



# Summary Report from Tribal and Indigenous Communities within California



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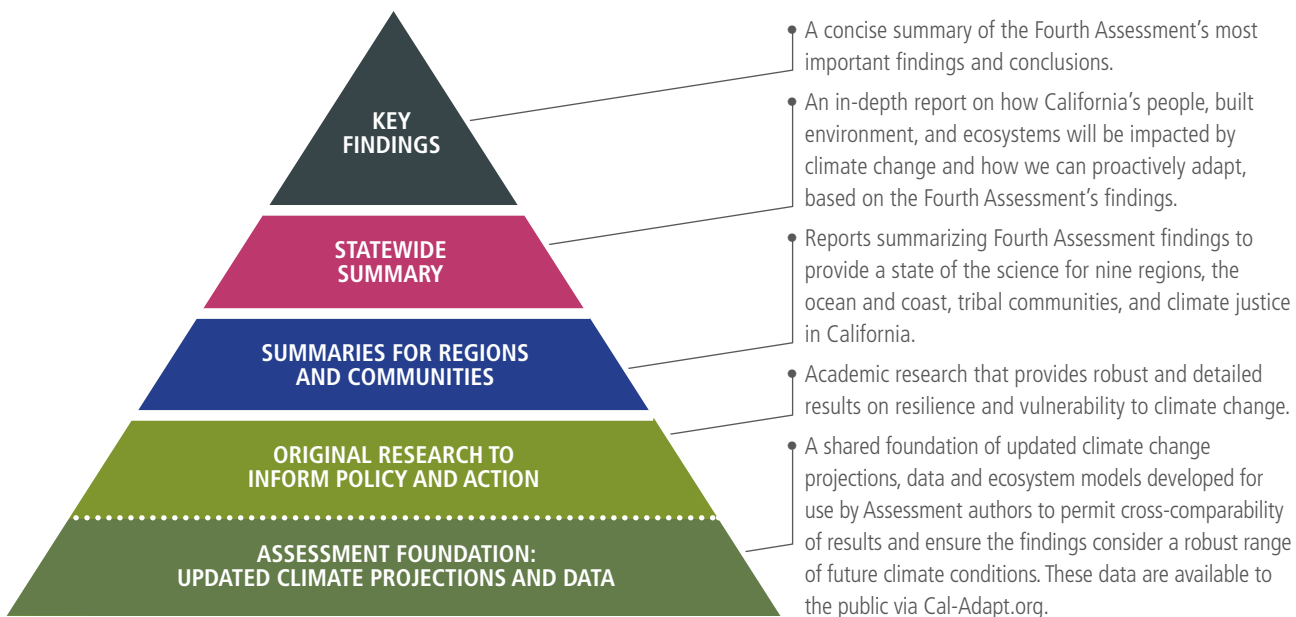




## Introduction to California's Fourth Climate Change Assessment

California is a global leader in using, investing in, and advancing research to set proactive climate change policy, and its Climate Change Assessments provide the scientific foundation for understanding climate-related vulnerability at the local scale and informing resilience actions. The Climate Change Assessments directly inform State policies, plans, programs, and guidance to promote effective and integrated action to safeguard California from climate change.

California's Fourth Climate Change Assessment (Fourth Assessment) advances actionable science that serves the growing needs of state and local-level decision-makers from a variety of sectors. This cutting-edge research initiative is comprised of a wide-ranging body of technical reports, including rigorous, comprehensive climate change scenarios at a scale suitable for illuminating regional vulnerabilities and localized adaptation strategies in California; datasets and tools that improve integration of observed and projected knowledge about climate change into decision-making; and recommendations and information to directly inform vulnerability assessments and adaptation strategies for California's energy sector, water resources and management, oceans and coasts, forests, wildfires, agriculture, biodiversity and habitat, and public health. In addition, these technical reports have been distilled into summary reports and a brochure, allowing the public and decision-makers to easily access relevant findings from the Fourth Assessment.

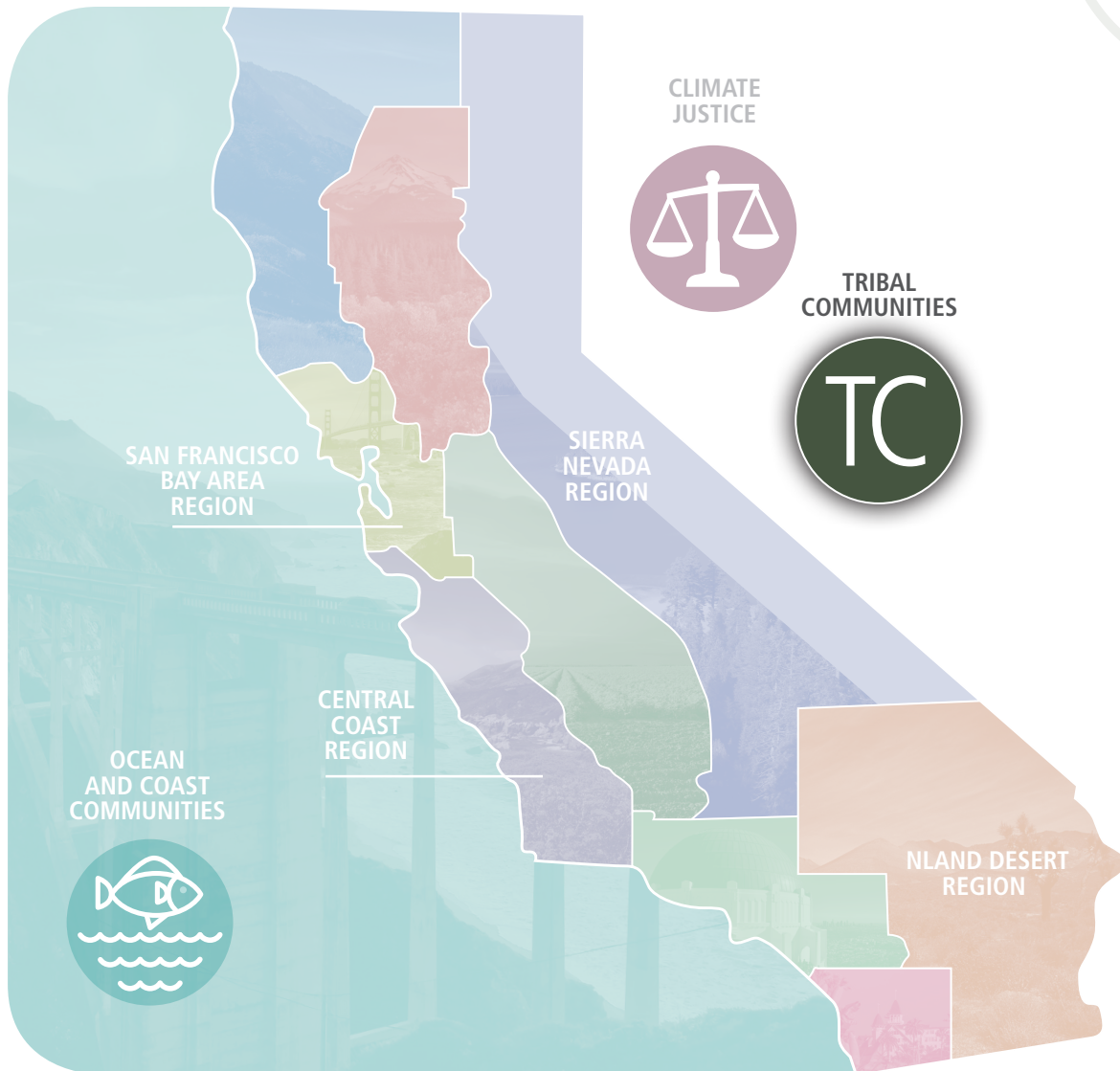


All research contributing to the Fourth Assessment was peer-reviewed to ensure scientific rigor as well as, where applicable, appropriate representation of the practitioners and stakeholders to whom each report applies.

For the full suite of Fourth Assessment research products, please visit: [www.ClimateAssessment.ca.gov](http://www.ClimateAssessment.ca.gov)



## Tribal and Indigenous Communities



The Summary Report from Tribal and Indigenous Communities within California is part of a series of 12 assessments to support climate action by providing an overview of climate-related risks and adaptation strategies tailored to specific regions and themes. Produced as part of California's Fourth Climate Change Assessment as part of a pro bono initiative by leading climate experts, these summary reports translate the state of climate science into useful information for decision-makers and practitioners to catalyze action that will benefit regions, the ocean and coast, frontline communities, and tribal and indigenous communities.

The Summary Report from Tribal and Indigenous Communities within California presents an overview of climate science, specific strategies to adapt to climate impacts, and key research gaps needed to spur additional progress on safeguarding Tribal Communities from climate change.



## Summary Report from Tribal and Indigenous Communities\*

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Disclaimer: This report summarizes recent climate research, including work sponsored by the California natural Resources Agency and California Energy Commission. The information presented here does not necessarily represent the views of the finding agencies of the State of California.



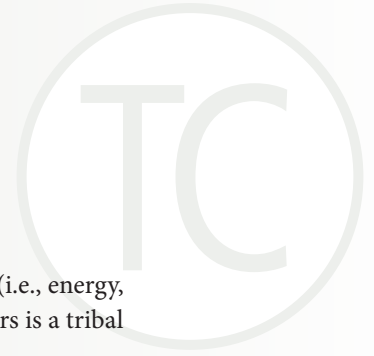


## Executive Summary

This inaugural Tribal and Indigenous Communities Report within the Fourth California Climate Change Assessment showcases tribes' innovative strategies and actions to address climate change. The report defines key climate impacts at the nexus of tribal lands, histories, and current conditions, describes stressors that amplify climate impacts within tribal communities, and proposes overall recommendations for future Assessment(s), including areas of study, climate actions that incorporate traditional ecological knowledge (TEK), and expanding areas of state/tribal collaboration. A focus of this report is TEK and related collaborative work with Tribes. The included case studies illustrate how TEK is unique to each tribe and underpins many tribes' environmental management and community and economic development approaches. TEK-based methods are gaining a revitalized position within a larger statewide toolset to combat the causes and effects of climate change by tribal and non-tribal stakeholders alike. Featured writings demonstrate the effectiveness of tribes' TEK-based scientific practices to solve some of the most acute climate change impacts. The importance of maintaining TEK is not isolated to environmental and ecological improvements. These ancient, traditional practices are closely linked to climate resilience across tribal cultural health, identity, and continuity. Cultural practices and traditional land management are also linked to improving physical and mental health among tribal members. Conducting meadow, watershed, and fisheries restorations, building sustainable energy infrastructure, and deploying resources to work more closely with outside agencies on projects are among an extensive array of tribal actions to reverse the causes of climate change and exert bold management to restore tribal lands and the shared environment. This report is the first outcome of a mutual invitation between tribes and the state to share learning with an urgent focus on climate action, and the starting point of a new productive climate conversation between tribes and the State of California. Selected highlights from this report are as follows:

- Tribes within California are actively managing climate change with innovative strategies.
- Habitat and watershed restoration, carbon sequestration, building sustainable infrastructure, and protecting and improving salmon runs are among an extensive array of tribal climate actions to reverse the causes of climate change and exert bold management to restore tribal lands, cultural and natural resources, and the shared environment.
- Tribal climate actions and solutions combine ancient history and generational and place-based knowledge from the symbiotic relationship between climate, environment, and human activity.
- Prior to Euro-American contact, tribes were the land stewards throughout California, and used a wide array of techniques to maintain an environment capable of supporting large, thriving human populations. These practices varied from tribe to tribe, but generally focused on ecosystem interconnectivity, respecting the carrying capacity of the land, and viewing humans as an integral part of the environment.
- Tribes are utilizing and blending traditional ecological knowledge (TEK) science and methodologies with other science and management techniques to mitigate and adapt to climate impacts.
- As an example of applied TEK science, many tribes use prescribed, controlled burns – commonly deployed within a centuries-old cultural context (“Cultural Burn”) – to manage meadows, forests, and other areas within tribal lands. These TEK techniques are increasingly incorporated by non-tribal land and resource managers as a part of wildfire prevention and ecosystem management.





- Tribal lands are burdened by climate change impacts to critical infrastructure and lifeline sectors (i.e., energy, water, food, communications/IT, and transportation), and increasing resilience within these sectors is a tribal strategy for climate change mitigations.
- This report includes several data sets demonstrating where traditional tribal cultural practitioners have noted the impacts of climate change over the course of their lifetimes. These observations demonstrate traditional cultural practitioners' ability to read and record the needs of the landscape, and direct actions to facilitate desired improvements. Coupled with active monitoring programs, these data are well positioned to provide a basis for predicting and steering outcomes and identifying correlative and causal relationships.
- Recommendations for future tribe/state co-management of climate initiatives are included, with a specific focus on strengthening climate assessments and data across tribal lands within California.





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## Introduction

Tribal climate change perspectives trace back thousands of years. For many tribes, climate solutions come from a variety of actors, ancient history, and generational and place-based knowledge from eras when the relationship between climate, environment, and human activity was more symbiotic. Many tribes reference changes in climate resulting from the Euro-American settlement era, and a change in land management from carrying capacity sustainability to a resource extraction model. From this perspective, tribes have experienced presently-defined climate change impacts for many generations. These impacts include, but are certainly not limited to, drought, air and water quality deterioration, sea level rise and inundation, food scarcity, supply chain vulnerabilities, increasingly severe weather and related disruptions and disasters, health impacts including shortened lifespans, dwindling wildlife numbers, deteriorating habitat conditions, soil erosion, and threats to cultural resources. Further,

“My mother taught me the value of learning slowly, to allow thinking to evolve with more information. She would present a difficult question, and guide me to consider it, to chew on it, sometimes for a year or more, until either I—or we—arrived at the answer.”

– Ron W. Goode,  
Chairman, North Fork Mono Tribe

“...[c]limate change impacts on many of the [over 570]...tribes...in the U.S. are projected to be especially severe, since these impacts are compounded by a number of persistent social and economic problems. The adaptive responses to multiple social and ecological challenges arising from climate impacts on indigenous communities...occur against a complex backdrop of centuries-old cultures already stressed by historical events and contemporary conditions. Individual tribal responses will be grounded in the particular cultural and environmental heritage of each community, their social and geographical history, spiritual values, traditional ecological knowledge, and worldview. Furthermore, these responses will be informed by each group’s distinct political and legal status, which includes the legacy of more than two centuries of non-Native social and governmental institutional arrangements, relationships, policies, and practices. Response options will be informed by the often limited economic resources available to meet these challenges, as well as these cultures’ deeply ingrained relationships with the natural world” (Bennett et al. 2014).

The Fourth California Climate Change Assessment Report (Assessment) has broadened the scope of prior Assessments, to include climate change considerations from Native American tribal nations, tribal governments, and tribal communities located within the state (hereafter referred to in general terms as “tribe” or “tribes”).<sup>1</sup>

<sup>1</sup> The terms tribe, tribal community, California Indian, Native American, and indigenous peoples are used interchangeably throughout this report. This report is a collection of diverse Native American perspectives from across California. Just as these groups have distinct names for their peoples (e.g., Karuk, Miwok, Miwko, etc.) there are various general terms used for the indigenous peoples of California. This report does not proscribe specific terms, but honors the preferences of the authors referenced herein.



There are over 100<sup>2</sup> federally recognized tribes and ~40-100 non-federally recognized tribes in California. While climate change indicators and impacts apply across the state, each tribe is distinct with unique histories, resources, and relationships to their environment, dating back to before the United States was a country, and before California was a state.

It is beyond the scope of this report to include climate impacts and solutions from hundreds of unique tribes. Further, while information on climate projections and impacts in California can be found in the Statewide Summary Report, and across the suite of reports that make up California's Fourth Climate Change Assessment, these reports do not specifically focus on climate impacts on tribal lands and resources, and as such, demonstrate a research need for future assessments (for more detail, see the recommendations section of this report). The Statewide Summary Report does highlight the need for a separate, distinct Tribal Assessment, and serves as a first step in building toward a comprehensive understanding of climate impacts on tribal lands and resources.

This inaugural effort seeks to highlight certain tribes' innovative strategies and actions to address climate change, to define key climate impacts at the nexus of tribal lands, histories, and current conditions, and propose overall recommendations for future Assessment(s), including climate action that incorporates traditional ecological knowledge (TEK) and areas of state/tribal study and collaboration.

Content for this report employs expert elicitation<sup>3</sup> and was developed through conversations with various tribal leaders and scientists. This report includes case studies from tribal perspectives that describe impacts associated with climate change across the Assessment's delineation of regions in California. Recurring themes include cultural resources (aquatic and terrestrial), tribal health (physical and cultural), cultural lifeways, and tribal phenology (i.e., the study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life).

These tribal case studies often include histories, to demonstrate the severity of climate impacts and the strength and effectiveness of tribes' climate actions, which have co-benefits and replication potential across California. For example, conducting habitat and watershed restoration, carbon sequestration, building sustainable infrastructure, and protecting and improving salmon runs are among an extensive array of tribal climate actions to reverse the causes

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2 It is important to note the common inaccuracy of data listing the number of tribes in California. Federal and state sources for these numbers differ. In this report the authors were inclusive, which presents a slightly larger number than the following illustrative sources: <http://www.ncsl.org/research/state-tribal-institute/list-of-federal-and-state-recognized-tribes.aspx#ca>; <http://www.courts.ca.gov/3066.htm>; <https://www.federalregister.gov/documents/2016/01/29/2016-01769/indian-entities-recognized-and-eligible-to-receive-services-from-the-united-states-bureau-of-indian>; <https://water.ca.gov/-/media/DWR-Website/Web-Pages/About/Tribal/Files/Maps/California-Indian-Tribal-Homelands-and-Trust-Land-Map.pdf>

3 Expert elicitation is a methodology used to combine the judgments of technical experts to have more informed policy under conditions of uncertainty. The underlying theory behind the methodology is that experts have more informed frames for viewing specific problems, including cases where data is insufficient or unavailable to inform decision-making, and there is a need to quantify the extent and causes of uncertainty. Expert elicitation generally depends on statistical methodologies and presents subjective judgments in a quantified manner. This is the first time a *Summary Report from Tribal and Indigenous Communities within California* has been included as part of the California Climate Change Assessment. The author team for the report spans a range of sectors, regions, expertise, and commitment to working on climate-related issues. Information on climate impacts and strategies and actions taken to mitigate and adapt to these impacts on tribes is often not documented in peer-reviewed scientific literature. Indigenous science, which includes long-term observations, monitoring, testing, and validation over generations, is often documented through oral traditions and passed down through traditional knowledge systems. Given this, a key guiding principle in the author outreach process for this report was that the value of traditional knowledge would be honored, recognized, respected, and protected.





of climate change and exert bold management to restore tribal lands, cultural and natural resources, and the shared environment. The recommendations included in this report are focused on the need for direct action to address climate impacts to tribal homelands and to increase collaborative tribal/state partnerships to enable these climate actions.

