to burn, a right never relinquished through treaties. They explained that for their people to survive on ancestral lands there must be a shift in Tribal approaches to land management. For the Karuk,

this shift requires Karuk Peoples to not “blend in” anymore. Survival during European settlement led Karuk ancestors to hide, resulting in night activities to hunt, dance, and live as Karuk People. Leaf Hillman explained,

> About 35 years ago we were fighting for dam removal and people were laughing at us, thinking that we weren’t serious. It occurred to me that we can no longer blend in, we have to change strategies. Even strategies responsible for us existing, that strategy is no longer paying dividends, it is going to lead to our inevitable destruction. We have to stand up and be noticed. We had to have our voice amplified. Our people have never been good at that, we've been good at blending in. Which meant, don't be seen, don't be heard, don't oppose something, you don't stand up, you blend in because if somebody notices you, they're going to kill you. Time to change now, if we continue to blend in, we're going to get rubbed out (#5).

Participants added that there is a need for a community centered around Indigenous Fire Stewardship, a lesson passed down through oral storytelling. The participant explained a creation story, where fire was stolen from the people. To return fire, a community was created to steal it back. Hillman shared, “It took the mountain lion, coyote, the turtle, the rabbit, the bear, the taupe frog, and everyone else... The same thing is required now. It needs to be a coordinated effort from a lot of different entities to steal fire back because [the government] has taken fire from us” (#5). By working with outside researchers, the Karuk Tribe intends to amplify their voices and build communities centered around Indigenous Fire Stewardship.

5. Discussion

This study was designed to understand the Karuk Tribe's perspectives on post-fire management and policy, including post-fire recovery priorities, management options, and governance systems affecting the Karuk Tribe's ability to recover from wildfires and steward their ancestral lands. Participants discussed the ongoing impacts of settler colonialism in U.S federal land management on their livelihoods and ancestral territories. The Karuk people traditionally practiced fire stewardship across their lands, with women tending areas near homes to support food and cultural plants, and men burning in more distant areas to maintain hunting grounds and ecosystem health (Curtis, 2022). Fire is critical for protecting communities, animals, and basketry materials, while smoke helps preserve acorn quality and cool rivers during salmon runs (Norgaard, 2019). Recent evidence suggests the Karuk Tribe may have set as many as 7,000 fires in a single year as part of their ecocultural land management (Greenler, 2023). Fire stewardship and a many-thousand-year history of cultural burning are foundations of Karuk ceremonies and lifeways.

Participants noted that the fire-adapted landscape that previously protected and sustained Karuk ancestors is now under federal oversight and divided between the Klamath and Six Rivers National Forests. Policies supporting fire suppression and timber production have effectively criminalized Karuk presence and fire stewardship on their ancestral homelands. While imposed land jurisdictions require present-day Tribal members to navigate diverse governance systems for approval and permissions, which are rare and difficult to obtain, to carry out fire stewardship efforts on ancestral lands. In addition, over a century of fire suppression and timber production on ancestral lands, now recognized as federal/public lands, have disrupted centuries of fire stewardship previously honored and fulfilled by Karuk ancestors.

Participants explained that the Forest Service suppressed fire and pursued site conversion, working to convert lands from fire-adapted and oak-dominated woodlands to conifer forests managed for timber production. Through cutting and aerial spraying to kill hardwood species (Norgaard, 2019), and now in response to high intensity wildfire on federal lands, the Forest Service has practiced and continues to practice replanting of monocultures of Douglas fir for timber production as well as participate in salvage logging. Curtis (2022) and others have discussed the enforcement of fire suppression policy and tactics as a means of safeguarding profitable timber plantations during the time of colonial settlement and expansion (Anderson, 2006; Norgaard, Reed, & Van Hor, 2011; Hirt, 1996; Wilkinson, 2013). Participants noted that these practices, particularly when coupled with fire suppression, set up the forest to have recurring catastrophic wildfire after several decades of timber plantation growth, endangering the Karuk community, culture, and resources; this is why Curtis (2022) concludes and notes that fires like the Slater Fire are a product of settler colonialism.

Experiences shared by our participants suggest settler colonialism is not a thing of the past, it is still being practiced through the very systems that control Karuk land and limit Karuk fire stewardship. The barriers participants described, limited authority, exclusion from decision-making, and the need to constantly reeducate federal staff, are not just bureaucratic inefficiencies; they are the outcomes of a colonial system designed to undermine Indigenous governance and erase Indigenous knowledge. When federal agencies impose rigid protocols, ignore Karuk expertise, or cycle through staff without building lasting relationships, they are perpetuating a system that continues to dispossess the Tribe of land, power, and cultural continuity.

Participants made clear that these dynamics are not neutral; they reflect a refusal to prioritize Karuk sovereignty and the legitimacy of Indigenous fire knowledge. This can be reflected in the Karuk Tribes funding challenges that impact their ability to carry out fire stewardship practices. With only 900 acres of their ancestral territory designated as trust lands, many of the grants Karuk relies on are often awarded according to calculations based on acreage or deliverables that do not align with their stewardship needs. As a result, the Tribe pieces together funding from a combination of state, federal, and private sources, including Cal Fire, the TFPA, and the RTRL. However, limited capacity within federal agencies often delays the process of acquiring burn approvals and implementing projects. Any funding allocated to the Tribe is put toward planning, implementation, and covering liability for intentional fire. At present, funding access remains uncertain due to potential shifts in federal priorities under the 2025 US administration.

Despite ongoing bureaucratic barriers, the Karuk Tribe is asserting its inherent right to steward fire and reclaim relationships with their ancestral land. Participants emphasized that cultural burning is essential not only for ecological healing but for the survival of Karuk culture, governance, and identity. This advocacy is significant as fire stewardship is not just a practice, it is how Karuk ancestors protected their lands, sustained their communities, and ensured their survival. The Karuk people are here today because their ancestors fought and survived to maintain these practices in the face of colonial violence and erasure. Today's efforts to revitalize cultural burning are a continuation of that resistance. These efforts are deeply rooted in the assertion of Karuk sovereignty, the right to burn without external interference, criminalization, or delay (Clark et al., 2021; 2024). During the 2023 Six Rivers Lightning Complex, the Tribe helped shift federal fire response strategies away from suppression and toward the strategic use of fire through the Incident Strategic Alignment Process (ISAP), demonstrating what true

government-to-government collaboration can look like (Aldworth, 2024). They also continue to care for their lands through post-fire practices like coppicing, though such stewardship is still mostly limited to lands they legally own and manage.

Through advocacy, knowledge-sharing, and leadership in programs like Good Fire I and II, the Karuk Tribe is challenging the bureaucratic systems that continue to limit Indigenous fire stewardship. Trainings like the Karuk Indigenous Women-in-Fire TREX are not just workforce development; they are about reconnecting people with each other, ancestral knowledge, and the land. This work honors the legacy of Karuk ancestors who burned and resisted. By sharing their story and knowledge, they ensure that future generations can do the same.

5.1 Connections to the Broader Literature

Existing literature discusses important differences in worldviews for land management/stewardship when comparing Western colonial paradigms and Indigenous knowledge systems. Many Indigenous scholars have identified colonial perspectives as effectively separating humans from nature, or creating a man-nature dichotomy, while Indigenous perspectives understand humans as a part of nature with a responsibility to steward the lands upon which they depend (Tom et al., 2023; Vinyeta, 2013; Whyte, 2017; Whyte et al., 2018). This difference is significant, as colonial worldviews have informed decades of land management policy and practices that have disrupted and currently neglect relationships between humans and nature. In forestry, this is showing up not just in the evolving understanding of the history of Indigenous fire stewardship (Hagmann et al., 2021) but also in the understanding of the Indigenous stewardship that nurtured the development and maintenance of old-growth forests (Eisenberg et al., 2024). Suppressing Indigenous stewardship and cultural burning traditions and

then managing lands primarily for commodity production has led to land management paradigms that are detrimental for the land and people who live there.

In Western academic traditions predominant in natural resource management, one way we could understand different relationships with land and resource management would be as a difference between coupled and decoupled social-ecological systems. In a coupled system, which is more likely to be a sustainable system over generations, humans access their material needs from a landscape and directly experience feedback within their community from the ecological systems they depend on. For the Karuk, however, the relationship is even deeper than this and requires an understanding of land stewardship in a context of reciprocity, that is, an ethic and lifeway that goes far beyond typical conceptualizations of social-ecological systems. Kari Norgaard (2014a, 2014b, 2019) has discussed extensively Karuk People's reciprocal relationship with the land, where they are related to the natural world through spirit and have an inherent responsibility to support non-human beings and the places that sustain them. This theme showed up consistently in our data when participants spoke about the significance of cultural burning on Karuk lands and within Karuk culture for their own political and food sovereignty, well-being, religious freedom and vitality. By contrast, Western land management paradigms often separate or decouple communities from the lands or resources upon which they depend, leading to degradation of places precisely due to the lack of a feedback between land and water systems managed for commodities and the lack of community in those landscapes. The effects of this paradigm of land management for resource production create cascading negative consequences for local communities like the Karuk Tribe who live near lands designated for commodity production and depend on relationships with their homelands for survival. In our conversations with Karuk tribal members and staff, people noted that their use of fire and communication of

their stewardship responsibility was often misunderstood by federal agencies or seen to be at odds with federal land management objectives. In our conversations, participants said that colonial views of land and resources as commodities has led to an ongoing resistance of acknowledging intentional fire as a means of wildfire mitigation and ecocultural revitalization; other scholars have also documented this as well (Christianson, 2015; Hoffman et al., 2021; Layden et al., 2025).