This report is the beginning of something truly innovative: a mutual invitation between tribes and the state to share learning with an urgent focus on climate action, incorporating traditional knowledges and practices. This synthesis is the starting point of a new productive climate conversation between tribes and the state.

“Across California, the area’s first people are reclaiming their roles as expert stewards of the state’s land and water resources. As drought and fire ravage undermanaged and overgrown public and private lands, [new] partnerships...are reintegrating native knowledge.”

– Lisa Micheli,  
Executive Director, Pepperwood Preserve



## Background

Today, tribes in California self-identify into three regions: Northern, Central, and Southern California. There are established Tribal Chairmen's Associations for each region, and these tribal government leadership forums address strategic issues concerning tribal governments and communities, including climate change.

Prior to Euro-American contact, tribes were the land managers of all of North America and throughout California. Tribes used a wide array of techniques to maintain an environment capable of supporting large, thriving human populations. These practices varied from tribe to tribe, but generally focused on ecosystem interconnectivity, respecting the carrying capacity of land, and viewing humans as an integral part of the environment. Much of that interconnectedness has been lost. Few tribal members are able to engage in their cultural traditions as a livelihood today. Nonetheless, these practices and their basis in traditional ecological knowledge (TEK) are re-emerging as foundations of, compliments to, and accelerators of modern techniques to combat climate change.

Tribes maintain cultural lifeways and rely on traditional resources (e.g., salmon fisheries) for both social and economic purposes. Adverse climate conditions such as drought, water scarcity, and air and water pollution have disproportionately large impacts on indigenous community health and well-being.

Tribal methods of managing the land are an essential and fundamental part of a concerted effort to successfully rebalance the climate. Due to historical events, regulations, and access prohibitions, tribes are separated from traditional homelands and harvest areas, have limited or no control over traditional resources, and are constrained in their ability to utilize TEK only within small land bases. Nonetheless, tribes throughout California are utilizing TEK and other scientific methods to evaluate climate impacts, and develop strategic plans and activities to improve the conditions in their respective homelands.

### TRIBAL LAND HISTORY

To understand the views of tribes in California on land and resource rights as they pertain to landscape-scale climate actions, it is important to understand the example of the "18 Lost Treaties."

In 1851-1852, three U.S. Treaty Commissioners negotiated and signed 18 treaties with tribes in California, which set aside ~8 million acres of land for tribes, and in return tribes ceded ~75 million acres of land to the U.S.

The U.S. Senate did not ratify the 18 treaties and placed them under an "injunction of secrecy" until 1905 (~53 years later).

As a result, many tribes all across California became "landless" as the laws allowed for others to gain title over the lands identified in the treaty maps.

This infamous history impacts current conversations regarding tribal land management and climate strategies, since access to land and opportunities to mitigate climate impacts are related to land access and jurisdictional authority.

Sources: <https://www.archives.gov/files/publications/prologue/2013/fall-winter/treaties.pdf>, and <http://digitalassets.lib.berkeley.edu/anthpubs/ucb/text/arfs003-001.pdf>





Tribes are no longer mobile across the landscape. For many tribes in California, seasonal movement and camps were a part of living with the environment. Today these nomadic options are not available or are limited. This is the result of Euro-American and U.S. policy and actions (see Tribal Land History sidebar) and underpins several climate vulnerabilities. Tribes with reservations/rancherias/allotments are vulnerable to climate change in a specific way: tribal lands are essentially locked into fixed geographic locations and land status. Only relatively few tribal members are still able to engage in their cultural traditions as livelihoods. Where tribal lands are subject to climate impacts such as sea level rise, extreme heat, drought, and wildfire, such lands are becoming unviable and, in some circumstances, uninhabitable, forcing some tribes to relocate, and negatively impacting cultural lifeways, sovereignty, and economic and social stability.

### Tribal Climate Timescales

For many tribes, there is an imbedded, cultural, long-term timescale applied to monitoring climate change: from “time immemorial” to present. Tribal climate action often contains the distillation of data stretching back thousands of years in the same region. Tribal climate data can include oral and written information passed down from generation to generation and incorporated into cultural norms and land management practices. Today’s tribal science looks back to ancient time to identify trends, norms, and adaptive behaviors within symbiotic relationships between humans and their landscapes. Tribal climate assessments incorporate this traditional data where it exists, as inseparable from more recent information.



## Traditional Ecological Knowledge (TEK)

Traditional ecological knowledge (TEK) is unique to each tribe and underpins many tribes' environmental management and community and economic development approaches. The indigenous people of California maintained their water, managed the land, and refreshed their resources with fire, tending, and harvesting. Today, tribes do not have management-level access to their ancestral territories. Due to tribes' reduced ability to tend resources, their traditional materials, foods, medicines and other resources are of low quantity and quality. However, through determined efforts by tribes to maintain these cultural lifeways and stewardship, TEK-based methods are gaining a revitalized position within a larger toolset to combat the causes and effects of climate change by tribal and non-tribal stakeholders alike.

Recent case studies demonstrate the effectiveness of TEK science and management practices to solve some of the most acute climate change-related problems such as wildfire, drought, human health hazards, and forest/watershed/species degradation (Indian Country Today 2014; Viles 2011; Sloan, K., & Hostler, J. 2014). Researchers at University of California at Davis performing DNA analyses in Spring Chinook salmon found that it was an “evolutionarily significant variation that has substantial ecological and societal benefits, and suggest ... [the need for] protecting [this] specific adaptive variation.” Tribes in California considered the Spring Chinook salmon unique and extremely important long before this fact was reconfirmed (Swezey and Heizer 1977). Further, a Reasonable and Prudent Alternative (RPA) to look at reintroduction of winter run salmon above rim dam(s) is underway. The winter run salmon are deemed evolutionary significant and endangered, and the federal government predicts if we cannot find a way to get these fish above the dam they may become extinct (NOAA 2017). In 2015, tribes' traditional controlled burn methods were called upon to combat wildfires in central and northern California.<sup>4</sup>

The importance of maintaining TEK is not isolated to environmental and ecological improvements. TEK practices are closely linked to climate resilience across tribal cultural health,<sup>5</sup> identity, and continuity, which in turn underpin social and economic sustainability. Cultural practices and traditional land management (sometimes referred to as cultural lifeways) are also linked to improving physical and mental health among tribal members. For example, many

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4 “As California battles its worst drought in 1,000 years — and after massive wildfires swept across the state for two consecutive summers — a number of tribe members, scientists and U.S. Forest Service officials are working to revive traditional Native American land management practices that some believe could help contain the blazes and lessen effects of the drought. Native Americans in California had long tended the land in ways that preserved watersheds to ease droughts and created barriers to out-of-control fires, said Rick Flores, steward of the Amah Mutsun Relearning Program at the University of California Santa Cruz Arboretum.

Flores is leading the program in conjunction with California's Amah Mutsun tribe to revive the knowledge of those cultural practices. One of the activities they have carried out is controlled burning in an effort to preserve certain useful plants and prevent larger fires.

The U.S. Forest Service uses prescribed burns in areas of high risk for wildfire, usually during the summer and not every year. But that practice has declined because of issues with staffing, budgets, liability and new development, a recent study showed” (Lewis, 2015).

5 Tribes define cultural health according to their unique culture(s), but generally is a holistic perspective that includes perseverance of culture and traditional lifeways. Maintaining native languages, subsistence fishing, preparing and eating traditional foods, preparing those foods by traditional means, song, dance, and use of traditional medicines may be included in cultural health. Interference with tribes' ability to interact with their environment can have a negative impact on their cultural health.





traditional tribal agricultural methods and crop species are more resilient to heat and low water stressors and grow more easily in difficult environments with less inputs. Use of these methods and species can reduce greenhouse gas emissions and water use, and provide sustainable and organic food production, increasing access to healthy foods, and economic opportunities through niche industry and markets based on traditionally inspired products.

Ultimately, as Chairman Ron W. Goode of the North Fork Band of Mono Indians states, “it starts in your own backyard.” Tribes are observing, analyzing, and responding to climate impacts with various strategies, which are grounded in tradition, unique to each tribe, and practiced and refined over generations.

## CASE STUDY | Traditional ecological knowledge (TEK)

Ron W. Goode, *Chairman, North Fork Mono Tribe*

Cultural resources and TEK are intertwined. TEK in my community is based on four factors: philosophy, practice, spirituality, and knowledge. TEK is repeating hundreds, and likely thousands, of years of tribal observational science passed down through many generations. Our knowledge is based on a philosophy that says we are at-one with Mother Earth. When my mother said our people could see the stars in the mid-day light, I asked, “Where do we look?” She turned her head, pursed her lips and pointed upward into the bright blue sky and waited until I saw it. Years later, a friend of mine was using a powerful telescope to show children one of the stars in the daytime. He could not locate it and told the children that his Indian friend could see the stars and called me to adjust his telescope. I looked up into the sky and turned his telescope, and the children looked into the eyeglass at the beautiful daytime star.

Ecological philosophy dictates our practices: gather what you need, leave some for the next gatherer, leave some for the animals, leave some for seed, and leave some for the bush itself (no one wants to be left naked). It does not matter whether gathering acorns, berries, sticks, or roots, the philosophy is taught and understood so that we can live off the land sustainability. Spirituality is integrated throughout philosophy and practice. Many tribes make offerings, give prayer, and sing songs when they come upon an ancient site, because the “old ones” (those who have been here since time began) are still there listening. We give thanks to the plants and trees for their offerings of sustenance and medicine, for example, when we acknowledge the keepers and spirits of the land, the elements, and the forest, the “old ones” will in turn communicate with us. The ability to communicate ecologically is not just a native or indigenous relationship but extends to all people.

With knowledge comes responsibility – responsibility to use gifts, share knowledge, and keep the traditions alive. As an elder Aborigine said, “healthy country, healthy people.” When we take care of the land, it will take care of us.

### APPLICATION OF TEK ON THE LANDSCAPE

Application of TEK on the landscape requires a holistic view of the plants, insects, fish, and animals within the landscape’s ecosystem, as well as their interactions with each other (including humans). Landscape decisions should look at the life cycle and potential changes in that life cycle impacted by decision-making. Likewise, decisions regarding species protection should not be considered in isolation of the ecosystem in question. Protection of endangered species within a specific region may be detrimental to the existing



ecosystem (plants, animals, insects, humans, etc.) and the diverse elements interacting in that system.

For example, on the Western side of the Sierra Nevada mountain range exists the Lahotan Trout; it is currently listed as an endangered species. The Lahotan Trout comes from the Eastern side of the Sierras. To some indigenous communities on the Western side of the Sierras the Lahotan Trout is an invasive species (i.e., non-native to the Western side). The indigenous native person does not say this species does not belong here. They ask, what is its purpose? What good does it offer? Does it make a good medicine, food, or stronger fiber? If they discovered the invasive was detrimental to their indigenous resource then they eradicated it, burned it, or just talked to it and told it to leave.

While working on a hydroelectric relicensing project and dam flows on the San Joaquin River, it was noted that there were too many Bass and they were minimizing the Trout population. On top of that the Federal Energy Regulatory Commission noted that eagles were no longer on the River, due to the lack of trout fish. So when spill day came in the spring, the spill was stopped by a State Agency because the Bass were spawning. With the application of TEK this would have been the perfect time to rid a future generation of the dominant Bass fish. You cannot restore the native Trout without first minimizing the dominant invasive species. TEK, as a more holistic science, could have helped point to the cascading effects that occur by relying on a solely Western science approach.

Implementing and incorporating TEK, stewardship terminologies, philosophical concepts, and development in all policies and regulations is critical when making decisions on issues pertaining to land, water, fire, habitat, and population concerns.

For example, the North Fork Mono Tribe conducts meadow restoration work in the Sierra National Forest. It takes years to eradicate invasive species. Eventually, the invasive plants are minimized and the native grasses return. Once they do they will keep the stronger invasive from being dominant again. At that point, the invasive can be reduced to non-existent.

When the North Fork Mono Tribe is conducting meadow restoration work, they ensure a variety of trees, plants, and cultural resources are allowed to grow, including Black Oaks, Golden Oaks, Canyon Oaks, Interior Live Oaks, and Chinquapins in and around the meadow edge of their restored areas. They trim, prune, thin, and manicure each of these species as well as the new sprouts, as did the Tribe's ancestors.

The new sprouts take three to five years to become established. When Live Oaks are starting out and are in the bushy state of growth, the birds love to make nest(s) inside of them. Deer eat the young leaves and twigs during the first three to five years of growth. At one of the Tribe's meadow restoration sites the Tribe has burned and pruned the three-year-old oaks back so the oaks can start all over. By doing this the Tribe uses new growth to lure the deer to the meadow for a longer period of time. After the initial three to five year growth, the young oak begins to blossom out, getting larger each year.

To understand this TEK concept a little better, we examine the life cycle of the deer. It takes a deer two and a half years of age before they breed, eight months gestation period, and the new baby fawn arrives when the mother is just over three years old. Now the young mother will take the new fawn back to the meadow where she ate young oaks so her young can do the same. If this cycle is repeated, a tradition is established. At the same time, other new oaks are also growing in the meadow (in addition to those being manicured by the Tribe), and that will support a larger population of deer to inhabit the restored meadow. This has been a tribal practice for centuries. This also meant tribes had a ready, local food source, and did not have to go far for their meal. Many intact meadows have archaeological site(s) nearby dating back hundreds or thousands of years, indicating the human connection to the meadows.





### CULTURAL BURNING

Indigenous peoples used and managed hundreds of cultural resources, medicines, fibers, and food sources. Because they could not leave their families and travel tens of miles to gather food every day, they ensured their local habitat 'refrigerator' was full by doing cultural burning where they lived.

When the Euro-Americans arrived, they reaped the rewards of a healthy forest ecosystem the Native Americans had controlled with fire and other techniques for thousands of years. But they did not know the traditional methods used to make it that way.

Descriptions of the beauty and abundance of the land were in large part due to tribes' active land management with prescribed wildfires and other traditional techniques. Documentation such as the Kinsman Diary of 1873-1894 describe daily accounts of the local Mono Indians' fire activity (Kinsman, n.d.). In 1834, Bill Walker came through upper Yosemite and described how open it was to travel through the forest and land. He followed a trail that led him and his party from the eastern side to the bottom of the western slope of the Sierras. The trails were made and kept clear by Native Americans. John Fremont spoke of the beauty of the land and the Indian, in 1844. In 1851, Jeff Mayfield described the golden beauty of the San Joaquin Valley in its richness of flowers, grasses and majestic oaks. In 1868 John Muir described the openness of the land and how it was like a "garden of Eden" for the Native American who lived out on the land.

Climate impacts such as more frequent droughts have combined with decades of fire suppression strategies (as opposed to periodically controlled burns) to increase the potential for severe wildfires (McCaffrey et al. 2015; see also Fourth Assessment Statewide Summary Report, Ch. 1).

A key component of meadow restoration is to routinely conduct prescribed burns. These cultural practices are ancient but have modern benefits, as they enrich and improve the soil and increase its ability to hold water, fire compels certain plants to grow, and it enables more wildlife to inhabit these managed ecosystems (Fourth Assessment Sierra Nevada Regional Report, Box 2).





## Social Systems and Built Environments

### Health

Tribes have persevered through centuries of colonial practices designed to exterminate them either physically or culturally. The persistence of tribes and their cultures demonstrates resilience in the face of change. Indian people still suffer from the generational trauma inflicted by both colonialism writ large and the federal government in particular. The cultural health of tribes is now threatened by climate change (Bennett et al. 2014; Donatuto et al. 2014).

#### CASE STUDY | Human Health Impacts from Climate Change

Shasta Gaughen, *Environmental Director/THPO, Pala Band of Mission Indians*

Climate change is commonly framed as an environmental issue, but the impacts of climate change on human health are equally significant. No community is immune from the health consequences of climate change, but how those consequences manifest will be different from place to place, and from culture to culture. [See Statewide Summary Report, Ch. 2 and regional reports for general information on impacts of climate change on public health; see also Gamble et al. 2016]. For tribes in particular, the health impacts of climate change are grounded in specific contexts that have arisen from historic, traditional, and contemporary circumstances. The tribal health picture in California is further complicated by the large number of distinct tribal communities and the diversity of ecological zones they inhabit (for a description of the 16 climatic zones in California, see Statewide Summary Report, Ch. 2). This makes providing a general picture of the human health impacts of climate change on California's tribal communities complicated. Nevertheless, it is possible to provide broad outlines of the major areas of concern, with a focus on the specific risks to tribal communities.

#### TEMPERATURE

Because California possesses enormous geographic and ecological diversity, it is subject to significant temperature-related climate variation (Statewide Summary Report). Temperature patterns range from intense heat in the desert to sub-freezing mountainous regions. Nevertheless, both historical records and patterns predicted by climate models indicate that temperatures in California overall are rising (Statewide Summary Report, Ch. 1), which will result in an increase in the amount of extreme heat days throughout California. Extreme heat is a health risk in particular for the young, the elderly, and those with underlying health conditions (Statewide Summary Report, Ch. 2).

For tribal communities, the risk may be exacerbated by a lack of infrastructure and public facilities that can be designated as "cool zones" for vulnerable tribal citizens. Furthermore, many tribal communities are economically disadvantaged; thus, residents may not be able to afford higher energy costs related to an increased need for air conditioning. An additional factor affecting many tribes, due to their rural locations, is a lack of easy access to medical facilities in the event of a heat-related illness.





## **WATER**

Drought is a constant threat in California, particularly in the central and southern portions of the state (Statewide Summary Report, Ch. 1; Los Angeles Report; San Diego Report, Inland Deserts Report). Recent droughts have not been linked definitively to climate change; nonetheless, climate research indicates that an increase in drought frequency and severity is likely to occur for the state as a direct result of climate change (Statewide Summary Report, Ch. 1). Many tribal communities rely on local water sources (ground and surface), so an increase in drought frequency and severity will impact water availability. Further, depleted water sources are more likely to harbor high concentrations of pollutants and disease pathogens, and become increasingly impacted by heavy rain events bringing polluted run-off (Ocean and Coast Summary Report). Coastal water sources may become saltier due to sea level rise and inundation by ocean water. Increased drought will also affect local ecology, with the potential to make traditional plant and animal resources scarce (Statewide Summary Report, Ch. 2).

## **WILDFIRE**

Wildfires create dangerous health conditions in tribal communities that can last for weeks, and tribes do not have the same capacity to deal with these impacts in terms of relocation, and other mitigations through cultural burning and forest stewardship.