A legacy of decoupled social-ecological systems enforced by U.S federal land management established and currently sustains negative impacts on Tribal Nations and their ancestral homelands. Participants consistently referred to bureaucratic barriers and preventions of Indigenous fire stewardship as a modern form of settler colonialism. The era of fire suppression, now compounded by climate change, has contributed to an increase in wildfires nationwide (Stephens & Ruth, 2005; Pyne, 2015). Wildfires are most likely to impact Indigenous communities that depend on lands within rural areas that are prone to impacts from drought, increased temperatures, and wildfires (Christianson, 2014). High intensity wildfire is also detrimental to resources vital to Indigenous lifeways and cultural practices, including nutritional foods, fibrous plants used in weaving and clothing, and wildlife populations significant to their relationships with non-human beings and places. Participants said that U.S federal land management systems often provide more funding, resources, and staff to Forest Service regions with higher timber production yields over regions with non-commodity producing land management needs (Biber, 2009). This manifests through incentives for timber production and fire suppression strategies that divert resources away from intentional fire practices, which have been shown to be proactive and effective in preventing catastrophic wildfires (Schultz et al. 2019 and Wilkinson, 2013). In these ways, the legacy of colonization continues to oppress Indigenous

people who suffer from increased fire risk in their homelands. The settler colonial paradigm is not just something of the past but remains active as Indigenous communities like the Karuk Tribe are still legally and practically prevented from using fire as a means of protection and preservation of their communities and resources they depend on.

Both Indigenous and non-Indigenous scholars agree that protecting communities from climate related issues requires not only fuel mitigation but reinstating, supporting, and amplifying Indigenous relationships with the land and their stewardship practices (Whyte et al., 2023; Datta et al., 2024). This is actively pursued and practiced throughout the Karuk community with implementations of cultural burning and coppicing on trust land alongside collaborations with researchers, the Karuk TREX program, and political education and advocacy through the *Good Fire I and II* reports. These efforts are intended to educate others on Karuk fire stewardship and support Karuk people's connection to land (Clark et al., 2021, 2024; Varney et al., 2025). Achieving a more sustainable form of land stewardship involves harnessing a deep understanding of local ecology that can only be learned through generations of observation and practice. Melinda Adams and other Indigenous scholars have spoken to the growing recognition of Indigenous fire stewardship as a science to be considered alongside Western academic traditions (Adams, 2024; Whyte, 2020, 2017; Norgaard, 2022). We saw this in Karuk, where the Tribe is a leader in cultural burning advocacy and practice, producing numerous studies with outside researchers highlighting the social and ecological benefits of cultural burning.

This recognition has contributed to a broader movement for Indigenous data sovereignty for all Indigenous Communities whose knowledge and stewardship practices are increasingly being considered in the face of climate change. Many Indigenous scholars have stated that the recognition of Indigenous knowledges must be accompanied with a recognition of Indigenous

rights, ownership, and authority in how their knowledges are applied and shared (Jennings et al., 2018; Hudson et al., 2023; David-Chavez et al., 2020). Karuk demonstrates this their active efforts to have Karuk DNR employees on fires and planning teams, and through the use of the Practicing Pikyav protocol in research collaborations, which enforces Tribal ownership, co-creation, and required approval prior to publication. Previous research has highlighted extractive practices in Western research, where non-Indigenous institutions tend to follow Indigenous guidance without Indigenous involvement or credit (Smith, 2012). Indigenous Scholars have developed a framework to address research needs such as the CARE Principles for Indigenous Data Governance (Collective benefit, Authority to control, Responsibility, and Ethics) developed as a complement to the FAIR (Findability, Accessibility, Interoperability, and Reusability) principles used in Western research (Jennings et al., 2023).

There are growing bodies of policy and practice recommendations, such as the Good Fire and the Status of Tribes and Climate Change (STACC) reports, that center Indigenous sovereignty in its fullest form, encompassing food, political, and data sovereignty (Whyte et al., 2023). These reports, like our findings, emphasize the need for Indigenous leadership and authority in cultural burning and fire management on ancestral lands. In our interviews, Karuk Tribal members emphasized that Indigenous leadership and sovereignty, in data and practice, is essential for protecting cultural practices, sacred sites, stewarding land and resources, and ensuring the safety and self-determination of their communities. Without it, efforts to care for the land risk being undermined, misunderstood, or made inaccessible by systems that have historically excluded Indigenous voices. We are beginning to see the state of California make legal strides toward supporting this shift and reflecting Tribal priorities, with recent legislation and policy frameworks acknowledging the legitimacy of cultural burning and its implementation

with minimal federal oversight. However, these are just starting points, and additional work is needed.

In summary, our study contributes to broader bodies of literature that highlight the negative environmental and social consequences of settler colonialism on both the land and Indigenous communities, driven by differing worldviews in land management systems. These impacts jeopardize Indigenous cultures, disrupt sustainable stewardship practices, and harm the local environment. Research is increasingly acknowledging this disconnect and the need to revitalize Indigenous knowledges, particularly in the context of climate change and increasing wildfire frequency. Several other bodies of literature, including policy recommendations from reports such as the *Good Fire* and STACC, demonstrate how federal agencies can support Indigenous sovereignty and leadership in land stewardship to address these challenges. However, welcoming Indigenous knowledge into federal systems requires the full acknowledgment of Indigenous rights and the active involvement of Indigenous peoples in the decision-making process. Federal land and fire managers can take the important step of educating themselves about the Indigenous people and their fire stewardship traditions in the places where they work and actively seek out the venues to engage Indigenous ecocultural practitioners in land management on ancestral lands. Our research emphasizes that the revitalization of Karuk fire stewardship presents an opportunity for meaningful reconciliation, especially in post-fire landscapes, where traditional practices can play a pivotal role in post-fire restoration. The success and longevity of these efforts remain contingent on the priorities of current and future U.S. political administrations, that ultimately determine how policies are implemented and where resources are allocated. A failure to support these practices perpetuates the legacy of colonialism, undermining Indigenous sovereignty and excluding traditional ecological knowledge.

6. Conclusion

Our research aimed to identify the Karuk Tribe's post-fire recovery priorities, explore management options to support those priorities, and examine governance systems impacting the Tribe. We discovered ongoing impacts of settler colonialism, such as land displacement, commodification, and access restrictions preventing the Karuk Tribe's ability to recover from wildfires and steward their ancestral land. Despite restraints, the Karuk Tribe is actively working to heal their community through the revitalization of fire stewardship through traditional land stewardship practices on their trust lands and through collaborations with researchers, agencies, and NGOs to share their knowledge while advocating for their right to practice fire stewardship.

This research was limited to a small sample size of 13 interviews; we were not able to speak with everyone we had intended to due to scheduling conflicts and limited availability. Our fieldwork was time-constrained by graduate school and grant timelines, with only seven days total spent in Karuk aboriginal territory to conduct in-person interviews, and a year to analyze data and write up findings. For our research, all participant outreach had to be coordinated through Karuk's Research Division Coordinator; we did not independently access participants. All interviews were conducted with Karuk Tribal members and staff only, limiting the study to their perspectives. While this was intentional for the scope of our research, further studies would be needed to understand how agencies like the U.S. Forest Service, particularly within the Klamath and Six Rivers National Forests, view post-fire management and Tribal collaboration. Additionally, our findings should not be generalized to all Tribal Nations or even all Karuk Tribal members, as each participant offered a unique and individual perspective. Similarly, the study does not fully capture the cultural context, ceremonial knowledge, or stewardship practices

that exist within Karuk fire traditions; knowledge and practice is deeply rooted in Karuk culture and traditional that cannot be fully shared or understood through limited interviews or outside perspectives.

Participants consistently spoke about the ongoing social challenges following the Slater Fire, including a severe housing shortage and how it is resulting in a lack of essential workers like teachers, dentists, and healthcare providers in their communities. They said these issues were limiting the community's ability to access proper and affordable health care, education, housing, and food. More research is needed to assess the broader social impacts of the Slater Fire on Tribal communities. Finally, we suggest learning more about the Karuk Women's TREX program, its significance, the roles it plays in cultural revitalization, and how it is connecting with other Indigenous communities and global Indigenous fire movements. The program is a powerful example of how Indigenous fire stewardship can center and support genders, creating space for women and Two-Spirit people to lead, learn, and reclaim their traditional roles in fire practice and governance. This remains an important area for future exploration.

Looking ahead, future research should be designed with an awareness of the structural limitations and ethical responsibilities that shape work with Indigenous communities. This includes recognizing the complexities of scheduling, as the availability of potential participants may be limited due to seasonal ceremonies, traditional practices, or other circumstances that can restrict opportunities for in-person interactions, which are often preferred. Future research should recognize that seasonal availability can further influence the knowledge participants share, as certain information may be more accessible or relevant during specific times of the year. Additionally, researchers could further investigate other complexities in fire management, such as funding sources that support land and fire management projects, the constraints associated

with those funds, and the deliverables or timelines they may impose. Also important are foundational understandings of Indigenous data sovereignty. Researchers, institutions, and federal partners must recognize that Indigenous populations and their knowledge(s) are not monolithic. Researchers must approach their work in a way that respects Indigenous sovereignty, and design research that allows for and prioritizes Indigenous ownership, authorship, and control over how their knowledge and cultural information is used or shared. This also includes understanding how policies are shaped, who benefits from them, and who is excluded.