Increased incidence of wildfire has been directly linked to climate change (Statewide Summary Report, Ch. 1). Vulnerable vegetation communities have been weakened by drought, allowing infestations of insect pests such as bark beetles to decimate forestlands (in part due to an increase in tree density, stress, and a lack of fire), creating millions of acres of dry tinder (Statewide Summary Report, Ch. 2).

Wildfire is a particular risk to rural and isolated tribal lands. Decreased air quality, destruction of cultural sites and gathering areas for traditional foods and medicinal plants, and damage to sacred lands are other critical impacts of wildfire within tribal communities (U.S. Health and Human Services 2017).

## **AIR**

Changes in climate patterns cause changes in air quality. Warmer temperatures can cause shifts in air patterns, leading to increases in particulate matter, ozone, and other pollutants (Statewide Summary Report, Chs. 2 & 3). An increase in the number, severity, and duration of wildfires causes risks from smoke. Impacts to vegetation communities may create changes in allergy patterns, with increases in pollen distribution and density.

All of these factors increase risks in tribal communities to children, elders, and/or those suffering from respiratory ailments such as asthma and lung diseases like chronic obstructive pulmonary disease (Gamble et al. 2016). Asthma rates among both adults and children in Native American communities are higher than they are among the general population.

The impacts of climate change and health in tribal communities must be assessed in partnership with tribes on the basis of each tribe's particular cultural background and individual circumstances. Beyond protecting physical and mental health, climate change adaptation in tribal communities must also protect cultural health.





## Culture

Cultural resources are environments, conditions, practices, places, plants, and animals that are of significance to a particular tribe's culture. Climate change is impacting cultural resources across all tribal lands. For example, tribes along the Klamath and Trinity Rivers have highlighted the adverse impacts of dams on salmon populations (a keystone cultural resource) for decades (see for example, Belchik et al. 2004). Additional information on climate impacts to tribes throughout these regions is provided in the North Coast Summary Report of the Fourth Climate Assessment (North Coast Summary Report). These adverse impacts are compounded by drought and increased sediment due to climate change. South Coast tribes are threatened by a loss of gathering areas, traditional plants used for food, medicine, and basketry, and (more abstract but as significant) a loss of a sense of continuity with connection to the land. Tribal gatherers in central California have had to travel north to the Hoopa Reservation, Lake Tahoe, or south to Tehachapi to gather enough Black Oak acorns for their cultural events. However, cultural resource protection and restoration is occurring across California, and traditional practices are combining with new discoveries to effectively protect critical resources in the era of accelerating climate change.

Traditional ecological knowledge offers an avenue for adaptation, mitigation, and resilience by tribes, but even this knowledge is threatened by the drastic impacts of temperature rise, sea level rise, drought, wildfire, air pollution, and more. Tribal cultural practices can provide a bulwark against some of the risk, as a strong sense of community identity and group cohesion provides a protective benefit to both physical and mental health.

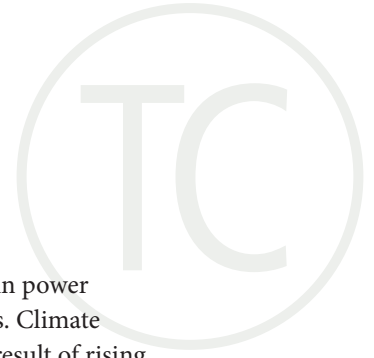
## Energy and Transportation

Greenhouse gas emissions from the energy and transportation sectors, specifically the burning of fuels, are the largest contributors of greenhouse gas emissions (ARB 2017). As stated in "Risk to Return," a report (riskybusiness.org) that focuses on investments in a clean energy economy:

"Seriously addressing climate change requires reducing greenhouse gas emissions by at least 80 percent by 2050.... [T]his goal is technically and economically achievable.... The transition to a cleaner energy economy rests on three pillars: moving from fossil fuels to electricity wherever possible, generating electricity with low or zero carbon emissions, and using energy much more efficiently" (Risky Business Project 2016).

Tribes are moving to build all three pillars: they are transitioning to electric systems, decarbonizing their energy and transportation sectors, and improving energy efficiency. With tribal government investment, tribes are implementing low- or zero-carbon energy and transportation solutions to fight climate change. Examples of innovative climate solutions include the Rincon Band of Luiseño Indians' (Ross 2016) and the Federated Indians of Graton Rancheria's installations of megawatt-scale solar arrays to offset fuel-burning energy to their economic enterprises. Others, like the Tule River Tribe, are electrifying their transit bus and government vehicle fleets (Greenpower 2017).

The apex climate impact from the energy and transportation sectors is air pollution. It is critical to reduce fine particulate matter pollution (PM 2.5), and other air pollution components (e.g., nitrogen oxides, ozone, carbon monoxide) for climate and health benefits. And it is important that communities understand the severity of the impacts: a 2010 California Air Resources Board study estimated that PM 2.5 causes ~9,000 deaths annually in California alone (ARB, 2010).



Tribal communities are impacted by air pollution from multiple sources, including biomass burning (in power plants, wood stoves, wildfires), diesel generator emissions, and vehicle emissions, among other sources. Climate change exacerbates air pollution with increased pollen, dust, and other airborne particles that are the result of rising temperatures, drought, and other conditions (USGCRP 2016).

Further compounding climate impacts are historic gaps in energy and transportation infrastructure within tribal communities: there are large tribal areas in California that have never had electrical grid, natural gas, internet, or other basic utility services (Tam 2010; McGill 2018).

Tribes are working to reverse the causes of climate change in the energy and transportation sectors, and the two sectors are increasingly overlapping with the advent and adoption of electric vehicles.

It is also important to note that even zero-carbon, renewable energy projects may have impacts on tribes' cultural resources:

“Renewable energy projects provide significant benefits both in promoting energy self-sufficiency and as a response to global climate change. As the United States shifts its energy policy away from fossil fuels and towards renewable energy sources in order to take advantage of these benefits, the West—and California in particular—are experiencing a dramatic increase in the number of utility-scale solar projects being sited or proposed to be sited on federal public lands managed by the Bureau of Land Management (BLM) ... The BLM lands proposed for siting these projects or where projects already have been sited often include lands that are of religious, cultural, and historic significance to Indian tribes. The consequences of renewable energy development can be devastating to pristine, irreplaceable landscapes that hold religious, cultural, and historic significance to Native American people and Indian tribes ... The project areas are fenced off and can involve leveling of land and removal of vegetation. This increases the risk of erosion and alters water flow. Significant impacts to wildlife include destruction of habitat and blocking of connectivity corridors and migration routes. There are significant visual impacts, as the project area is often a pristine landscape with little to no development other than the project itself. There are also noise and air quality impacts. These impacts all significantly change the character of the area and affect lands of religious, cultural, and historic significance to Indian tribes. In developing renewable energy projects that are intended to mitigate climate change impacts and protect the environment, therefore, it is critical that government agencies with approval authority over these projects ensure that such development does not destroy the very things that renewable energy development is intended to protect” (Houck 2013: 37).

Strategic and project-by-project energy and transportation development seeks to balance all of these complex considerations. The Desert Renewable Energy Conservation Plan (DRECP) is an example of a concerted effort to work through adverse impacts up front, to identify sites of least conflict, and pre-designate those as favorable for renewable energy projects. This effort was in part a state response to tribal requests to be included in strategic energy development discussions. Tribes in California have recommended to U.S. Department of Energy (Indian Country Energy and Infrastructure Working Group 2015) that the DRECP model be considered as a national tribal energy development initiative, to help reduce the costs of environmental review and to pre-identify renewable energy development sites on tribal lands in other areas of California and across the U.S. – specifically to rule out and/or mitigate sites of cultural importance.



## CASE STUDY | Blue Lake Rancheria Decarbonized Energy and Transportation Lifeline Sectors

### CURRENT CLIMATE IMPACTS

The Blue Lake Rancheria, California (Tribe) is located in the Mad River valley in rural Humboldt County. Currently the Tribe is experiencing primarily temperature increases, wildfires, drought, extreme storms, and flooding events as a result of climate change.

### STRESSORS THAT AMPLIFY CLIMATE IMPACTS

Humboldt County, where the Tribe is located, is an energy peninsula, which locals refer to as “behind the Redwood curtain.” There is a 115 kV transmission loop that runs through wildfire country, and import is restricted to ~70 MW. There is one 10-inch natural gas line to serve the region. Diesel fuel is expensive and supplies can be threatened due to disasters and disruptions. Local diesel retail costs are typically among the highest in the lower 48 states (Humboldt Economic Index 2018; GasBuddy, n.d.), and landslides across the region’s two main arterials are frequent, causing supply constrictions. Out-of-area impacts such as hurricanes and refinery output can in turn impact local barge/shipping/trucking vulnerabilities. Further, Blue Lake Rancheria is within one of the most dangerous and active seismic zones in the U.S. The Cascadia Subduction Zone, Mendocino Fault, Gorda Plate, Pacific Plate, and North American Plate all converge at the ‘triple junction,’ directly offshore from the City of Eureka (about 20 miles from the Tribe’s lands). Large earthquakes and/or tsunamis are a constant threat, and Cascadia Subduction Zone earthquake predictions are dire (Schulz 2015). Many tribes are located in areas that have some or all of these conditions.

### CLIMATE CONCERNS / EMERGING ISSUES

Adding to these vulnerabilities and threats, climate change has amplified local impacts. Drought is now an annual occurrence or threat and brings with it toxic blue green algae (cyanobacteria) in the Mad River, which was once a rare event. The fog which local giant Redwoods, the tallest trees on the planet, rely on is less prevalent. Storms (and resulting landslides) are more frequent and severe. Additional information on climate impacts in this region is provided in the North Coast Summary Report.

Humboldt County and tribal lands within it are already in “non-attainment” with particulate matter air quality standards. Emissions from the region’s biomass power plants and woodstoves are factors, and wildfire has increased to be an imminent and constant danger year-round. Costs – including energy and transportation – are rising due to cascading effects of a warming planet. In October 2017, a ~25-acre wildfire flared up directly across CA Highway 299 from the City of Blue Lake and the Tribe. Due to quick action by local and state responders no one was hurt, but it was an illustrative event that even in the Tribe’s historically temperate region with significant annual rainfall and high humidity, wildfire threat is imminent and the ‘new normal’ for the Tribe and the region.

### INNOVATIVE SOLUTIONS

The Tribe has implemented several energy and transportation initiatives that both mitigate climate change by reducing greenhouse gas emissions and improve climate adaptation and overall resilience in the energy and transportation sectors.





In the energy sector, the Tribe, in partnership with the Schatz Energy Research Center at Humboldt State University, Pacific Gas and Electric Company, Idaho National Laboratory, Siemens, Tesla, and several other academic, public, and private partners, implemented a low-carbon community microgrid. Funded in part by the California Energy Commission through an Electric Program Investment Charge grant, the microgrid was completed in March 2018 and is in full-time operation. The microgrid has a power generation backbone of a ~500kW solar photovoltaic array and ~1MWh of battery storage, and provides power to the Tribe's main campus of critical infrastructure, including the government office, economic enterprises, electric vehicle charging infrastructure, and other lifeline sectors including water, food facilities, and communications/IT. Results include eliminating ~195 tons of carbon dioxide emissions each year, \$200,000 in energy cost savings, and the ability to disconnect from the larger grid and provide emergency power to the campus – which includes a certified American Red Cross shelter – for as long as needed.

In the transportation sector, the Tribe has a biodiesel manufacturing system, which uses waste cooking oil from the Tribe's kitchens to create lower-carbon fuel for the Tribe's public transit buses. The transit system is the only public transportation serving the Mad River Valley region. The Tribe has also installed multiple level 2 electric vehicle charging stations, which are powered by the low-carbon microgrid.

At the time of this report the Tribe is building another microgrid to serve its fuel station / convenience store complex. The project is again funded in part by the California Energy Commission through an Electric Program Investment Charge grant, and is a partnership with the Schatz Energy Research Center, Lawrence Berkeley National Laboratory, Tesla, and others. The goal is to combine rooftop/canopy solar array, battery storage, and microgrid and advanced building efficiency controls to create a replicable low-carbon resilience package for the Tribe's facility. There are over 12,000 similar facilities in California, and these fuel stations/convenience stores, especially in rural areas, are critical infrastructure in business-as-usual and emergency situations. Providing a low-carbon solar power plus battery storage solution will improve resilience and drive down the causes of climate change.



Photo Credit: Blue Lake Rancheria



Photo Credit: Blue Lake Rancheria



## Land Use and Community Development

Tribes with established reservations are vulnerable to climate change in a specific way: tribal lands are fixed in a certain location, with tribes essentially locked into rancherias, allotments, or other types of fixed geographic locations and land status. Where these tribal lands are subject to climate impacts such as sea level rise, extreme heat, drought, and wildfire, they could become uninhabitable and, under extreme circumstances, force tribes to relocate.

### CURRENT CLIMATE IMPACTS

In 2017, tribes in the Lake County regions of California were driven from their homes as a result of wildfires. Many tribes are enacting emergency planning to address these incidences, and are now engaged in activities and advocacy to improve conditions strategically. Climate changes impacts experienced by other tribes within the U.S. are harbingers of the difficulties that will likely impact tribes within California. For example, due to sea level rise and other factors, the Quinault Indian Nation in Washington State is in the process of relocating its lower coastal village to a culturally connected location inland at higher ground (Quinault Indian Nation 2015). In all cases, relocation to new tribal lands – often federal trust land – is administratively difficult, prohibitively expensive, takes years or decades to accomplish, and is fraught with cultural, social, and economic upheaval.

### CLIMATE CONCERNS / EMERGING ISSUES

Many tribes throughout the State of California do not have the abundance of water they once had. The majority of California's water comes from traditional tribal homelands, yet tribal water rights remain contested. Many tribes repeatedly state they never relinquished their water rights. Tribes (like downstream farms), are losing wells annually, increasing depth of wells, and being exposed to iron, magnesium, uranium, arsenic, and heavy minerals. Many tribal members throughout the state have to filter their water at a very high cost, and cannot use excess water for recreational uses (e.g., children's wading pools). Tribes have constant maintenance on their community and residential water systems.

The indigenous people of California maintained their water, cleared the land, and refreshed their resources with fire, tending, and harvesting. Today, they do not have access to gathering or harvesting in State Parks, other conservation lands, or their ancestral lands. Because tribes have not put cultural fire on the land and have not had the ability to tend resources, their fiber materials, foods, medicines and other resources are of low quantity and quality.

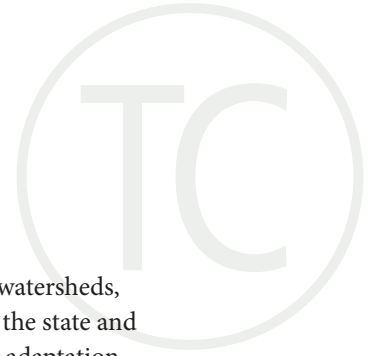
Tribal health is affected by drought and climatic changes because tribal members cannot use traditional medicines. Many indigenous communities are adapting and engaging in gardening their own traditional medicines. Tribal people throughout the state are now highly involved in forums, collaborative groups, cooperatives, Integrated Regional Water Management (IRWM) programs, and co-management efforts to enhance their cultural resources.

Although many tribes have developed economic enterprises (e.g., approximately half the federally recognized tribes across the state have gaming enterprises<sup>6</sup>), tribal communities are still among the most socio-economically disadvantaged due to historic factors exacerbated by climate change impacts.

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<sup>6</sup> There are over 100 federally recognized tribes in California and dozens of non-federally recognized tribes and tribal communities. The majority of tribes with gaming enterprises only generate sufficient revenue to support tribal governmental functions.





## Natural and Managed Resource Systems

Today across California, tribes manage an array of lands and natural resources – forests, waterbodies, watersheds, developed areas, and wildlands, among others. Often tribes are in co-management arrangements with the state and other governmental and agency entities, and work cooperatively on climate analytics, mitigations, and adaptation efforts. The following case studies allow tribal communities to present, in their own words, both the impacts they are directly experiencing from climate change as well as some of the co-management arrangements that they are using to combat climate change.

### CASE STUDY | North Mountain Pit River Tribe Environmental Protection Department

Case Study Primary Author: Pit River Tribe Environmental Protection Department, excerpts from contributing authors included for thematic consistency.

Located in a region that spans a vast area referred to as the '100-mile square' ("square") that approximates 7,000 acres, the Tribe is federally recognized and comprised of 11 autonomous bands: the Ajumawi, Aporige, Atsugewi, Astarawi, Atwamsini, Hammawi, Hewisedawi, Ilimawi, Itsatawi, Kosealekte, and Madesi. There are Shasta Wintun to the northwest and the west, where some of the bands have Yahi and Wintun blood as well. Down to the southeast of the square are the Hat Creek Bands of Atsugewi and Aporige. These bands are bordered by the Maidu and have been referred to as Snow Maidu historically. Up to the far east were the Kosealekte and Hammawi Bands. These upriver dwelling bands are bordered with Paiutes to the east. At the very top are the Hewisedewi bands to the northeast, neighboring with the Modocs. The Medicine Lake Highlands is located near Ajumawi and Madesi bordering Mount Shasta. Pit River People share bloodlines from ancestors that can be traced back to their respective band and contain bloodlines from bordering tribes. From Madesi Country near Montgomery Creek/Big Bend to the high desert of the Modoc Plateau in Alturas, Pit River territory expands five counties and multiple watersheds with unique habitat types. These habitats and watershed conditions create diverse communities with varying demographic and socioeconomic conditions.<sup>1</sup>

The Pit River Tribe is made up of 11 autonomous Bands with different cultural values and traditions. Some people may go to Fall River gospel church and others may practice traditional dances and ceremony. There are a few tribal events every year that are less formal and emphasize health. These events include the Ancestral Run that goes from Mt. Shasta to Mt. Lassen. There is now a run route that comes from the Upper Pit River Bands from Alturas and Big Valley area to Burney to join the other run. Others celebrate the winter and summer solstice through dancing. Some opt to just pray in private during key times of the year. The diverse culture and identity of the 11 Bands and families cannot be overemphasized.

#### CURRENT CLIMATE IMPACTS

Currently (early spring, 2018) in the mountain regions, the Manzanita is blooming and early blooms are impacting traditional food harvests. The Pit River Tribe (Tribe) evaluates impacts of climatic changes, and members are already seeing changes in season transitions, early blooms, and other instances that can and will negatively impact traditional food gathering, as well as management of invasive species, animal migration, patterns of groundwater availability due to reduced snow pack, reduced groundwater filtration, and changes in rain patterns.