There are real differences in management styles and worldviews between federal agencies and Indigenous communities, many of which are shaped by histories of colonialism, sexism, racism, and the exclusion of non-dominant perspectives from formal systems such as education, training, and governance. Future researchers should not only be aware of this context but also be willing to ask questions and explore how these dynamics show up in decision-making spaces, collaborations, and everyday interactions between diverse rightsholders. This includes understanding the deep relationship between society and the environment. In the context of this work, intense wildfires do not just damage landscapes; they reduce the resources that Indigenous communities rely on to recover, often increasing their dependence on government support. That support is frequently tied up in bureaucratic red tape, which compounds trauma and slows down recovery. The more we educate ourselves on these interrelated issues, the better equipped we are to support Tribal Nations like the Karuk Tribe in restoring their relationships to land, fire, and culture.

CHAPTER THREE: CONCLUSION

In this thesis, I explored recovery priorities and management options to foster an understanding of policy needs for Tribal Nations in post-fire landscapes. I found evidence of ongoing settler colonialism in federal forest and fire management as well as pathways to revitalizing Indigenous fire stewardship. I found that post-fire landscapes can be seen as opportunities for government-to-government collaboration, reaffirming Indigenous rights and sovereignty, with a focus on reintroducing cultural burning practices to the land rather than repeating their exclusion. Participants discussed the benefits of controlled, low-intensity fire in reducing the risk of catastrophic wildfires and safeguarding communities and ecosystems. They also identified bureaucratic barriers to reintroducing cultural burning, emphasizing how these obstacles contribute to ongoing harm and the increase of high-intensity wildfires.

In chapter two, I explored the perspectives of Karuk Tribal members on policy and governance challenges in post-fire response and recovery. Participants discussed the ecological and social consequences of current federal forest and fire management regimes on their ancestral territory. They discussed the negative impacts of fire suppression and timber plantations on the forest, suggesting that fire suppression tactics prioritized the protection of profitable timber plantations while disrupting centuries of Karuk land stewardship, effectively altering ecosystem functions, and increasing the community's vulnerability to wildfire. Even after wildfires, site conversion, or planting of Douglas fir monocultures in postfire landscapes often continues, reinforcing a cycle of catastrophic wildfire. These dynamics dismiss Karuk knowledge and safety while further degrading forest health. Despite these challenges, participants emphasized that cultural burning is a form of post-fire restoration necessary to promote the health and resilience of the community and landscape. They described cultural burning as a land stewardship practice and a responsibility to the nonhuman relatives that sustain them. However,

they also discussed persistent barriers to implementing cultural burning, including federal regulations, inconsistent collaboration, agency turnover, limited funding, and other legal constraints that restrict the application of cultural burning on federal lands. They highlighted the Tribe's efforts to restore fire stewardship on their trust lands with practices like coppicing that prepare the land to receive fire. They also highlighted their policy advocacy through recommendation reports, knowledge-sharing events, and research collaborations to amplify their Indigenous knowledge systems. Through these efforts, they are building a community around Indigenous fire stewardship, which they see as essential for effective post-fire response and recovery.

A limitation of this study was that the sample size was small. Data was only collected on the perspectives of the Karuk Tribe. In-person interviews were limited and held within a three-day visitation period to the Karuk ancestral territory. Findings of this study are context specific and cannot be generalized across all Tribal Nations or all members of the Karuk Tribe. This limitation can also be recognized as a strength, allowing for deeper insights that are reflective of the unique experiences and knowledge of individuals from the Karuk Tribe. Additional perspectives, particularly from U.S. Forest Service personnel and state agencies, would be necessary to fully understand post-fire response and recovery efforts on Karuk ancestral territory. We were also unable to speak with all the individuals we had hoped to include, and access to tribal participants was limited due to the collaborative nature of the study with the Karuk DNR. This research was conducted as part of a Master of Science degree program, which often imposes a limited timeline that can restrict opportunities for travel and extended communication with participating Nations, who may require more time for engagement.

Further research is needed to fully understand the social impacts of wildfires on the Karuk community. Several participants spoke about the loss of homes, resources, and lives that continue to affect community-run programs and daily operations. They explained that critical areas such as education, healthcare, and public services are suffering from staffing shortages exacerbated by a lack of available housing. Many participants also mentioned difficulties securing insurance due to high wildfire risk in their area. Future studies should expand our work by capturing the full range catastrophic wildfire impacts on both Tribal and non-Tribal residents in the region. Further research is necessary to understand how wildfires impact community services, including education, healthcare, and social support systems, to better inform policy and recovery efforts.

My research shows that the Karuk Tribe seeks a proactive role in post-wildfire response and recovery by returning fire to the landscape more frequently, especially within recent fire footprints, over continuing the pattern of fire suppression. This approach, grounded in generations of traditional knowledge and land stewardship, is essential to preventing future catastrophic wildfires. My research adds to an existing body of literature, highlighting the negative impacts of colonization on Indigenous communities and landscapes, which suggests that a paradigm shift is needed. This thesis offers a framework for federal agencies to reframe post-fire landscapes as opportunities to support Tribal Nations through meaningful collaboration grounded in an understanding of ecological, political, and cultural landscapes. Further research can be conducted to explore how such collaborations can be implemented effectively, including how federal agencies might engage with policy recommendations published by Tribal Nations. These published recommendations offer critical insights, enabling federal agencies to educate

themselves and seek partnerships with Tribal Nations rooted in respect, reciprocity, and shared responsibility for land stewardship.

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APPENDIX A – INTERVIEW GUIDE

SW CASC Tribal Post-Fire Interview Guide

1. Introduction

1. To start off, can you take a couple minutes to talk about how you ended up working for **[Tribe's Name]** as a **[Position Title]**? Background? Education?
2. Today I'd like to focus mostly on **[Tribe's Name]** post-fire recovery efforts for **[Incident X].** Could you please tell us about your professional role and responsibilities for treating lands affected by **[Incident X]**?

2. Recovery Priorities and Management Options

1. After **[Incident X]** occurred, what were your main priorities in terms of rehabilitating the land and how did you address these priorities?
2. After **[Incident X]** was contained, what initial steps did your department take to assess the damage? Is there an official process for conducting a Preliminary Damage Assessment (PDA)?
3. Were there any other priorities in terms of flooding, soil stabilization, invasive species, water quality, road or home damage?
4. **FOLLOW-UPS:**
    i. **NOTE: WE LIKELY WON'T ASK THESE BUT HAVE NOTED SOME POSSIBLE SPECIFIC QUESTIONS IF MORE DETAIL IS NEEDED:**
        1. *Did any excessive runoff and flooding occur because of **[Incident X]**? What impact did the flooding have on the community?*
        2. *Have you taken any steps to mitigate the impact of future flooding events? (**Follow ups, if needed**: bank stabilizers, gabion structures, berm and/or culvert improvements)*
        3. *Can you talk about the steps your department took to address post-fire soil erosion? (**Follow ups, if needed**: straw-mulch, wood-mulch, hydroseeding/mulch, debris collection fences, high-to-low elevation planting)*
        4. *After **[Incident X]**, did lands impacted by the fire experience any invasive species? Have you been able to implement any treatments to reduce invasives and promote the regrowth of native species? (**Follow ups, if needed**: hand pulling, mechanical removal, herbicide)*
        5. *Were any soil tests conducted to measure soil productivity or soil water repellency on lands impacted by **[Incident X]**?*
        6. *Did **[Tribe's Name]** experience any road damage from post-fire soil erosion? If so, how extensive was the damage and were you able to repair most of these issues? (**Follow ups, if needed**: armored dips, hydroseeding/mulch, culverts, litter cover, Woodstraw)*
5. What challenges and successes did you have in implementing management projects to address the post-fire recovery priorities that you just mentioned?
6. Are there changes you would want to see made to future land management practices in response to **[Incident X]** so that future fires aren't so severe?

i. What about community safety? Did **[Tribe's Name]** implement any planning or zoning changes to avoid future wildfire threats to the community?

3. **Governance Systems, Barriers, and Opportunities**
    1. Can you talk about your experiences working with federal agencies to address **[Tribe's Name]** post-fire recovery efforts? Specifically, who did you work with, and how did the partnership come about? We're interested in all phases of the partnership, from planning to funding to project implementation.
    2. I want to get your thoughts on how effective you think the **[Federal Agency Name]**'s post-fire response has been to **[Incident X]** on **[Forest X]**, specifically on lands that are part of **[Tribe's Name]** ancestral territories. Are they being responsible stewards?
        i. At any point did the **[Federal Agency Name]** consult with **[Tribe's Name]** on post-fire treatment projects on these lands? What did this consultation entail?
        ii. **If no**: If given the opportunity, would you have an interest in collaborating with **[Federal Agency Name]**'s post-fire recovery efforts on federal lands that are part of **[Tribe's Name]** ancestral territories?
    3. What role (if any) does the BIA play in implementing post-fire projects on **[Reservation/Rancheria Name]** lands?
        i. How would you describe your department's relationship with the BIA?
        ii. Has your department ever applied for or considered applying for a 638 contract through the BIA to fund land management projects either on **[Reservation/Rancheria Name]** or federal lands?
    4. Have any federal agencies consulted with your department or with representatives from **[Tribe's Name]** for assistance in identifying cultural sites and resources that have been impacted by wildfire on federal lands?
    5. **FOLLOW-UPS:**
        i. **NOTE: WE LIKELY WON'T ASK THESE BUT HAVE NOTED SOME POSSIBLE SPECIFIC QUESTIONS IF MORE DETAIL IS NEEDED:**
        ii. Now I'd like to ask you a few specific questions about your experiences with the National Interagency Fire Center (NIFC) Burned Area Emergency Response (BAER) team you worked with in the aftermath of **[Incident X]**; can you talk about how this process and interaction went?
            1. *Who initiated the collaboration between **[Tribe's Name]** and the BAER team?*
            2. *Were **[Tribe's Name]** representatives on site with the BAER team when they were conducting post-fire assessments on **[Reservation/Rancheria Name]**?*
            3. *Did they ask for your input and keep you in the loop while they were conducting their assessment?*
            4. *Did you agree with most of the findings and recommendations in their report?*
            5. *Did you implement any of the BAER team's recommendations into your post-fire treatments?*
        iii. Did you partner with the Forest Service at all in your post-fire recovery efforts? **(IF 'NO' MOVE ON TO FEMA SECT. IF 'YES':**
            1. How did this partnership come about?
            2. Has **[Tribe's Name]** participated in formal consultation with the Forest Service?
            3. What grant program(s) funded this partnership with the Forest Service?