<sup>1</sup> Given this expansive geography and regional diversity, an adequate summary of all local considerations is impossible here. However, additional information on specific climate impacts in these regions can be found in the North Coast, Sierra Nevada, and Sacramento Valley Regional reports.





Smaller snow packs, increased precipitation, and mono-cropping forestry plantation practices have resulted in dryer forest stands that are prone to fire and infestation of beetle species. This change in climatic regime, coupled with suspect fire practices, has resulted in fires that burn hotter and more intensely than they did historically. For instance, in the Medicine Lake Highlands there is less frost exposure to the stands, resulting in increased mortality. Ground fuel builds up and ineffective fire suppression practices have contributed to the loss of biodiversity of plants that were historically managed by indigenous fire management practices.

### GROUNDWATER IMPACTS

Hydro modification, lack of protection for ephemeral and seasonal springs, increased evapotranspiration, and decreased snowpack as a result of warmer temperatures have resulted in less water availability. Economic and resource impacts include decreased water availability for community water systems and agriculture operations managed by the Tribe, and intensive forestry practice and salvage logging operations that have altered hydro morphology and impacted ephemeral springs, increased erosion, and contributed to degraded habitats.

Water resources are a major attribute of Pit River Territory within the Tribe's jurisdictional boundaries. Numerous trust lands and individual tribal allotments exist along major

waterways in the Upper Sacramento River Watershed. Also within the territory are major spring-fed waters that contribute a significant source of fresh cold water. Groundwater stored in Medicine Lake Volcano emerges at the largest spring system in the western U.S. – the Fall River Springs, which supply Fall River, a major tributary of the Pit River that flows into Shasta Reservoir. Volcanic aquifers in northeastern California supply spring-fed rivers that contribute significantly to California's water supply. Spring-fed rivers are major sources of inflow into Shasta Reservoir, which supplies Volcanic aquifers near Mount Lassen that emerge to form spring-fed Hat Creek to the north and Lake Almanor in the south. Lake Almanor receives nearly half of its water from springs, and supplies flow to the North Fork of the Feather River, which flows into Lake Oroville and the State Water Project.

Various watersheds ranging in size exist in Pit River Territory, including the Gooselake Watershed near Hewisedawi territory (in the north central part of the square); the Upper and Lower Pit River Watersheds which traverse the entirety of the square; and the Burney Creek Watershed, Hat Creek Watershed, and Fall River Watershed. These tributary streams, rivers, and springs coupled with volcanic geology create specific surface and sub-surface water resources that are unique to the area. A two-hour drive through the country spans densely forested canyons, ridges, lush meadows, wide sprawling valleys, and high basins. As just one example of the unique formations in Pit River Territory, Burney Falls demonstrates how volcanic geology and water combine into an aquifer-fed large waterfall.



Photo credit: Jonathan Long, USFS



## STRESSORS THAT AMPLIFY CLIMATE IMPACTS

### PRE-CONQUEST LAND MANAGEMENT

Tribes in California often managed their homelands with controlled burns, to bring multiple benefits to their ecosystem (see also Traditional Ecological Knowledge Case Study above). Prescribed fire created healthy grass grains that they would eat or for ensuring that their oak stands were producing the most acorns possible for collection. Controlled burns also had an impact on how rabbits or larger game populations could be sustained for hunting. And controlled fires helped maintain fire safety perimeters around Pit River summer homes. Pit River People controlled the age of the deer killed to ensure numbers would stay high. They also would leave mushrooms or roots behind instead of over-gathering to ensure new mushrooms and plants came back to that gathering area. Controlled burning also has an influence on surface groundwater remaining longer throughout the year for perennial flows that would otherwise be absorbed.

### MISSION SYSTEM AND MEXICAN CONTROL

The mission system in California resulted in legacy effects due to multiple impacts including genocide and forcing Native Americans into mission-led agricultural work and other areas of labor. After the Treaty of Guadalupe Hidalgo in 1848 and the Mission period, forts were strategically placed along the border and up through California. The forts represented the forward push of Indian Policy and The Doctrine of Discovery that the new American Owners believed gave them the right and ownership of everything before them (for more information on the Doctrine of Discovery, see Newcomb 1992). Forts symbolized a taming of the land, wild animals, and Indians. A famous fort right in the heart of Pit River Country was Fort Crook, established in 1848, in Fall River Mills. The fort and its inhabitants were responsible for the systematic killing and starving of indigenous peoples and forward expansion into one of the last dangerous areas of the Wild Northwest regions of California. Before the Pit River Wars of 1861, the area was considered dangerous and a high-risk zone for traveling.

### THE GOLD RUSH

In 1848 the Gold Rush coincided with the purchase of Guadalupe Hidalgo. The potential to get rich drove opportunistic settlers up into the rivers and streams of California and Nevada. Settlers infiltrated Native California; the Gold Rush brought environmental and cultural devastation, such as dynamiting the river beds to release more gold and forcibly moving indigenous peoples from their communities.

### HYDROELECTRIC POWER GENERATION AND SHASTA DAM CONSTRUCTION

Access up the Pit River was completely cut off by the hydropower facilities referenced as Pit 1, 2, 3, 4, and 5 power project dams (1922-1927). Shasta Dam construction (1943) eliminated Salmon runs into the Pit River Drainage. The Pit system alone comprises half of the main Sacramento River. Achumawi People ("Pit River Nation") controlled 50 miles of salmon streams in their territory, primarily the mainstream (Olmstead and Stewart 1978). Spring, fall and winter Chinook salmon, Pacific lamprey and Steelhead trout existed.

In the past two centuries, the Pit River has been widely recognized as a 'noted salmon stream', and prior to hydroelectric dam construction, its tributary Hat Creek once contained an abundance of salmon, pike, trout, and suckers. The Salmon numbers were in the thousands during spawning. Fall River delineated the upper limit of the Salmon run, maintaining spring and winter runs. Burney and Kosk Creek also maintained winter runs. McCloud River Watershed has been described as the 'best salmon-breeding river in the world'





and supported Chinook spring, fall, and winter runs. Excessive and illegal fishing by commercial gillnetters significantly depressed spawning runs in the McCloud system.

### INNOVATIVE SOLUTIONS

Despite the legacy of hardships that these stressors inflicted on both the Tribe and the landscape, the Pit River Tribe is actively pursuing development and implementation of climate adaptation planning. The Tribe is focusing efforts on developing responses to emergency situations and preparedness to ensure food and water availability, and to respond to increased wildfire, intense rain events, mudslides, and other extreme weather events that can have significant impacts for the Tribe.

The Tribe is currently in the process of researching efforts to document and mitigate changes in vegetation and habitat conditions impacting Prong-horn Antelope migration patterns on the Modoc Plateau in coordination with the U.S. Fish and Wildlife Service. The Tribe is also conducting an aquatic investigation of North Fork Pit River Fishes. The Tribe is also currently studying impacts to species and habitats associated with diversions to the Pit River and other activities referenced above.

On a government level, the Tribe continues to participate in cross-jurisdictional planning through State water management planning efforts undertaken through Integrated Regional Watershed Management (IRWM) and pertinent new groundwater legislation under the Sustainable Groundwater Management Act (SGMA). The jurisdiction of the Tribe lies within four water management-planning regions: the North Coast, Upper Sacramento, Upper Pit River, and Lahontan.

In addition, the Tribe maintains an overarching Memorandum of Understanding (MOU) with three U.S. Forest Service entities and consults on forestry planning, projects, and policy efforts undertaken by the agency. Sustainable forestry management, tribal science-based restoration practices, and co-management opportunities continue to be a focus of consultation efforts for the Tribe.

The Tribe is engaged with federal entities on feasibility studies for fish passage infrastructure and Salmon re-introduction, incorporating traditional ecological knowledge.



Photo credit: Jonathan Long, USFS





## CASE STUDY | Bay-Delta Foothills Regional Assessment

Case Study Primary Author: Don L. Hankins, Ph.D., excerpts from contributing authors included for thematic consistency.

### CURRENT CLIMATE IMPACTS<sup>1</sup>

Climate change is not a new phenomenon impacting the landscapes and inhabitants of California, but the solutions we develop to address future change must draw upon the knowledge and experience from the past to fully encompass and guide that process. Throughout California exist numerous examples of past climate change including the glacially carved Yosemite Valley to the remains of petrified forests and relict populations of species dotting the state, which were once connected during more favorable conditions. The only certain thing is that change will continue to happen. Throughout the diverse landscapes of California, indigenous people have stories, laws, and strategies that draw from the past to inform the present and future of these landscapes. Among some of the themes that emerge from this understanding are sea level rise, cycles of drought, cycles of wetter conditions, cycles of hotter and colder conditions, fire, and floods. These events have shaped the indigenous cultures and territories within the state. The intimate and reciprocal relationships between traditional indigenous societies and their landscapes have ensured sustained and resilient communities, both ecological and social. In contrast, the State of California has existed for a relatively short period. Considerations of stewardship, sustainability, and resiliency include gaps between indigenous and broader societal views of long range planning. Indigenous populations inherently plan generations ahead, and consider the obligation of the present generation to leave the world in a better condition for the unborn generations to inherit.

### CLIMATE ISSUES AND NEEDS

Much of the natural habitats of the region have been heavily impacted by land use conversion. The remaining wildland ecosystems are increasingly at risk due to the fragmented nature of these ecosystems and direct effects of climate change and stochastic events. Where resources remain, the ability to achieve stewardship necessary to maintain the resources is limited. For instance, setting prescribed fires is particularly difficult due to conflict with air quality regulations and metropolitan areas (Statewide Summary Report Ch. 4). While climate change is not foreign to indigenous populations in this region, the ability to actively engage in stewardship to buffer against the impacts of climate change are largely beyond indigenous control as the ability to steward at a landscape scale does not exist under the purview of indigenous planning and action. Traditional cultural practitioners have noted the impacts of climate change over the course of their lifetimes. Table 1 identifies some of the impacts noted for this region and the significance of the issue.

### STRESSORS THAT AMPLIFY CLIMATE IMPACTS

Since colonization, indigenous people have systematically been denied their ancestral rights, which were never surrendered by treaty (i.e., 18 unratified treaties, see Tribal Land History box in the Background section of this report) or other means.

The landscape and indigenous cultures of the Sacramento-San Joaquin Delta, San Francisco Bay, and foothill regions are defined by the water that flows into this area from the surrounding mountains and tides from the sea. By reading the needs of the landscape and waters, Miwok (Plains Miwok) have been guided through past environmental change of rising seas along the tidal plains of the paleo

<sup>1</sup> Portions of this report draw on materials that have been adapted from works currently in review for publication.



Delta as it moved between the Farallon Islands to the current floodplains of the Sacramento-San Joaquin Delta Region. The ability to know the landscape and waters has also ensured resiliency across other climatic variability. Miwko are estuarine/river people and recognize the dynamic and resilient nature of a functional landscape. In consideration of environmental change within this region, it is recognized that ecosystems exist within a dynamic state, whereby the distributions, abundance, and assemblages of species comprising these ecosystems have shifted spatially and in time. Each ecosystem provides its own suite of functions and resources, which have been tended to since time immemorial; cattails and waterfowl from emergent marsh, corms and seeds from grasslands, digging sticks and manzanita berries from chaparral, etc. The stewardship of these resources is directed by the needs of people reading the needs of the landscape at various scales. By reading the seasonal and inter-annual needs of species and systems within the landscape, the long-term needs of all organisms could be met. The relationship with this landscape is illustrated in the traditional stories, laws, and economy of the region. Here it is evident that there is an interconnected relationship between upland, wetland, and oceanic systems.

As indigenous people to this region there is knowledge recorded in the Miwko collective histories, which illustrate the dynamic state of existence within this landscape. What is present today is a reflection of an ever-changing system. Through our collective histories we have learned the laws conveyed through the lands and waters as a way of life, which sustained our ancestors, and made this world resilient to stochastic events. It is our obligation to uphold this to the unborn generations.

**TABLE 1. OBSERVED PHENOMENON AND EVIDENCE THEREOF WITH THE SIGNIFICANCE OF THAT PHENOMENON AS AN ISSUE.**

PHENOMENON	EVIDENCE	SIGNIFICANCE
Shifting Seasons	Cultural indicators of seasons are occurring out of sync. Seasonal phenomenon are either not occurring, occurring at different times of the year, or are more intermittent.	Unpredictable nature of resource availability, species migrations, etc. puts traditional cultural activities at risk. Major shifts could impact processes like freezing, which is important for seed scarification, pest control, and fruiting.
Fire	Fuel accumulation, extended dry season, extant of wildfire, limited prescribed fire use, limited cultural fire use.	Fire is encoded in traditional law. Without cultural fire use, wildfires will continue to devastate extensive areas of the region, and impact ecocultural resources, ecosystems, and other issues.
Fisheries	Native fishes decline due to higher water temperatures, decreased flows, water quality, and other factors.	We have significant relationships with native fishes from the miniscule delta smelt to the Chinook salmon. The loss of fisheries is a real threat not only to the traditional diet and economic needs, but also the broader food web connecting the mountains to the ocean. Throughout that food web is the interdependent relationship of people.



**TABLE 1. OBSERVED PHENOMENON , CONT'D.**

PHENOMENON	EVIDENCE	SIGNIFICANCE
Willows	Prolonged drought has damaged traditional willow gathering areas, where seasonal gathering has been hampered by poor quality materials and decreased productivity.	Willows are the foundation of basketry throughout much of this region. The loss of willows would have a tremendous impact on the material culture and continuity of culture.
Changing Species Associations	Scrub jays moving into Stellar's jay habitat.	Species relationships to specific habitats are bound to change, but due to the loss of habitat and conversion of habitat throughout the region, the predictability of finding certain species within their "normal" habitats may be more difficult.
Invasive Species	Nutria, aquatic primrose, bullfrogs, cattle egrets, etc.	Inherently there is a responsibility to look after all that occurs in one's territory. Invasive species pose additional responsibilities, and conflict when those species adversely impact important culturally significant species.
Harmful Algal Blooms	Increased algal blooms in the Delta, lakes, and broader extent of red tides along coastal areas.	Harmful algal blooms are potentially dangerous to people, pet, wildlife.
Aquatic Chemistry	Near shore acidification. Excess nutrient loading in freshwater systems.	Impact to marine fisheries, intertidal life, food, medicine, and economic.
Water Temperature	Increased temperatures of waters in lakes, streams, rivers, and marine environment.	Continued risk to native fisheries (see above).
Loss of Acorn Production	Changing temperature and precipitation has impacted acorn production over vast areas for multiple years.	Acorns are a culturally significant resource that support traditional dietary needs, but also the needs of many wildlife including deer, bear, acorn woodpeckers, and many more.
Loss of Mushroom Production	Prolonged dry periods have led to decreased distributions and production of some mushrooms.	Certain species of mushrooms are culturally important. Hyphae and mycorrhizae of mushrooms play a critical role in the establishment and maintenance of many native species of plants and animals.
Valley Fever	Prolonged dry periods contribute to increased cases of valley fever.	Prolonged regional drought can exacerbate the distribution of <i>Coccidioides</i> sp. and exposure risk, which can have severe health implications if undetected or treated.





**TABLE 1. OBSERVED PHENOMENON , CONT'D.**

PHENOMENON	EVIDENCE	SIGNIFICANCE
Mosquito and Other Insect Pathogens	Fewer cold periods and improper land management have contributed to mosquito and other insect activity throughout a longer portion of the year.	More favorable conditions may increase the distribution and seasonal activity of vectors, which may contribute to more cases of West Nile virus, malaria, Dengue fever, Lyme disease, etc.
Intertidal Organism Loss	Warmer sea surface temperature and changing oceanic chemistry are contributing to declines of some intertidal organisms (e.g., red abalone).	Loss of intertidal organisms, such as red abalone, can have a profound impact on traditional cultural associations and traditional economy.

Planning for the future is something that California Indians have done since time immemorial. The best means for achieving proactive solutions involve facilitating stewardship actions based on traditional cultural practices, led by traditional cultural practitioners. Traditional cultural practitioners have the ability to read the needs of the landscape, and direct actions to facilitate desired outcomes, and have employed these abilities over their lifetimes. These actions, coupled with active monitoring programs, are best positioned to provide a basis for interpretation of outcomes and causal relationships. While monitoring has been an inherent part of Indian traditions in California, additional scientific methodologies can provide further insight to assess outcomes. Table 2 outlines some basic solutions identified to address the observed phenomenon.

**TABLE 2. OBSERVED PHENOMENON WITH POTENTIAL SOLUTIONS.**

PHENOMENON	SOLUTION
Shifting Seasons	Unpredictable nature of resource availability, species migrations, etc. puts traditional cultural activities at risk. Major shifts could impact processes like freezing, which is important for seed scarification, pest control, and fruiting.
Fire	Fire is encoded in traditional law. Without cultural fire use, wildfires will continue to devastate extensive areas of the region, and impact ecocultural resources, ecosystems, and other issues.
Fisheries	We have significant relationships with native fishes from the miniscule delta smelt to the Chinook salmon. The loss of fisheries is a real threat not only to the traditional diet and economic needs, but also the broader food web connecting the mountains to the ocean. Throughout that food web is the interdependent relationship of people.
Willows	Willows are the foundation of basketry throughout much of this region. The loss of willows would have a tremendous impact on the material culture and continuity of culture.



**TABLE 2. OBSERVED PHENOMENON , CONT'D.**

PHENOMENON	SOLUTION
Changing Species Associations	Species relationships to specific habitats are bound to change, but due to the loss of habitat and conversion of habitat throughout the region, the predictability of finding certain species within their "normal" habitats may be more difficult.
Invasive Species	Inherently there is a responsibility to look after all that occurs in one's territory. Invasive species pose additional responsibilities, and conflict when those species adversely impact important culturally significant species.
Harmful Algal Blooms	Harmful algal blooms are potentially dangerous to people, pet, wildlife.
Aquatic Chemistry	Impact to marine fisheries, intertidal life, food, medicine, and economic.
Water Temperature	Continued risk to native fisheries (see above).
Loss of Acorn Production	Acorns are a culturally significant resource that support traditional dietary needs, but also the needs of many wildlife including deer, bear, acorn woodpeckers, and many more.
Loss of Mushroom Production	Certain species of mushrooms are culturally important. Hyphae and mycorrhizae of mushrooms play a critical role in the establishment and maintenance of many native species of plants and animals.
Valley Fever	Prolonged regional drought can exacerbate the distribution of <i>Coccidioides</i> sp. and exposure risk, which can have severe health implications if undetected or treated.
Mosquito and Other Insect Pathogens	More favorable conditions may increase the distribution and seasonal activity of vectors, which may contribute to more cases of West Nile virus, malaria, Dengue fever, Lyme disease, etc.
Intertidal Organism Loss	Loss of intertidal organisms, such as red abalone, can have a profound impact on traditional cultural associations and traditional economy.