4. Do you think that **[Tribe's Name]**'s priorities were taken seriously by the Forest Service, and were these priorities incorporated into project planning? Were the tribe's priorities similar or different to the USFS's priorities? How so?
5. Did the partnership extend onto federal lands or was it limited to **[Reservation/Rancheria Name]**?
6. Would you say that your partnership with the Forest Service was one of equals, or did the Forest Service have the final word on most matters?
7. What were some of the successes of this partnership? Challenges?
8. Were most of the project's objectives met?

iv. Let's transition to your experiences with FEMA. **(NOTE: WE WILL ONLY ASK 1 OR 2 OF THESE SUB-SECTIONS DEPENDING ON THE EXTENT TO WHICH THE PARTICIPANT HAS INTERACTED WITH FEMA)**

1. If tribe has an active/expired FEMA mitigation plan:
    a. *What prompted your department to put together a FEMA mitigation plan?*
    b. *Did the mitigation plan address post-fire recovery strategies? If so, what was included?*
    c. *Can you tell me about the process of writing the mitigation plan? Was it overly complex or was it straightforward and easy to put together?*
        i. *Did FEMA pretty much let you include what you wanted, or did they have the final word in what was included in the final version of the plan?*
    d. *Has the mitigation plan been helpful in addressing **[Tribe's Name]**'s post-fire recovery priorities?*
    e. ***If mitigation plan has expired**: Why did **[Tribe's Name]** let the mitigation plan expire? Do you ever plan to renew it? **If mitigation plan is still active**: Do you know how long the plan is active for? Do you plan to renew it when the time comes?*
2. If tribe has never had a FEMA mitigation plan:
    a. *What has prevented you from pursuing a mitigation plan with FEMA?*
3. If [Incident X] was NOT constituent to a Presidential/Fire Management Assistance declaration:
    a. ***[Incident X]** did not receive a Presidential or Fire Management Assistance declaration. Are there any post-fire treatments on these burned acres that you would treat if you had federal funding available, such as through an HMGP post-fire grant?*
    b. *Did you lobby any state or federal officials for a declaration? What reasons did they give you for refusing?*
4. If [Incident X] was constituent to a Presidential/Fire Management Assistance declaration but the tribe did NOT apply for an HMGP post-fire grant:
    a. *Is there a specific reason **[Tribe's Name]** did not apply for an HMGP post-fire grant?*
    b. *Is there anything FEMA could do to improve the HMGP grant process that would entice you to apply for these funds?*

5. If [Incident X] was constituent to a Presidential/Fire Management Assistance declaration and the tribe applied for and received funding from an HMGP post-fire grant:

a. Can you tell me about the process of writing the mitigation plan? Was it overly complex or was it straightforward and easy to put together?

*b. Did you use the BAER assessment you received for the **[Incident X]** in your HMGP post-fire proposal to justify project treatments and expected outcomes?*

c. Were funds delivered in a timely manner?

d. Did you have the final say in how these funds were spent, or did FEMA put restrictions on which treatments to implement?

e. How far did these funds go toward helping you meet your post-fire recovery priorities?

6. *Would you say that **[Tribe's Name]** and FEMA's post-fire recovery priorities are, for the most part, in sync?*

a. Did you have to compromise any of your post-fire recovery priorities to work with and receive funding from FEMA?

6. What can federal agencies do to better engage with **[Tribe's Name]** on post-fire land management decisions on **[Tribe's Name]**'s ancestral territories?
7. Are there any other federal agencies, state agencies, private, or nonprofit organizations that we haven't talked about who you've worked with to address **[Tribe's Name]** post-fire recovery efforts?

4. Closing

1. Are there any other partnerships or collaborations that **[Tribe's Name]** has been a part of that addressed post-fire management and recovery priorities?
2. Is there anything else related to post-fire recovery that we haven't covered that you'd like to touch on?

Is there anyone else from your department or **[Tribe's Name]** that you recommend we talk to?

APPENDIX B – CODEBOOK

SWCASC Code Book

Root Code: Background/Introductions	**Description: Personal histories, especially related to previous employment, education, and/or upbringing. Introductory conversations.**

Root Code: Governance	**Description**
Collaboration, Consultation, Trust	Ways in which tribes have collaborated with federal, state, NGO, or other tribes, including references to trust building with tribes.
Funding/Funding Programs	Any mention of how federal, state, or NGO funding programs impact the implementation (or lack thereof) of projects on a tribe's territory and ancestral homelands.
Tribal Sovereignty/Border Issues	Topics related to tribes' jurisdiction over their traditional territories and rights as sovereign nations in relation to federal/state agencies, NGOs, or other tribes.
Issues with Capacity	Any mention of capacity limitations or opportunities within the context of tribal land management, especially in relation to a tribe's ability or inability to accomplish high-priority projects.

Root Code: Indigenous Knowledge	**Description:**

Arrival/Contact	Historical tribal knowledge of early contact with settlers and the repercussions that followed UNRELATED to changes in ecology
Crosscultural Disconnect and Connections	Disconnect and connections between past, present, and future that exists between Western and Indigenous traditions.
Cultural Resources	Any mention of cultural resources important to the participant or community, especially in relation to natural environments.
Ecological Relationships	Any expression of knowledge about local ecosystems, including ecologically significant relationships between people, flora, fauna.
Intergenerational Ties	Language that speaks to generations of the past, future, and their ties to the present generation.
Origin Narratives	Creation stories or other traditional folklore.
Revitalization of IK	Any mention of attempts made to implement IK to land management projects, both actual or hypothetical, as well as challenge of implementing/revitalizing.

Spiritual Matters	Anything that comes up related to spiritual knowledge, it's use, and/or appropriate use of.

Root Code: **Land Management**	**Description:**
Contemporary Indigenous Policies	Details land management policies of Indigenous community members and employees, especially in relation to postfire environments. NOTE: If the participant talks about their experiences implementing projects ("We reseeded hillslopes"), code under Contemporary Indigenous Practices.
Contemporary Indigenous Practices	References to contemporary land management actions implemented by tribal forestry, natural resources, and environmental departments. NOTE: If a participant refers to guidelines or principles that guide land management actions ("After a fire, it's important to reseed hillslopes as quickly as possible"), code under Contemporary Indigenous Policies.
Federal/State Management Policies	Details land management policies of federal/state management agencies/departments, especially in relation to postfire environments. NOTE: If the participant talks about their experiences implementing projects ("We reseeded hillslopes"), code under Federal/State Management Practices.

Federal/State Management Practices	References to contemporary land management actions implemented by federal/state management agencies/departments. NOTE: If a participant refers to guidelines or principles that guide land management actions ("After a fire, it's important to reseed hillslopes as quickly as possible"), code under Federal/State Management Policies.
Eco/Social Impacts of Colonialism	Ecological and social consequences of colonial takeover of tribal lands, including any reference to replacing traditional ways and people from their ancestral homelands as a result of colonial settlement.
Implementation of IK	Ways that IK has been or could be implemented into land management practices.
Traditional Indigenous Stewardship	References to traditional Indigenous practices, ecological or cultural.

Root Code: **Postfire Ecological/Cultural Impacts**	**Description:**
Climate Change Impacts	Impacts of climate change on traditional tribal territories, especially in postfire environments.
Cultural/Archaeological Sites	Any reference to cultural/archaeological sites in postfire environments, including political/administrative references regarding other tribes/feds/states,

	especially matters related to accessing cultural sites pre- and post-fire.
Ecological Changes	Changes to an environment's ecology, without reference to colonialism/Western land management, FOR EXAMPLE, increasing fire intensity caused by climate change.
Invasive Species	Any mention of invasive species in postfire environments or otherwise.
Physical Health Issues	Human health issues associated with wildfire or postfire environments.
Postfire Resources	Resource opportunities that arise in postfire environments, for example, firewood, plants, etc.
Recovery Needs	Participant assessments of steps that need to be taken for landscapes to recover from wildfire.

Root Code: **Relevant Quotes**	**Description:** Quotations that express a particular sentiment in particularly compelling ways. ALWAYS DOUBLE CODED

Root Code: **Tribal Federal/State/NGO Relations by Agency/Department/Organization**	**Description:** ALWAYS DOUBLE CODED
BIA	Topics related to a tribe's relationship with the Bureau of Indian Affairs.
BLM	Topics related to a tribe's relationship with the Bureau of Land Management.
General Federal References	Nondescript references to an agency, department, or bureau, e.g. "agencies," "the feds," etc.
Multiple References	Use when a participant list more than two child codes from the Tribal Federal/State/NGO Relations by Agency/Department/Organization parent code.
NGOs	Topics related to a tribe's relationship with NGOs.
References to other Tribes/Tribal Members	Topics related to a tribe's relationship with other tribes or tribal members relationships with each other.
State Government/Agencies	Topics related to a tribe's relationship with state government and/or agencies.

US Fish and Wildlife	Topics related to a tribe's relationship with US Fish and Wildlife.
US Forest Service	Topics related to a tribe's relationship with the US Forest Service.