The following is taken from the official website of the Karuk Tribe, and describes the restoration of the Wooley Creek watershed by the Karuk tribe and other government and community entities.

## CASE STUDY | Northern Region, Karuk Tribe Watershed Restoration

**O**n November 1, 2002, the Karuk Watershed Restoration team, U.S. Forest Service personnel, and community members watched with jubilation as the...Steinacher Road Project reached completion.

The Karuk Watershed Team had worked diligently for three full seasons to finally meet the goal set before them. The Tribal crew is exceedingly proud to have had the opportunity to repair a portion of the landscape of the Karuk Ancestral lands by decommissioning this road that was built in the late 1960s as a major log-haul road.

The Karuk tribe has a vested interest in restoring the traditional ecosystems and culture incorporating traditional ecological knowledge, and to employ Tribal and local community people within our Ancestral Territory (Karuk Tribe 2016).

### CLIMATE IMPACTS

Most rivers on the north coast of California are considered impaired under the Clean Water Act for temperature and sediment, due to increased storms, floods, logging, and other watershed activities and impacts, all of which are amplified by climate change (SWRCB 2010).

The objective of the project was to decrease the sedimentation caused from the road by removing approximately 187,000 cubic yards of potential sediment, within the Wooley Creek watershed thereby securing the critically important Salmonid refugia from which to restore the Spring Chinook, Coho salmon, petitioned Fall Chinook salmon, and steelhead trout.

Improved watersheds and fisheries are a significant component of rebuilding the region's economy. Watershed restoration represents an opportunity for long-term, stable employment based on non-resource extraction ecosystem management, a stable, fully functioning ecosystem, and an increase in recreation with improved fishing and economic development (see Ocean and Coast Summary Report).

### STRESSORS THAT AMPLIFY CLIMATE IMPACTS

In the past, tribal participation in [U.S.] Forest Service planning efforts has been limited, and at best at an advisory level. Due to the extremely rural population of the Mid-Klamath and Salmon River sub-basin and severe budget cuts of the [U.S.] Forest Service personnel the sub-basin planning and subsequent implementation of projects has not generated necessary funding or staff time for habitat recovery.

A Karuk goal is to protect watersheds that serve as habitat for Tribal trust species (i.e., species protected via treaty or acknowledged as part of the Federal government's trust responsibility to Tribes) while maximizing the Tribe's and local communities long-term economic and cultural benefits. Management policies of the current land managers have undermined traditional avenues of access to resources thus preventing the careful ecosystem tending of the Karuk people. Lack of knowledgeable traditional stewardship has created landscape conditions that have ignored and devastated traditional resources and now threatens the well-being of both the forests and the forest-based communities. The management of traditional resources through implementation of specific forest management practices requires addressing an intricate complex of political, cultural, and technical issues.





### **INNOVATIVE SOLUTIONS**

The Tribe and the Klamath and Six Rivers National Forests have entered into a Memorandum of Understanding (MOU) based upon the Government-to-Government relationship established between the Tribe and the [U.S.] Forest Service. This MOU establishes a framework upon which the Tribe and the Forest Service may jointly identify, plan and accomplish mutually beneficial projects and activities that provide for watershed restoration, job opportunities, and community economic development.

The objective of the Karuk Tribe's Watershed Restoration Division is to protect the habitat of anadromous fish by decreasing the sedimentation caused by the road networks within watersheds of critical concern. The Tribe accomplishes this by conducting site-specific geomorphic mapping, surveying, prescription design, and preparation of work order specifications for implementation of identified project areas. Implementation includes proven road decommissioning methods to remove and/or stabilize unstable logging haul road-stream crossings and to reestablish the natural hillslope drainage pattern along the road. The objective of a decommissioning project is to decrease the sedimentation caused by a road by removing the potential sediment. Decommissioning of roads begin with roads that have the highest density of high hazard sites and that pose the greatest hazard to watershed processes, water quality, and aquatic habitats.

The Karuk Tribe of California [is] developing an overall "Karuk Cultural Adaptive Management Program" for management of the Tribe's Ancestral Territory and for the creation of long-term employment for Tribal and community members.



## CASE STUDY | South Central San Joaquin Region

Case Study Primary Author: Ron W. Goode, excerpts from contributing authors included for thematic consistency.

### CLIMATE IMPACTS

Climate impacts are serious concerns for the South Central San Joaquin region's tribal stakeholders, which includes 16 tribes from Tulare, Kings, Fresno, Madera, and Mariposa Counties.<sup>1</sup> [For a summary of climate change impacts projected in California, please refer to the Fourth Assessment Statewide Summary Report].

The North Fork Indian Community and Rancheria of Madera County have endured five wildfires ripping through their homes and homeland over the last fifteen years. Many evacuated, but just as many stayed put to ride them out. The community was hit hard the last couple of years with flooding - an abundance of water flowing down their streams, evacuating sometimes five times in one winter season.

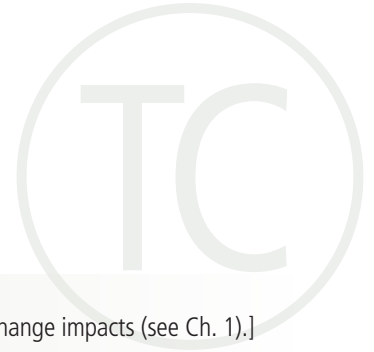
Across and south of the San Joaquin River, the Big Sandy Rancheria of Fresno County also has been hit with wildfires, but even harder by the recent drought. Over the past few years, Big Sandy Rancheria's wells have gone from 300 – 400 feet to 800 – 900 feet deep.

Dry fuel has created a perpetual hazard for potential wildfires; likewise, the climatic changes and drought has brought the wildlife down from the mountains. Mountain lions and bears are not only more common but also more aggressive, putting their community in jeopardy. There are ongoing concerns over how much water fire trucks can take from area wells. On one such fire, the water trucks drained their storage tanks and tribal members were basically without water. The tribe addressed that issue by creating a storage tank for wildfire usage only, brought in more tanks for residential and enterprise use, and kept a water tanker loaded and always on-hand. These added needs are expensive.

In 2015, the Rough Fire impacted the Dunlap Band of Mono Indians as it burned through the community, gathering areas, and homeland. The Mariposa Southern Sierra Miwuk Tribe had two or three fires in different locations threatening their community, with heavy mandatory evacuations the past couple of years (~2013-2017). Picayune Rancheria and their Allotments have like-wise been impacted by the water table dropping (~2010-2017), and have also observed changes with the animal habitat and their migration patterns.

Out in the western part of the San Joaquin Valley, in Lemoore, the Tachi Yokuts Tribe (i.e., Santa Rosa Rancheria of Kings County) was affected by the recent (~2014-18) drought years. During drier years, the dust and air are very unhealthy, plus the smoke from all the wildfires settles right on top of them. They have their own air monitoring station so they can monitor the daily effects of unhealthy air, as poor air quality creates more allergies for their tribal members. Heat and rising temperatures also affect their homes and electric bills. The Tribe has two water channels that bring in their allocated water rights; one channel is 85 acre feet of surface water and the other brings in 87 acre feet, but during the drought their water needs and allocation were not met. [The Fourth Assessment Statewide

<sup>1</sup> The Mariposa Southern Sierra Miwuk Tribe; Chaushilha Yokuts Tribe; Picayune Chukchansi Rancheria; North Fork Rancheria; North Fork Mono Tribe; Big Sandy Rancheria; Cold Springs Rancheria; Wuksachi Tribe; Dunlap Band of Mono Indians; Table Mountain Rancheria; Dumna Woa Tribe; Choinumni Tribe; Choinumni Tradition Indian Tribe; Wukchumni Tribe; Tachi Santa Rosa Rancheria; and Tule River Indian Reservation are included in this region. There are also a number of tribal organizations and non-profit groups including: the Mono Nation of North Fork; Sierra Nevada Native American Coalition of Dunlap; Haslett Basin Traditional Committee of Squaw Valley; Go Native of Visalia; Many Lightening's; two Temporary Assistance to Needs Families (TANF) organizations – Fresno TANF and North Fork Rancheria TANF; the historic Wassuma Roundhouse of Ahwahnee; and the Sierra Mono Museum of North Fork.



Summary Report discusses the potential for water availability and water quality issues resulting from climate change impacts (see Ch. 1).]

To support this report, three Native American-owned ranches were interviewed about the effects of climate change on their economic endeavors. The Topping Cattle Ranch utilizes close to 6,000 acres of land, with about 400 head of cattle and, for a couple months a year, an additional 300 cows on land in the O'Neal's area forest located on the Kennedy Table Top in Madera County. The Toro Bravo Arena (a bull riding arena and where bucking bulls are raised) is located on the San Joaquin River in Fresno County. And, the Ta-Hoot Deer Ranch, where Fallow Deer are raised for venison, is located in the community of Academy in Fresno County. While all three ranches have an abundance of water in their wells, the high costs of running agricultural wells have caused two of the ranches to re-strategize their commodity numbers. The Ta-Hoot Deer Ranch has cut their livestock numbers in half to meet the raising costs. The Toro Bravo Arena has had to restructure their agricultural well output. The Topping Ranch was hit hard by the drought as many springs and holding ponds all dried up.

Dying trees have impacted the cattle and deer ranches, causing the deer ranch to have to build shade covers instead of using natural tree coverage. The Topping Ranch has observed the Bull Pine dying for several years, and in these past two years (2016-17), some Blue Oak died and lots of Live Oak died from the drought effects. They also indicated that since there has not been a good freeze for several years, and in a rare positive impact, certain native grasses are now growing well. In the Academy/Prather area on other ranches, the Blue Oak and Water Oak are dying from Sudden Oak Death Syndrome and Mistletoe. The Toro Bravo Ranch also indicated the water table has dropped, probably due to human over-population, and reports that utility bills have increased.

Culturally, all of the region's tribal stakeholders have been affected by climatic changes and drought. Tribal gatherers have had to travel north to Hoopa Reservation or Lake Tahoe, or south to Tehachapi to gather enough Black Oak acorns for their cultural events. Other resources such as red bud and mushrooms have suffered from the lack of no cultural burning, no access, and the lack of good freezes at the right time. Chaushilha tribal folks reported their Black Oak acorn gathering areas did not produce enough acorns to harvest again this year. Picayune also reported a reduction in production of indigenous plants, acorns, sour berries, soap root, and basket weaving supplies.

#### **STRESSORS THAT AMPLIFY CLIMATE IMPACTS**

One of the North Fork Mono Tribe's fifteen Public Domain Allotments is located at ~3,000 feet of elevation in Eastern Madera County. For this report, tribal members were interviewed and asked to describe infrastructure needs. In one case when the interview took place, one of the family members located between Redinger Lake and Kerckhoff Reservoir was out trimming brush along the County Road because the road had not been cleared back, which earned recognition from a Southern California Edison utility employee who commented on a great job. The North Fork Rancheria has improved the Allotment's personal road from the heavy rains, and springs continually erupting in the road, washing it out. Like other tribal members and tribal stakeholders, one-way access is a hindrance. There is an old roadway once kept open, but is now over-grown and too difficult to maintain. The Allottees have good water, as they have an artisan well; however, it is loaded with heavy minerals and the water coolers have to be cleaned twice a year to keep it clear of corrosion.

Big Sandy Rancheria has been hit hard with high levels of uranium, manganese, and iron in their water. The Tribe filters all water to each residence and every home has a meter so their water can be monitored. If there is a breakage, overflow, or over use, the Tribe can respond. Their water treatment plant is very costly, but they do not charge their tribal members as of yet. Each household is limited in their water use and fitted with quick valves and low flow apparatuses. Conservation is a primary practice, which includes no





individual kiddie pools or swimming pools. The Tribe transports their children down to the local high school during the summer so they can swim.

The North Fork has been dealing with arsenic. Picayune Rancheria of Madera County also has a lot of natural minerals in their water, including iron, manganese, calcium, and uranium. The Tribe also has an insufficient road system that places their tribal members in danger. The Tribe is negotiating with the U.S. Forest Service to create another safe passage out of the Rancheria.

Another local tribal stakeholder, Cold Springs Rancheria, also has only one route into their land base and is also negotiating another escape route. They too were hit hard by flooding this past winter.

There are several medical facilities, two Indian Clinics (Central Valley Indian Health and Fresno American Indian Health), and a Veteran's Hospital and several Tribal Veteran organizations in this region; however, rising costs for doctor care and pharmaceuticals as well as travel costs creates a burden for the health of the indigenous citizen.

#### **INNOVATIVE SOLUTIONS**

In 2017, there was an abundance of acorns with other types of acorn trees such as the Golden Oak and White Oak or Water Oak, and a moderate crop with the Blue Oak. Some gatherers were still harvesting in early December, but most of the acorn was on the ground by mid-October. The North Fork Mono Tribe partnered with Sequoia Park and conducted two cultural burns in the summer. The monitoring showed that 36% to 48% of the 200 Blue Oak trees that were culturally burned produced acorns but by the end of October the animals had devoured the acorns.<sup>2</sup>

The North Fork Mono Tribe, Big Sandy Rancheria, Cold Springs Rancheria, Dunlap Band of Mono Indians, and the Wukchumni Tribe of Visalia have engaged in resource restoration over the past decade. Yet at the same time the community in the region has trouble getting access to County, State, and Federal lands to gather their natural medicines and native food and fiber products. A local Native of the Central Valley had a five-acre traditional garden growing healthily, but lack of funding and limited water along with the drought has almost eliminated the garden. Volunteers are helping to keep the garden going.

Some of the local tribes have been engaging in safety first emergency planning with emergency stakeholders. For example, the 2nd Central Valley Tribal Emergency Management Summit, "Growing Partnerships Beyond a Handshake," which included tribal chairs and leaders, took place on April 19-20, 2017. The Summit was held at the Eagle Mountain Casino on the Tule River Indian Reservation in Porterville, where the first Summit was also held. Local regional tribal stakeholders attending the Summit included: Big Sandy Rancheria, North Fork Rancheria, Tule River Indian Reservation, Dunlap Band of Mono Indians, Cold Springs Rancheria, Haslett Basin, Santa Rosa Rancheria Tachi Yokuts, and Southern Sierra Miwuk. Participating Tribes from outside of the region also included: the Jackson Rancheria Band of Miwuk, Morongo Band of Mission Indians, Santa Rosa Band of Cahuilla Indians, Tejon Indian Tribe, and the Tuolumne Band of Me-wuk. Various agency and other stakeholder representatives included those from the California Governor's Office, Native American Heritage Commission, Office of Tribal Coordination, Tribal Emergency Management, Verizon Crisis Team, Home Land Security, National Oceanic and Atmospheric Administration (NOAA), American Red Cross, Tribal Environmental Protection Agency (EPA) Directors, and writers, researchers, and journalists with Indian Country expertise.

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<sup>2</sup> As referenced throughout this report, acorns are a culturally significant resource for many tribes in California. Acorns support traditional dietary needs, cultural life-ways, and provide sustenance to many wildlife including deer, bear, and acorn woodpeckers that are important to tribal cultural and dietary health.



## CASE STUDY | South Coast

Case Study Primary Author: Shasta Gaughen, Environmental Director/THPO, Pala Band of Mission Indians, excerpts from contributing authors included for thematic consistency.

### CLIMATE IMPACTS

Because of its ecological and geographic diversity, the South Coast region is subject to multiple different climate change threats, including sea level rise, drought, extreme heat, wildfire, and flooding. Additional information on climate impacts in the South Coast region are in the San Diego and Los Angeles Reports (San Diego Summary Report 2018; Los Angeles Summary Report 2018). Culturally, South Coast tribes are threatened by a loss of gathering areas, traditional plants used for food, medicine, and basketry, and the more abstract but significant loss of a sense of continuity with and connection to the land.

The region is home to multiple federally recognized tribes and several state-recognized tribes. Encompassing San Diego, Orange, and Los Angeles Counties, the South Coast region is rich with tribal cultural diversity. Geographically and ecologically, the South Coast stretches from the shore to the Peninsular Range, and includes multiple river systems, watersheds, and ecological zones. Some of the most endangered and sensitive habitat in the country is found within this region. Although the entire South Coast has a deep history of tribal settlement and culture, at present only San Diego County includes federally recognized tribes; in fact, there are more tribes in San Diego County than any other county in the nation. Several non-federally-recognized tribes call Los Angeles and Orange County home as well.

Each tribe has a distinct culture, government, and traditions, but there are six overarching cultural groups: Kumeyaay (including Diegueño and Ipai-Tipai), Luiseño, Cahuilla, Cupeño, Juaneño, and Gabrielino. Tribal reservations in the South Coast region encompass just over 124,000 acres, or approximately 193 square miles (University of San Diego, n.d.) Demographically, San Diego County includes a local population of approximately 20,000 Indian people. Including so-called “urban Indians,” who are descended from non-California tribes, that number rises to approximately 43,000. The combined Native American population of Orange and Los Angeles Counties adds another 89,000 people, which means the South Coast region is home to approximately 132,000 Indian people (US Census 2010).

Although each tribe in the South Coast region has its own history and culture, the environment they share means that they are similarly impacted by climate change. From a cultural standpoint, traditionally significant species such as oak trees, deer grass, chia sage, and more are threatened by changes in temperature, water availability, extreme heat, and increased wildfire risk. Traditional practices that are at least partially based on access to specific areas and/or the ability to harvest particular plants or animals may be much harder to maintain. The consequences of changes to these practices are not just environmental and ecological; they are intimately linked to cultural health and continuity. Climate change mitigation and adaptation efforts must take into account the effects of climate impacts on tribal cultural practices and traditions, and not just on environmental and physical effects.

### STRESSORS THAT AMPLIFY CLIMATE IMPACTS

The California tribes of the South Coast have inhabited their lands for at least 10,000 years. Their lives were upended beginning in 1769 when Fr. Junipero Serra founded the first of the Spanish missions of Alta California in San Diego. Under the mission system, tribes from San Diego to Sonoma were subjected to violent colonial practices that included slavery, systematic loss of their languages



and cultures, loss of their homes and lands, and introduction of devastating diseases. Traditional foraging and horticultural practices were disrupted, and ecological management techniques such as controlled burns, oak stand management, and native fisheries were severely curtailed or ceased altogether. Spanish, then Mexican and American agricultural and ranching operations introduced invasive grasses and displaced habitat for game animals. Burgeoning settler populations eroded the native land base and impacted traditional practices. Scarce water resources were put under increased pressure as wells, dams, and crop irrigation projects diverted water from the landscape.

### INNOVATIVE SOLUTIONS

The California Landscape Conservation Partnership (CA LCP) is a management-science partnership created to inform and promote integrated science, natural resource management and conservation to address impacts of climate change and other stressors within and across ecosystems. As part of this work, the CA LCP maintains a team of tribal professionals and agency staff that work closely with Tribes through the CA LCP resource area, which includes most of California. The CA LCP Tribal Partners,<sup>1</sup> in their ongoing work to facilitate better coordination with Tribes and as part of an analysis of lessons learned from projects incorporating TEK or ascribing to incorporate TEK, discussed these issues through a series of workshops, phone calls, and roundtable discussions and identified key actions:

1. Respect the role of elders in authorizing and developing TEK projects and parameters of projects;
2. TEK is a lifestyle and a responsibility;
3. TEK partnerships work best when they are driven by Tribes and addressing issues that Tribes have an interest in;
4. It is important to protect Tribal data and information, facilitating and maintaining tribal control of this data and tribal knowledge leads to successful partnerships;
5. Building a mutual trust is important, building trust takes time;
6. Knowledge is earned through trust building and demonstrations of worthiness;
7. Incorporation of youth and younger generations is an effective component of successful TEK projects.

When integrating TEK, turn to tribal partners, tribal partnerships, and/or tribal stakeholders to link or bridge a project or endeavor to those who are knowledgeable of ecological traditions. This link could be as simple as hiring native youth trainees, indigenous workforce employees, elders, and/or experienced Native American consultants. Many state and federal agencies have been engaged in these methods for approximately four decades. Most of these tribal inclusions have been to provide resource monitors - and while that creates a bridge, it must extend beyond the consultation process. To fortify a program, project, or endeavor, relationships must be built and maintained to engender trust and knowledge sharing within a partnership.

CA LCP Tribal Partners have identified key points critical to a successful TEK project:

1. Engaging Tribes and Tribal Communities early and often in the initial project development;
2. Defining clear and possibly negotiated outcomes of a TEK project;

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<sup>1</sup> <https://californialcc.org/mission-and-vision>





3. Building a model for partnership (e.g., an advisory committee of elders) is one way to start. Once a model gets established, maintaining it can be easier;
4. Tribes and tribal communities are at times already engaged in discussion over a proposed project, therefore, they will and can invite agency representatives to come to them to hear how they feel and what they expect. Through this approach, the information stays with the elders and keeps control of the resources in their hands. When information is not "gathered" or analyzed, but given to partners it is so done in a such a way that it becomes directly applicable and actionable to the project outcomes;
5. Engaging indigenous youth as trainees and or workers on the project so they may maintain their heritage connection to their homeland and bring with them family TEK that may be applicable to the success of the project.

TEK is a continued practice in the tribal community in landscape management, protection of cultural and sacred areas, riparian habitat management, watershed management, and wildlife management. Co-management is exponentially enhanced by working with tribes, tribal homelands, and cultural resources.



## TRADITIONAL ENVIRONMENTAL KNOWLEDGE: THINNING, PILING, AND BURNING

BEFORE



AFTER



Maidu Stewardship Project in Greenville, CA: these pictures taken from the same location show the overstocked forest and then the results of the tribal fire crew's thinning and piling. Thinning is done with attention to preserving culturally important species, and opening the canopy to enable Black Oak to thrive. The thinning, piling, and burning reduce danger of catastrophic fire, and open the land for traditional management techniques, including low underburns for forest health. This exemplifies the type of tribally-led management activities. (Photos courtesy of Danny Manning, Asst. Fire Chief, Greenville Rancheria)





## CASE STUDY | Agriculture

Case Study Primary Author: Keir Johnson-Reyes, excerpts from contributing authors included for thematic consistency.

**W**hen considering agriculture within Tribal contexts, reference must extend to both traditional and mainstream practices to ensure that the breadth of Tribal agriculture and food ways practiced in California are acknowledged. Tribal agriculture and food ways are as varied as their cultures, languages, spiritual practices, and unique responses to the outgrowths of colonialism. No umbrella statement can be made to fully encapsulate the food ways of Indian Country in California; however, there are several themes that emerge around the impact of California's changing climate on Tribal agriculture and food ways.

An important starting point in the discussion of agriculture and food ways in Indian Country in California involves examining the word agriculture. This term is often associated with European practices that can be seen to impose domination over the land for the purpose of producing dominant culture foods and textiles. Many traditional Native peoples in California may draw this association. Agencies who seek to build relationships with Tribes to support agriculture/food sovereignty/land management efforts may be inadvertently fueling a perception of imposed "one size fits all" approaches to Tribes in general. It is important to acknowledge that what constitutes agriculture is defined by the Tribal Nation, not an outside agency.

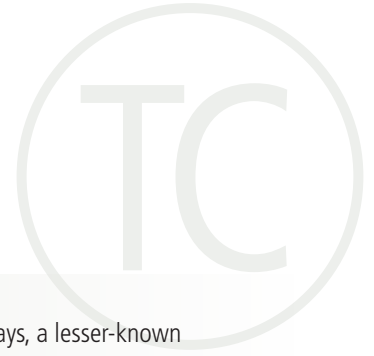
Agriculture, within various Tribal contexts, can be generally defined as any intentional landscape or waterway management activities carried out for the purpose of working within environmental conditions to produce, gather, and/or harvest useful natural products (food, fiber, ceremonial, etc.). Some products may not be intended for open markets, and are inherent to the subsistence and cultural perpetuation of a people (examples: salmon, acorns, pine nuts, elderberry, chokecherry, Indian potato, bear grass, angelica root, mesquite, etc.). Other products are produced utilizing mainstream agricultural practices and are actively sold within local, national, and international markets (olive oil, wine grapes, rice, venison, cattle, almonds, citrus, avocado, mixed vegetables, etc.). There are also Tribal agricultural products that are appropriate for cottage industry and local markets that may be traditionally inspired (jewelry, clothing, canned goods, bath/body products, etc.).

### STRESSORS THAT AMPLIFY CLIMATE IMPACTS

From an indigenous perspective, climate change has been and will continue to be part of the environmental makeup of the natural world. However, there are many factors (both natural and human derived) that have adversely impacted the availability of raw forest, desert, grassland, and oceanic/waterways products necessary to maintaining the traditional diets and cultural products of many Indian communities in California. Diminishing water tables, urban encroachment, depleted soils, catastrophic fires, and various chemical control abatements, among other climate-related impacts, have adversely affected both commercial and non-commercial agricultural activities on Tribal lands in California. Exploring a few examples from across the state will highlight some general issues impacting Tribal agriculture.

Tribes along the Klamath and Trinity Rivers have been instrumental in highlighting the adverse impacts of dams on salmon populations to the world for decades (see also Human Health Impacts from Climate Change case study in this report). Through their leadership, the plight of diminishing salmon spawning grounds and habitat has become planted in mainstream awareness. Damming the ancient waterways of this sacred food source is known to impact the viability of entire watersheds. The messaging around decreased salmon habitat, the impact to the populations, and the concreteness (literally and figuratively) of the dams, aids in drawing a direct line to





human causation of decreased salmon populations. In looking deeper at the current status of these waterways, a lesser-known climate-based impact is exacerbated by decreased/regulated water flows. The proliferation of Cyanobacteria toxins in certain blue green algae when shallow waterways are warmed is due to drought, decreased flows, and more consistent hot temperatures. The presence of these highly toxic compounds greatly impacts the ancient water-based practices of the peoples in this region of the state. Monitoring programs, such as the Klamath Basin Monitoring Program, are essential in providing important monitoring and public safety information.

Traditional gathering activities have been adversely impacted by diminished access to traditional foods and fiber throughout the state. The contributors to this reality are multifold. From a climactic standpoint, prolonged droughts, increasing temperatures, declining soil health, invasive species, disease, and tree mortality are all factors. Other stressors include urban encroachment, privatization of lands, jurisdictional issues, and irresponsible agency procedures. Tribal governments and individuals concerned with tending to traditional responsibilities (ancestral food ways being a central component) must contend with a patchwork of laws, regulations, agencies, and land holders, while gathering, hunting, and fishing areas continue to wane. Tribal consultation concerning culturally sensitive areas has fallen short too many times concerning both state and federal agencies. Often, Tribal representatives note that consultation has morphed into mere announcements regarding agency decisions, instead of a forum for direct feedback informing the implementation of a given program or initiative.

The threat of listing the Greater Sage Grouse as an endangered species inspired an unprecedented interagency collaborative effort to increase the bird's habitat (scattered throughout the western U.S.) and keep it off "the list" for a variety of commercial and non-commercial reasons. Its habitat, and therefore its numbers, had decreased to dangerous levels. In 2010, the substantial initiative, termed the Sage Grouse Initiative, rolled out involving numerous state and federal agencies, conservation districts, individual ranchers, and organizational partners. The multi-year initiative was successful in keeping the Sage Grouse off the endangered species list. A practice utilized for increasing Sage Grouse habitat involved clear-cutting conifer trees at points in the eastern Sierra Nevada range, amongst other target areas across the western United States. Tribal Liaisons from partnered agencies worked to get the word out about the initiative to Tribal communities in the impacted area.

Attempts at consultation occurred, but ultimately did not include key Tribal stakeholders concerned with the specific treatment areas. As a result, a contractor unknowingly clear-cut 70 acres of ancient Paiute gathering area that had been in continued use. Shockwaves went through Paiute communities in California and Nevada, with relationships souring between the initiative partners and the impacted Tribal communities. Irreparable damage to the Sweetwater Forest site occurred, demolishing an area said to be a primary source of pine nuts for innumerable generations. This example highlights the impacts of climate change (diminishing sensitive species' habitats/invasive plant pressure), jurisdictional and consultation issues, and the unfortunate results of unintended/ill-informed procedures that adversely impact Native communities.

Commercial agriculture is present within many Tribal communities in California. Tribes and individual producers have developed land to compete within both commodity and specialty markets. The unique makeup of Tribal communities, their history, culture, diversity, and vitality, aid in building very marketable product contexts that attracts high-end buyers time and again. Climate-related issues that are present within the general commercial agriculture sector are likely to be common within related Tribal contexts as well. Many Tribal agricultural producers seek to align with natural/sustainable and organic methods of production. Issues have been raised around pesticide and herbicide drift from adjacent properties relative to increased pest and invasive weed pressures. A vineyard operation



in Lake County, for example, abuts a Tribe's orchard and concerns have been raised regarding runoff during major rain events. Tribal environmental staff members explore ways of monitoring the runoff from the vineyard above the Tribal property to substantiate observations.

Adjudicated, grandfathered, and Tribal water rights tied to Tribal and non-Tribal operations have been a historic point of contention between neighbors, states, and environmental activists. Tribes along the Colorado River, for example, may have water rights that enable draws from the river in times when other producers are rationed. This reality can and has set the tone for contentious legal and social battles that bring into question interpretations of individual treaties and adjudications. On the other end of the spectrum, the inhumane and destructive *Rancheria* system forcibly annexed many groups of Native families to often less-than-desirable outskirt tracts of land in the state, often away from known territories and environments, which rooted cultures to place and protocol. This enabled natural resource grabs from the colonist forces to build substantial agricultural operations, many of which are still in existence to this day.

#### **INNOVATIVE SOLUTIONS**

Native peoples continue to be creatively responsive, a quality inherent to Native cultures, to issues relating to climate, socio-political pressures, jurisdictional issues, and limited access to various resources. Within the current context, the establishment of mutual partnerships (agency, organizational, governmental) continues to be a necessity to ensure the internal goals of Tribal communities are furthered. Various strategies have been and are being developed in coordination with Tribal governments to better respond to Tribal needs and ensure the incorporation of priorities and objectives. The California Department of Food and Agriculture's Healthy Soils Initiative is funding a Tribal project in Southern California that will incorporate carbon sequestering conservation practices developed by the U.S. Department of Agriculture's Natural Resources Conservation Service, to test production strategies and offer educational opportunities to farmers and ranchers in the Pauma Valley.

The Natural Resources Conservation Service has funded extensive fuels reduction treatments on Tribal lands in California to reduce the potential for catastrophic fires. Headway continues to be made in prescribed/cultural burning implementation as a fuels treatment strategy, involving local, state, and federal collaborations with Tribes. Prescribed Fire Training Exchanges (referred to as TREX) regularly involve Tribal fire crews throughout California. Public awareness continues to grow around this indigenous practice of treating landscapes with controlled burns, highlighted in conversations involving Traditional Ecological Knowledge (TEK) (see also case studies in this report on Traditional Ecological Knowledge, and the Bay-Delta Foothills Regional Assessment, for more information on cultural burning).



## CASE STUDY | Water

Case Study Primary Author: Beth Rose Middleton, Co-author: Teri Red Owl, excerpts from contributing authors included for thematic consistency.

Over the last century, water has remained California's most valuable commodity, and its strategic manipulation has enriched some of California's wealthiest landowners, often at the expense of indigenous peoples in California (see, for example, Rodney 1982; Middleton Manning forthcoming, 2018). Indeed, the management of California water has long been a site of ongoing injustice for tribes, exemplifying layers of attempted colonization of Indian homelands within California. The storied waterscapes of California Indian country, essential for life, livelihoods, identity, history, and spirituality, were appropriated by both Spanish and Mexican colonists to irrigate missions and land grants without tribal consent (see, for example, Anderson 2005; Bauer 2016). With the onslaught of miners in search of gold in the early American period came the advent of the doctrine of prior appropriation, by which water claimants asserted that the first parties to put water to productive use could claim it as their right. Miners were notoriously violent towards California Indians, murdering at will in a campaign of terror supported by the new state, which offered a bounty for heads of California Indians (Heizer 1974; Johnston-Dodds 2002; Anderson 2005; Madley 2016).

In 1851-1852, amidst these horrible times, three commissioners were sent by the federal government to negotiate treaties with California Indians. The 18 treaties would have confirmed 8% of California (and accompanying water) as tribal land, but real estate interests in the new state found these terms too generous and prevailed on the Senate to not ratify them (Hoopes 1975; Miller 2013). Between 1851 and 1853, Californians were offered the opportunity to file on lands under the 1851 Land Claims Act<sup>1</sup>, and these lands generally came with a water right, either riparian (along a waterway) or appropriated (put to use under the doctrine of prior appropriation). All persons were required to submit their claims for review and approval within two years, or they would pass into the public domain. Given the outright violence of the time period against California Indians, the fact that California Indians were not citizens at the time, and the lack of communication to California Indians about this law, California Indians were not able to file their land claims under this statute, so their time-honored water rights were taken from them along with their land.

Following the non-ratification of treaties, some California Indian lands were set aside by Executive Order (i.e., Round Valley, 1856; Hoopa, 1864; Tule River, 1873; Mission Indian Lands 1870s, 1880s, etc.); allotments via application and assignment under the General Allotment Act (1887); and Congressional appropriations to purchase Rancherias for "homeless California Indians." Pursuant to the 1908 *Winters v. U.S.* decision, tribal water rights were affirmed on trust lands, yet quantifying these rights and upholding their delivery remain significant issues for tribes.

Climate change creates increasing variability in water abundance and availability (additional information on climate impacts to water availability and quality are included in the Fourth Assessment Statewide Summary Report, Ch. 2). When tribal water rights are not affirmed, it creates increasing uncertainty for tribes, and enhanced vulnerability to drought, flooding, and fire.

### AGUA CALIENTE

Tribes throughout California have long been advocating for recognition of their inherent water rights before the courts, including asserting their need for adequate water quality and quantity for continued irrigation, subsistence, culture, industry, development, and

<sup>1</sup> An Act to Ascertain the Private Land Claims in the State of California (March 3, 1851, 31<sup>st</sup> Congress, Session 2, Chapter 40, 41).





conservation. This water is indeed their birthright, yet they must expend significant money and time to fight for it. As water resources become increasingly unpredictable and scarce, attention has expanded from surface waters to groundwater, a particularly important source of water in arid parts of the state such as the southern California desert. Agua Caliente Band of Cahuilla Indians (“Tribe”), located in the Coachella Valley in and around Palm Springs, engaged in a water battle with the local water districts that was recently decided on appeal in 2017. The decision in *Agua Caliente Band of Cahuilla Indians v. Coachella Valley Water District et al.* may have significant ramifications for tribal leadership in water stewardship in California and beyond.

Briefly, in 2013, the Tribe sued the Coachella Valley Water District and the Desert Water Agency for overdrawing the groundwater under the Coachella Valley and then pumping in lower quality water from the Colorado River. The Tribe argued that it had both an aboriginal and a federally reserved right (pursuant to the Winters doctrine) to adequate quality and quantity of groundwater. This case marks one of the first times a Tribe asserted right to groundwater and has been watched carefully by tribes and federal, state, and private water managers around the country. In 2015, the U.S. District Court, Central District of California, ruled that the Tribe did indeed have a federally reserved (yet not aboriginal) right to the groundwater. The two water agencies appealed and, in 2017, the 9th Circuit Court of Appeals upheld the decision and the Supreme Court declined to hear the case. This significant “win” for tribes affirms that they are legal constituents in the management of groundwater underlying tribal lands (see also Walton 2015, 2017).

The Owens Valley located in California’s Eastern Sierra is home to five federally recognized Tribes and stretches 112 miles in length. The Owens Valley flanked by the Sierra Nevada Mountains on the west and by the White Mountains and Inyo Mountains on the east is home to the Inyo National Forest. Mountain peaks on either side of the valley reach above 14,000 feet in elevation including Mount Whitney while the valley floor is about 4,000 feet in elevation, making it one of the deepest valleys in the United States. Water exportations from the Mono and Owens River Basins currently supply the City of Los Angeles with approximately one-third of its drinking water (USC Viterbi School of Engineering n.d.).

There is a long and complicated history of Los Angeles’ water grab from the indigenous people of the Owens Valley region. As common with other California Indians, the Owens Valley Paiute and Shoshone Indians lost their traditional homelands and water resources to settlers and farmers and then later to the City of Los Angeles with the help of the federal government. On May 9, 1912, President Taft signed Executive Order 1529, which set aside 67,120 acres in the Owens Valley for homeless Paiute and other Indians living on or adjacent to these lands. This order was later revoked in 1931 by House Resolution 11969 and in 1932 by Executive Order 5843 when Congress withdrew certain public lands from settlement for the protection of the watershed supplying water to the City of Los Angeles and other cities and towns and by President Hoover’s revocation of Executive Order 1529.

There are historical accounts of the Paiutes making use of the water that flowed from the mountains onto the valley floor. In 1855-56, W. Von Schmidt surveyed the Owens Valley and recorded over 60 miles of “Indian ditches”. In 1859, U.S. Army Captain John W. Davidson traveled to the Owens Valley and described the indigenous people as industrious and making good use of their resources and that the mountains were filled with timber, the valleys with water, and the meadows with luxuriant grass. This all changed with the arrival of settlers and miners and with the U.S. Army’s forced removal of 1,000 Paiutes that were marched out of the Owens Valley some 250 miles to the south to Fort Tejon. Eventually, many of the Paiutes returned to the Owens Valley.



After land grabs by the City of Los Angeles and the building of the Los Angeles Aqueduct that started in 1908 and was completed in 1913, surface water that flowed from the mountains began leaving the Owens Valley for Los Angeles some 233 miles to the south, and later, in 1918, exports of groundwater pumped from the valley floor began.

Due to Los Angeles' water gathering activities and their plans to relocate the indigenous population, there was a land exchange in 1939 between the federal government and the City of Los Angeles resulting in the current reservation land bases for the Bishop, Big Pine, and Lone Pine Tribes. The largest reservation is a mere 875 acres. Today, there remains a dispute over the indigenous people's water rights and land.

With land bases being a fraction of the size of their original traditional homelands, ensuring plants, animals, and water resources are cared for is a top priority for the Indians in the Owens Valley. The indigenous people in the Owens Valley are especially affected by climate change because of the fragile state the Valley is in due to over-pumping of groundwater and poor surface water management practices. Alkali meadows are turning to tumbleweed landscapes as a result of drought and over pumping. Piñon trees in the forest are not yielding the pinenuts that historically were major sustenance to the Paiutes. The rabbits are scarce. The Piuga (Pandora moth larvae) found in Jeffrey Pines that were and still are harvested, prepared, and stored using traditional methods are harder and harder to find. The dust that blows from the Owens Dry Lake located at the southern end of the Owens Valley is toxic and creates asthma and other respiratory problems for the residents of and visitors to the Owens Valley. The Owens Dry Lake dust is the largest source of PM10 dust pollution in the United States, exceeding the federal air pollution standards for particulate matter.

Changes in climate including drought have had a negative impact on the indigenous people's quality of life. Incorporating traditional ecological knowledge into resource management practices would benefit the region by rebalancing the carrying capacity especially in terms of water use.



## CASE STUDY | The Living Environment

Case Study Primary Author: Ron W. Goode, excerpts from contributing authors included for thematic consistency.

**T**he North Fork Mono Tribe has been conducting ecological restoration work on governmental land since 1991 and has been burning and maintaining their 1.4 million homeland acreage for some 15,000 years on the western Sierra Nevada Range (oldest dated artifact, Clovis Point, Sierra National Forest, Cultural Heritage Program, 2002).

The tribe understands that drought, flood, meadows, forests, and harvests are all intertwined, and being changed by the climate.

There are two definitions of drought that tribes use in the Tulare Lake Basin. The first reflects precipitation or a period of precipitation (at least two years) that is significantly less than average. The second definition is when, for various reasons, including diversions and climate change, we do not have the quantities of water we are entitled to. While precipitation can return to average to eliminate drought in the first definition, there still isn't enough water to meet demand due to socio-political action or inaction (e.g., global and local climate action or lack thereof). Local farmers prevailed to have Tulare Lake drained so that the lakebed could be used for agricultural purposes. As a result, the presence of excess water in the lakebed is labeled a flood (Austin 2012).

Droughts are commonly hyphenated by very wet years; some droughts are preceded by wet years, and some droughts are ended by very wet years. Therefore, flooding is given a higher priority of remembrance by the Tribe than the drought years. Mudslides that follow fires and floods are just as dangerous and devastating as droughts, global warming, and mega-fires.

### CLIMATE IMPACTS

The Fourth Climate Assessment Statewide Summary Report includes information on historical and projected changes in temperature, precipitation, and snowpack; the biggest takeaway is an increase in variability and extremes projected under continued climate change (Statewide Summary Report, Ch. 1). The historical information presented in this report is documented by the author and his tribal community. In recent decades, 1976-1977 was the warmest year on recent record until 2015-2016. 1987 to 1992 is considered one of the longest droughts of our time (six years), yet it was followed in 1992 with an El Niño. 1993 to 1997 began another four-year drought and in 1997 major floods took place. Flooding happened in 2011, prior to the 2012 start of the last five-year drought, in the Sierra Nevada Mountains, but precipitation was low. It was said, if we had no more rain that year, we had enough snow pack to take us through the year. Unfortunately, we got very little rain the rest of the year, but the snow did take us into the next season.

By 2015, the snow and precipitation returned moderately to the San Joaquin Valley, but never quite reaching normal snow and precipitation levels for the season. As indigenous gatherers, we knew things were turning around as our "harvest" window began to change in 2016 and the resources were trying to adjust to an abundance of water once again. What this means is, during the drought the resources adjusted to how much water they needed to survive on. The tribe witnessed production of the fruit and nut or bulb was in a deficit but some individual bushes and trees or plants were producing. This increased the production from approximately 10% during the height of the drought back up to 25% crop production. During normal water years, and when the acorn producing trees are abundant, the Native American community will have three to four food booths selling acorn products at their cultural events. During the drought, cultural events had 10% of its normal selling booths with acorn products.





The Tribe monitors by observation, and standards are set by ancestral generational knowledge passed down, taught, and practiced by the elders. For example, during the drought, there were very few trees dying within the meadow area. Outside the meadow, everything was brown from drought and the bark beetle. Once the water returned, trees began to die somewhat slowly, turning from a kind of blue green color to a dirty brown versus the orange brown color the bark beetle trees turned. It was like the trees figured out how to live with a minimal amount of water, and then died from drinking too much water.

**HARVEST WINDOW MONITORING**

Over the last seven years (2010-2017) the Tribe has monitored and recorded the times when harvests are taking place in the South Central San Joaquin Valley – and how the harvest windows are changing.

**TABLE 3: HARVEST WINDOW**

**Effects of Climate Change on Native American Resources – Harvest Window (S. Central San Joaquin Valley), Researcher Ron W. Goode, North Fork Mono Tribe (2010 to 2017)**

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
<b>Blue Elderberry</b>												
Harvest Window (High Elev.)				Mid Aug. to Early Nov.				I - - - - -				I
Current Harvest		<b>2017</b>		(Mid Aug. to Early Nov.)				I - - - - -				I Bloom Mid - July to Aug
Last year		<b>2016</b>	"light"	Early Sept. to Early Nov.				I - - - -		I - - - -		I
2 to 3 yrs. ago		2015/2014		Late Aug. to Mid Oct.				I - - - - -				I
4 yrs. Ago Harvest		2013 and Prior		Mid Sep. to Late Oct.				I - - -		I - - -		I
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
<b>Black Oak Acorn</b>												
Harvest Window					Mid Sep. to Late Nov.					I - - - - -		I
Current Harvest		<b>2017</b>	???	(Early Oct. to Dec.)								
Last year		<b>2016</b>	"Poor"	Early Oct. to Dec.						I - - - - -		I Acorns early Dec.
2 to 3 yrs. ago		2015/2014		Mid Oct. to Mid Nov.						I - / - / -		I
4 & 5 years ago		2013 and 2012		Late Oct. to Early Nov.							I - -	I
7 yrs. ago Harvest		2010 and Prior		Mid Sep. to Mid Nov.						I - - -		I - - - I



**Effects of Climate Change on Native American Resources – Harvest Window (S. Central San Joaquin Valley),  
 Researcher Ron W. Goode, North Fork Mono Tribe (2010 to 2017)**

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
<b>Blue Elderberry</b>													
Harvest Window (High Elev.)									I	-----		I	
Current Harvest									2017	(Mid Aug. to Early Nov.)			
									I	-----		I	
Bloom												Mid - July to Aug	
Last year									2016	"light"	Early Sept. to Early Nov.		
									I	----	I	----	I
2 to 3 yrs. ago									2015/2014		Late Aug. to Mid Oct.		
									I	-----		I	
4 yrs. Ago Harvest									2013 and Prior		Mid Sep. to Late Oct.		
									I	---	I	----	I

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
<b>Black Oak Acorn</b>													
Harvest Window													
Current Harvest									2017	???			
(Early Oct. to Dec.)													
Last year									2016	"Poor"	Early Oct. to Dec.		
									I	-----		I	
Acorns early Dec.													
2 to 3 yrs. ago									2015/2014		Mid Oct. to Mid Nov.		
									I	-/-/-		I	
4 & 5 years ago									2013 and 2012		Late Oct. to Early Nov.		
											I	--	I
7 yrs. ago Harvest									2010 and Prior		Mid Sep. to Mid Nov.		
									I	---	I	----	I
<b>Golden Cup Oak Acorn</b>													
Harvest Window													
Current Harvest									2017	'abundant'	(Early Sept. to )		
									I	-----		I	
1st- Crop out late Aug.													
Last year									2016	"Poor"	Sept. through Nov.		
Weak Crop													
2 yrs. ago									2015	"Good"	Sept. through Nov.		
Full Crop – Worms													
3 yrs. ago									2014	"Ok"	Sept. through Nov.		
Minimal Crop													
4 & 5 years ago									2013 and 2012		Sept. through Nov.		
Sparse Crop													
7 yrs. ago Harvest									2010 and Prior		Mid Sep. to Mid Nov.		
									I	-----		I	
Medium Crop													



**TABLE 3: HARVEST WINDOW, CONT'D.**

**Effects of Climate Change on Native American Resources – Harvest Window (S. Central San Joaquin Valley),  
Researcher Ron W. Goode, North Fork Mono Tribe (2010 to 2017)**

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
<b>Native Tobacco</b>												
<b>Harvest Window</b>					I	-----	I					May 1 to Late July / August
<b>Current Harvest</b>		2017	"light harvest"		I	---I	---	I				May 1; Bloom May 21; June 15 & July 18
<b>Last year</b>		2016	"light harvest"		I	--I	--I	--I				Mid May; Early June to Early July
<b>2 to 4 yrs. ago</b>		2015/2014/2013			I	-----	I					May 19/21/22 to Mid June
<b>5 yrs. Ago Harvest</b>		2012 and Prior			I	--I	---	I	--I			Late May; June-July; Late July
<b>Three Leaf Sumac</b>												
<b>Harvest Window</b>					I	-----	I					Mid May to Late July / August
<b>Current Harvest</b>		2017	"good"		I	--I	-----	I				Green May; Early June; June 18 & July 2
<b>Last year</b>		2016	"light"		I	--I	-----	I				Fake Harvest Early May; June to July
<b>2 to 4 yrs. ago</b>		2015/2014/2013			I	-----	I					Late May to Late June
<b>5 yrs. Ago Harvest</b>		2010 and Prior			I	--I	---	I	--I			Late May; June-July; Late July

In 2016 the Tribe witnessed more rain than normal in the Central San Joaquin Valley with plenty of precipitation well into the late spring. Resources had to readjust themselves; several cultural resources had a "pre" crop. Berries on the Three Leaf Sumac came out and ripened a month early in April/May. But they had no seed or none that hardened so that by June the berry shriveled up. Meanwhile, a new crop was coming forth and by June and July they were ready for harvest. Another example was the Native Tobacco; normally the plant begins to come out by mid to late May and is harvestable in June and July. In 2016, the plant came out on April 1 as it had the previous three years, only to grow spindly with small leaves low to the ground. Later, by May 22, a new crop emerged and was harvestable in early June.

**MEADOW SPECIES MONITORING**

In 2015 the species count at the higher elevation meadow went from 55 in 2014 to 136. In 2014, no ladybugs were recorded, but in 2015, 5 thousands of ladybugs were found under downed logs, and 4 to 5 different species of the lady beetle was recorded. Likewise, the bird count went from 6 to 8 birds identified via feathers, song, and visual identification, to 18 to 20 identified via visual identification and song.





In 2015, species observation monitoring counts increased from 55 to 110 species on the middle elevation meadow. As stated, the lower elevation meadow increased by 25 new species in 2016, and three nests of ladybugs were recorded.

Species monitored included: grasses, rushes, cultural plants, food producing trees, bushes and flowers, medicine and fiber plants, as well as insects, spiders, ants, dragonflies, butterflies, bees, flies, birds, animals, and reptiles. Some of the species identified may not live on each respective meadow but very well may travel from one meadow to the other, as all three meadows are located on the same north fork of Willow Creek water drainage.

In May 2016, water oaks appeared to be dying with no new leaf structure. By late July, the leaves began to regrow on trunks and limbs of the tree, yet the tips of the limbs remained dead. It was as if they were giving up, then discovered there was still plenty of water and came back to life. All species, all resources, adapt in their own way to climatic change.

The Bass Lake meadow site increased from 40 to 72 species in 2016. Oak monitoring was also conducted in 2016: 62 black oaks and 49 golden oaks were recorded in the broader surrounding 10 acres of the meadow. Over 100 young growth and saplings were recorded. In 2017 some of the black oak trees produced acorns on a moderate scale; however, the golden oak trees were loaded with an abundance of acorns.

The North Fork Mono Tribe's Crane Valley Road Restoration Project provides an example of species monitoring and overlapping cultural resource considerations. This project started in 2003 and was completed in 2017, in collaboration with the U.S. Forest Service, Sierra National Forest, and the Bass Lake Ranger District. The following is an illustrative list of species / cultural resources at the ~5 acre site.

**TABLE 4: CRANE VALLEY ROAD RESTORATION PROJECT – CATALOGUE OF SPECIES / CULTURAL RESOURCES ON THE ~5 ACRE SITE, NEW PLANTS AND RESOURCES IDENTIFIED FROM 6-15-17 TO 9-28-17, ~90 SPECIES RECORDED**

ANIMALS	INSECTS	INSECTS	PLANTS	BIRDS
Black Bear	Lady Bugs	small black ant	Hartweg Iris	Grey Hawks
Turkeys	yellow bee (?)	black spider	Cinquefoil	Turkey Vulture
Deer	Gnat	stink bug beetle	Potentilla	Red tail Hawk
Big dog track	small fly	earth worm	Violet	Ravens
Lion	Scorpion	butterfly (?)	Pearly Everlasting	Woodpecker
<b>REPTILES</b>	Small red bee	House fly	- (dry)	- Pileated
Salamander	Bark Beetle	CA Sister	Shoot Star	Black Phoebe
Racer Snake	Black Deerfly	Spring White	Sweet Pea	American Kestrel
		Swallow tail	Water Plantain	
			Buttercup	



**TABLE 4: CRANE VALLEY ROAD RESTORATION PROJECT, CONT'D.**

ANIMALS	INSECTS	INSECTS	PLANTS	BIRDS
			Blue-eyed Grass	
			Clarkia (Farewell to Spring)	
			Common Madia, wet/dry	

CULTURAL RESOURCES	BERRIES	OAKS	CONIFERS
Bracken fern	Blackberries	Black Oak	Ponderosa Pine
Chaparral	Manzanita berries	Canyon Live Oak	Incense Cedar
Deer grass	Strawberries	Golden Oak	
Indian hemp	Sierra Coffee Berry	Interior Live Oak	
Leather root			
Manzanita	MEDICINES & TEAS	FOOD SOURCE	
Mule Ear Broad Leaf	Horse tail	Blue Dicks - Bulb	
Mule Ear Narrow Leaf	Lupine – blue	Yampah – Tuber	
Hall's Mule Ear	CA Mint	Clover – long stalk	
Sedge root	Bridge's Wild Rose	Clover – 3 leaf Red	
Soap root	Yarrow	Miner's lettuce	
Willow–Button	Pine Pitch	Native Grass – Seed- Oat/ Wheat (?)	
Willow–Long leaf	Manzanita bark	Apple tree	
	Moss/Lichen	Clover – Foothill	
	Skullcap Mint	Clover – Slimy (Salt)	
	Wormwood	Brodiea – Indian Potato	

FUNGI
Mushrooms – (3) all different non-edible species

INVASIVE
Bull Thistle; Scot's Broom; Velvet Grass



In 2017, the six meadows the Tribe had been restoring were considered fully functional, while still requiring some repair and maintenance. In mid-August, an assessment of the six meadows was conducted. Every meadow not only had a flow of water, but was also holding water throughout the wetland ecosystem. This was evidenced by the pant legs of all those assessing which were soaked above the boot and below the knee after reconnaissance of each meadow.

### **STRESSORS THAT AMPLIFY CLIMATE IMPACTS**

Drought and climate change is strongly affected by evaporation in a dense forest canopy and the watershed run-off in said dense canopy. The Tribe observes the average forest canopy when untreated is 80% to 90% in denseness. Treated forest's leaves has 40% to 60% canopy denseness, whereas, when Native Americans were stewarding the full landscape, they kept the canopy at 40% or less according to the Tribe's records. Further, if the snowpack and precipitation cannot reach the floor the precipitation evaporation constitutes a 15% to 20% loss according to tribal observation. A faster snowpack melt happens when the forest floor is left trashy with tree debris, and this will be enhanced by the current tree mortality in the Sierra Nevada forests. A trashy floor allows air pockets, creating a faster snow base run-off.

Downstream users, urban centers, and agriculturalists are all affected by evapotranspiration and outdated hydroelectric power plants that lose significant precipitation by evaporation from storage lakes. Losing our sacred water is not acceptable. The general population cannot count on an abundance of water year in and year out for any sustainable time.

100 years of fire suppression and mismanagement by forest agencies and environmentalists has created a tinderbox forest. Climate change may make this worse, but what it comes down to is current management policies do not meet our environmental needs for equitable sustainability.

As referenced throughout this report, on-going climate change impacts are well documented. Yet, it is crucial to understand that the Native American lived well off the land for thousands of years, advancing their technology and continually populating the land. Before the Euro-American came to California in the 1800s, more than 350,000 indigenous natives lived healthily off the land, in what is California today. But unlike their vulnerability today where the American Indian is locked in on allotment lands, Rancherias, Reservations and Indian Communities, back then they could move around, spread themselves out, adapt to the constant climatic changes.

### **INNOVATIVE SOLUTIONS**

In 2017, the Sequoia National Park and the North Fork Mono Tribe jointly conducted a Cultural Burn to restore 200-plus Blue Oaks and create a more efficient acorn production. The Burn took place in June and the monitoring was conducted in November. On one burn unit, 48.5% of the trees produced an acorn crop, with at least three trees having an abundant crop. The smaller burn unit had a 36% acorn crop production per the unit's trees.

Since 2003, the Tribe has been engaged in meadow, oak, and cultural resource restoration work on the Sierra National Forest, and has six meadows that are being restored; two were considered healthy with some maintenance needed, and the other four were listed in





the non-existent category needing total repair. Each meadow had water, but was not holding water the way they are designed to do. Plus, they were all over-grown and needed eradicating of invasive species, conifer encroachment, and the cultural resources needed to be burned. In Mid-August of 2017, an assessment was conducted on all six meadows; the meadows were full of water throughout the meadow and were green not brown, as mid-August should have had them. Water soaked all members' pant legs while they were assessing the meadows.

#### RESTORATION

Ecological restoration entails taking meadows that in some cases are no longer considered viable meadow ecosystems and were basically written off as not having the capability to hold water and making them a 'sponge' that a functioning meadow should be. To accomplish this, what doesn't belong on the meadow needs to be removed, i.e., conifer encroachment, invasive plants, and/or fixing erosion gullies and culverts in roads that cut through the meadow as well as damage from the historic train logging that changed or modified the stream and water flow to the meadow. Restoring the land and restoring the meadow entails bringing the water table up to the surface, allowing the precipitation to fully reach the surrounding watershed by thinning, so it will be soaked up and stored by the roots of the vegetation and allowed to gradually and continually flow to the meadow sponge.

Accomplishing this landscape restoration is done by thinning outside of the meadow so the canopy is less than 60%. When Native Americans lived out on the land, they kept the forest canopy at or less than about 40%. As evidenced by the archaeological site in-association with every major meadow, they used a philosophy called, "the see-through concept." This meant they needed to be able to see under the forest trees and create an openness that they were comfortable with because that is where their children played, where the deer, bear, and lion roamed, lived, and came to drink in the meadow spring. In order for the Indian to live on the land for 15,000 years, they could not afford to feed to the bear and lion many of their children, hence the-see-through concept. These traditional perspectives are supported by new and ongoing reports on forest management and health.<sup>1</sup>



Photo credit: Jonathan Long, USFS

<sup>1</sup> U.S. Forest Service Pacific Southwest Region 5 has identified thousands of meadows in the Sierra Nevada Mountain Range. The majority of these meadows are in need of maintenance or repair. Improving the watershed by restoring the meadows will provide a higher water content to the valley floor. "Built infrastructure alone is increasingly unlikely to provide future water security and resilience against predicted climate change impacts (Ozment et al. 2015; Dalton and Murti 2013). New demands on solutions for water security are emerging in a global context where about four billion people – 60% of the world's population – live in regions with a state of near-permanent water stress, where net withdrawals of surface and groundwater meet or exceed the available supply, meaning that no additional water is available for ecosystem use or to meet future demand. Water stress is exacerbated by pollution, creating severe risks for human health (Corcoran et al. 2010).



When Native Americans lived on the land, they conducted prescribed burns, broadcast burns, and cultural burning. All three of these burns have a skill set, a strategy, a ten-year plan, and a thirty-year plan. The indigenous tribal folks' life concept was to always look to the seventh generation, their grandchildren's grandchildren, some 100 to 120 years into the future, because the decisions they made now better be good enough for the future of the people.

As the Tribe continues our restoration process, we start with who lives there. Each meadow has some 120 to 150 different species, of plants, foods, fibers, medicines, flowers, animals, bugs, insects, reptiles, birds, bees, and butterflies, lions, bears, and cows too. So as we strategize our plans to rejuvenate the forest and bring back the water, we have to look at the whole picture, not just how we preserve our land for those that are endangered or threatened in their existence. Because the Indian has been on the land for eons, they know some species do slip out of existence, but where one species disappears, another replaces it.

Because of the state of deficiency the meadows are in, one cannot expect to restore a meadow fully in one or two years. Taking into account the decades that the meadows have been encroached upon and the lack of maintenance and repair that has created the condition that they are in today, landscaping takes a few years to restore them. On the three meadows the Tribe engaged in, the National Environmental Policy Act (NEPA) was created five years before restoration began and discussed some time before then. Once that Record of Decision (ROD) comes out, and the proposed work gets going, there may be vast differences not only in the written document but what has transpired on the meadow over that time period. So while the Tribe conducted encroachment and invasive plant removal over the past three years (2014-17), the plugged culverts in the road that bisects the meadow(s), the historic railroad mitigation, and the gully erosion(s) mean it will take another two to five years before the meadows can be considered fully restored.

The tribal concept of "seeing through," is a literal and philosophical view of what the landscape should look like. When we are in the forest, elders and ancestors have passed down the concept through the generations that you should be able to see through the trees for at least a quarter of a mile. When a baby is born, it is placed in a baby basket made of sticks, rushes, reeds, and roots, some of which comes from the meadow and riparian areas out in the forest. This basket is made so the baby can look through the hood of the basket and see the world, yet the hood is a cover and shade for the baby.

All four of the Tribe's meadow restoration sites have the "see through" cultural concept. In the middle elevation meadow, an interesting TEK story surfaced in regards to the removal of the invasive species, the Bull Thistle. In 2014, ten 40-gallon bags of bull thistle were removed by digging up the thistle. At the start of the 2015 summer, another five 40-gallon bags of thistle were removed. Then the Forest Service botany team joined the tribal workers and an additional six 40-gallon bags of bull thistle were removed. Only this time the forest botany team only wanted the tops removed.

There was some concern that digging in the meadow might not be a good thing or even meet environmental policy. However, tribal cultural practices include aerating the meadow, especially when digging roots and bulbs. But the real objection came when new bull thistle growth was left. A small confrontation took place: why would thistle be left when the point was to remove it? As described to the botany team, this was a tribal cultural practice. All the species on the meadow and in the forest are considered relatives in the tribal lifeway. The cultural practice is to always take food when visiting a relative and when you do visit a relative they will always feed you. They (your relatives) may talk about you after you leave but food will always be shared.

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Harnessing the water-related services of 'natural infrastructure,' such as forest, wetlands and floodplains, will help combat the risk of water crisis, particularly in face of future climate stresses (Ozment et al. 2015; Cohen et al., page 12, 09/04/2016)."



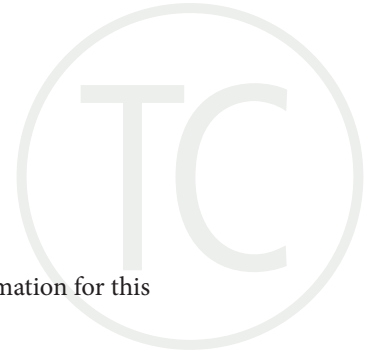


So why come to the meadow where all our relatives live and remove their entire food source? The time was late August, early September, with Indian summer yet to come. Even though rain and snow came early in 2015, late growing sunflowers and bull thistle still matured. This gave all those who feed off of them something to feast on before winter set in.

The Tribe's Participating Agreement (PA), and new Master Cost Share Agreement states that the Tribe will be utilizing their Tribal Cultural Practices (TCP) and implementing their Traditional Ecological Knowledge, (TEK) and agencies will work along with the Tribe to gain knowledge of the tribal ecological practices. This is a highly regarded statement, and the contract affords the Tribe latitude and flexibility toward accomplishing its restoration goals while applying their TEK and TCP.

The application and integration of tribal and non-tribal science while navigating restoration practices through a maze of environmental policies requires a lot of patience. One meadow may very well take ten years to restore. There are thousands of meadows in California. However, this application and integration holds the promise for a new framework for restoration landscaping.





## Recommendations

The following recommendations are compiled from case studies and tribal review of the climate information for this report and are intended for consideration by the state and tribes alike.

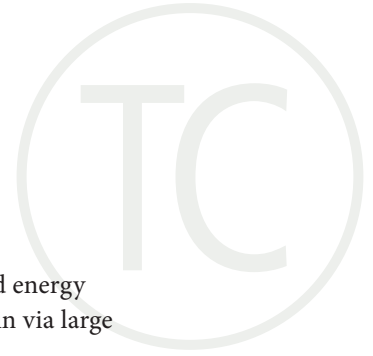
### Recommendations for Incorporating TEK and Cultural Practices

- All co-managers of lands and resources should form alliances and cooperatives with tribes to share knowledge and techniques to include TEK.
- Look to working models like landscape conservation consortiums for examples of benefits to partnering with tribes and incorporating TEK into management practices.
- Conservation efforts and particularly land conveyances should be done in partnership and consultation with tribes who identify those areas as ancestral homelands to ensure continued land management by those tribes utilizing TEK (e.g., rethinking perpetual conservation). Work on ways to incorporate TEK while preserving confidentiality of TEK information and practices as needed.
- Acknowledge that TEK is a lifestyle and a responsibility for tribes.
- TEK partnerships work best when they are driven by tribes and address issues that tribes have an interest in. When integrating TEK, turn to tribal partners, tribal partnerships, and/or tribal stakeholders to link or bridge a project or endeavor to those who are knowledgeable of ecological traditions. This link could be as simple as hiring native youth trainees, indigenous workforce employees, elders, and/or experienced Native American consultants.
- It is important to protect tribal data and information, and facilitate and maintain tribal control of this data and tribal knowledge leads to successful partnerships.
- Building a mutual trust is important and takes time.
- TEK is earned through trust building and demonstrations of worthiness.
- Incorporation of youth and younger generations is an effective component of successful TEK projects.
- Defining clear and possibly negotiated outcomes of a TEK project.

### Recommendations for Energy

To achieve rapid reduction in greenhouse gas emissions and improve energy and transportation reliability and resilience, there are many areas tribes and the state can look to for collaboration:

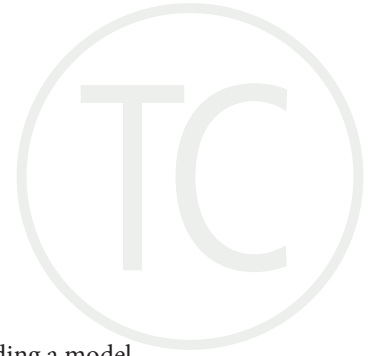
- Explore tribal participation and co-benefits of leveraging tribal government resources with state resources to more rapidly reduce greenhouse gases and achieve California and tribal climate goals. Examples include but are not limited to: carbon markets, revolving loans, funding for rapid deployment of low carbon energy and transportation technologies, and expansion of net energy metering (NEM) and NEM aggregation for community-scale decarbonization in the energy sector.
- Ensure California energy and transportation policy, programs, and incentives consider including tribal governments (e.g., tribal governments eligible to form community choice aggregation entities).



- Consider grid tied or islanded microgrid applications for tribal communities that have never had energy service, and/or where energy service is low quality, and/or cost-prohibitive to provide or maintain via large transmission lines.
- Enable community solar gardens (with battery storage as applicable) with rate structures that support these types of infrastructure developments (e.g., net energy metering aggregation), especially where benefits accrue to disadvantaged communities and/or low- to moderate-income (LMI) households.
- Implement more “Social Cost of Energy” and carbon emission valuation paradigms alongside lowest cost/highest benefit models to stop externalizing health and environmental hazards in the energy and transportation sectors. Companies report that these types of regulation are not onerous in practice, as long as they are predictable.

## Regional Recommendations

- Revise policies to include tribal state partnerships across all sectors of climate action.
- Redefine and expand the role and authority of tribes in managing traditional resources offers an equitable solution to the current situation.
- Developing new relationships between tribes and state and federal agencies (e.g., the U.S. Forest Service) will require changes in the current management institutions in the decision-making processes of land management and in access by tribes to agency managed resources necessary to tribal physical and cultural well-being.
- Building tribes’ capacity to play an appropriate role in ecosystem management is the best means by which ecosystem restoration, cultural survival, and community prosperity will be achieved.
- Incorporate TEK with other scientific techniques.
- Study, based on demonstrated need, and with tribal TEK inclusion:
  - o Upper watershed environments and their functionality. Millions of dollars have been allocated for water improvement projects by the state, and more of that funding must reach projects and studies in the upper watersheds.
  - o The San Joaquin River’s 14 dams and storage basins, and temperature increases and evaporation losses. The dam/storage system is preventing cool water from reaching the ocean, where it helps to cool the ocean temperatures.
  - o Meadow restoration projects for replication possibilities. With thousands of meadows and only a small percentage efficiently functional, the need to restore our meadows (and the upper watersheds) that service our downstream stakeholders is a very high priority for the sustainability of our future generations.
- Put fire back on the land. Cultural, prescribed, controlled fire is a restorative process that is necessary to rejuvenate the landscape, put more food on the table for the habitat, and raise the water table in the watershed. Tribes are key experts and stakeholders and can be relied upon for information and techniques related to fire management.
- Factor in landscape-scale restoration, restoring the water, fixing the functionality of Mother Earth’s mechanics.



## Recommendations for Better Partnerships with Tribes

- Respect the role of elders in authorizing and developing projects and parameters of projects. Building a model for partnership (e.g., an advisory committee of elders) is one way to start.
- Engage tribes and tribal communities early and often in initial project development. Tribes and tribal communities are at times already engaged in discussion over a proposed project; therefore, they will and can invite agency representatives to come to them to hear how they feel and what they expect. Through this approach, the information stays with the elders and keeps control of the resources in their hands. When information is not “gathered” or analyzed but given to partners, it is so done in such a way that it becomes directly applicable and actionable to the project outcomes.
- Support capacity and network building within tribal communities on climate topics and co-management initiatives.
- Continue placing emphasis on acknowledgement of tribal history and involvement in the state of California. Traditional and mainstream forms of agriculture and land management are present on the vast majority of tribal lands. Partnerships with tribal governments increase collaboration on and effectiveness of strategies to address the impacts of California’s changing climate.

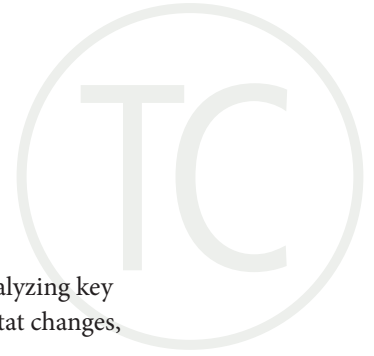
## Recommendations for Climate Action Research

- Funding for tribes to be engaged as partners in crafting and implementing projects for climate impact assessment and mitigation/adaptation work.
- Achieve better data reporting and analysis from tribal resource agencies – forestry, fisheries, natural resources, energy, and environmental departments so that tribes and the state can utilize tribal data.
- Ensure inclusion of a tribal lead on studies of climate impacts on tribal lands
- More research is needed on tribal-specific adaptation strategies given legal and political context (relocation, cultural preservation) to better address challenges and issues facing tribal communities.
- More documentation and case study development is needed of integration of TEK and collaborative approaches.

## Recommendations for the Fifth California Climate Change Assessment Report

- Ensure this tribal report and contents are the basis for tribal/state partnerships in future assessments.
- Begin tribal report synthesis earlier with a goal of incorporating >20 tribes in California.
- Focus outreach to tribal natural resource, environmental, sustainability, energy, transportation, and other climate-related staff, especially tribal scientists, for data and content.
- Support Tribes in obtaining more data and reporting from tribal resource agencies – forestry, fisheries, natural resources, energy, and environmental departments, etc.
- Dedicate funding for tribal authors’ and editors’ time.



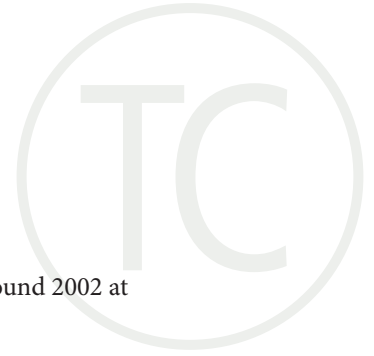


## Conclusion

Many tribes are strong advocates for climate action. Tribes are studying, compiling, providing, and analyzing key scientific data sets within the climate sector (e.g., air quality, water quality, TEK, fisheries, forests, habitat changes, and others).

California's climate goals will be far easier to reach with tribes as co-management collaborators. This collaboration requires a respect and incorporation of tribal science and management practices (e.g., TEK).

Climate action requires bold, knowledgeable leadership, and tribes and the state share this trait. Regardless of past events and relationships, climate action requires all parties to look forward and work together.



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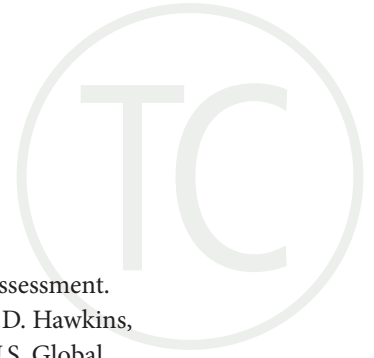


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## Additional References

The following references are for further reading.

### Tribal

- [Climate Change and Indigenous Peoples Synthesis Report](#)
- [Guidelines for Considering Traditional Knowledge in Climate Change Initiatives](#)
- [Institute for Tribal Environmental Professionals' climate profiles](#)
- [Pacific Northwest Tribal Climate Change Network](#)
- [Southwest Tribal Climate Change Network](#)
- [Southwestern Tribal Climate Change Summit](#)
- [2017 National Adaptation Forum tribal track presentations](#)

### California Climate Assessments

- [California Climate Change Assessments](#)
- [California's Fourth Climate Change Assessment: Energy Research Portfolio](#)
- [California's Fourth Climate Change Assessment: Resources Research Portfolio](#)
- [California's Fourth Climate Change Assessment: External Collaborator Projects](#)

### California State Government websites and resources

- [Cal-Adapt.org](#)
- [California Climate Change Portal](#)
- [California Climate Data Archive](#)
- [Climate Change Research Plan for California \(2015\)](#)
- [University of California Climate Change Extension: Climate Science Applications Program](#)

### US National Climate Assessment and US Global Change Research Program Special Reports

- [3<sup>rd</sup> US National Climate Assessment](#)
- [Draft Fourth US National Climate Assessment](#), when available (particularly the Indigenous Peoples Chapter and Southwest Chapter)
- [2013 Assessment of Climate Change in the Southwest United States](#)
- [Climate Change Impacts of Human Health in the United States](#)



## Government climate change programs' documents and websites

- Bureau of Indian Affairs Tribal Resilience Program-Pacific Region,
- California Landscape Conservation Cooperative
- North Pacific Landscape Conservation Cooperative
- EPA Region 9 Southwest
- USGS Southwest Climate Science Center
- NOAA's California-Nevada Applications Program
- US Climate Resilience Toolkit profile case studies, Climate Adaptation Knowledge Exchange case studies
- USDA's Southwest Climate Hub
- U.S. Climate Resilience Toolkit: <https://toolkit.climate.gov/topics/tribal-nations>
  - o Case Study, Karuk Tribe: <https://toolkit.climate.gov/case-studies/karuk%E2%80%99s-innate-relationship-fire-adapting-climate-change-klamath>
  - o Case Study, Blue Lake Rancheria, California: <https://toolkit.climate.gov/case-studies/blue-lake-rancheria-tribe-undertakes-innovative-action-reduce-causes-climate-change>