

## 6.7 Impacts of Climate Change on the Pala Band of Mission Indians of Mission Indians

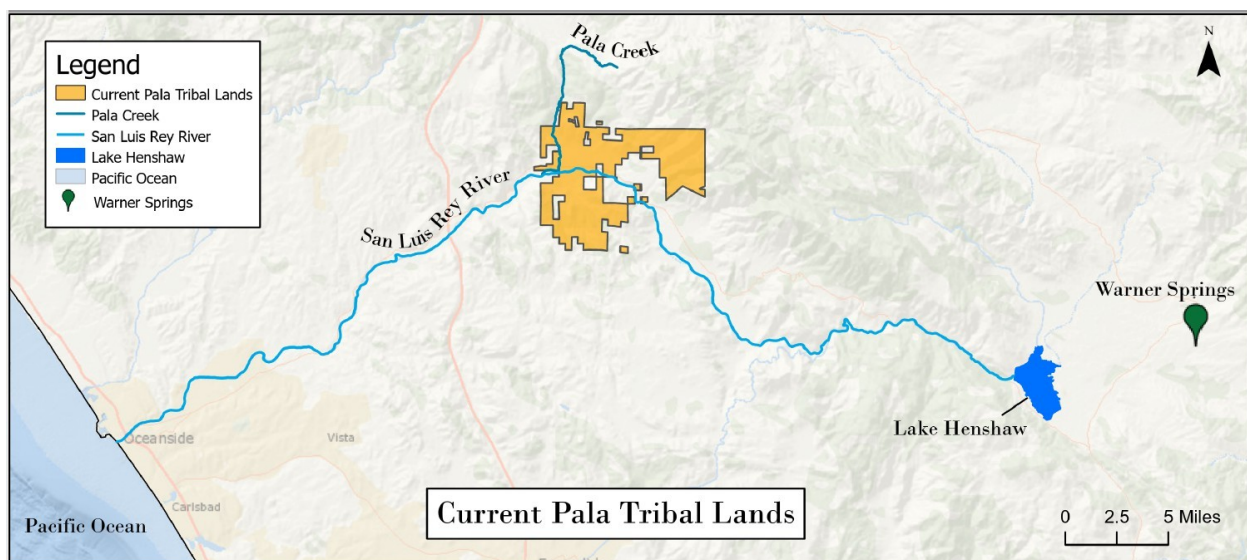


Rising temperatures, drought, wildfires, and flooding are threatening the physical, cultural, and spiritual health of the Tribe, its habitats and ecosystems, and its built environment.

### Background

The Pala Band of Mission Indians is a federally acknowledged Native American Indian Tribe that has a current enrollment of approximately 1,000 Tribal members. The Pala Band has jurisdiction over the Pala Indian Reservation that was established in 1875. Approximately 1,500 people live on the reservation. The Pala Indian Reservation is located on approximately 14,000 acres in northern San Diego County, approximately 30 miles east of the Pacific Ocean (see [Figure 6.7.1](#)). The Pala Reservation sits next to the Palomar Mountain range that runs along 5,000 square miles of California desert. Adjacent to the reservation is the Cleveland National Forest to the north and east, and

**Figure 6.7.1. Map of Current Pala Tribal Lands.**



Source: Pala Environmental Department



private agricultural lands to the south and west. The reservation lies within an alluvial valley surrounded by steep granite mountains and is divided into two areas by the San Luis Rey River; these are referred to as the north side and the south side. The north side contains most of the homes and development; however, there are also approximately 100 homes and structures south of the river. Elevations range from approximately 340 feet above mean sea level (MSL) at the valley floor to approximately 1,250 feet above MSL in the northern and southern mountainous areas, with most residential, agricultural, and industrial activities occurring in the lower elevations of the reservation. Approximately 88% of the land is currently undeveloped. Land uses include agricultural, mining, pastureland, commercial businesses including gaming, and residential uses.

The South Coast of California where Pala is located is home to one of the world's biodiversity hotspots. Rapid development occurring in the areas surrounding the reservation has increased the burden on natural resources and degraded ecosystems and habitats. In particular, new housing developments west of Pala as well as the growing population in the nearby city of Temecula, north of Pala, have created issues with traffic and air quality.

Prior to the construction of the Lake Henshaw Reservoir and Dam in 1923, Pala had access to the San Luis Rey River's perennial water supply. A complex history of water diversion by new settlers and legal battles ultimately led to a Congressional settlement that was signed into law. The 1988 San Luis Rey Indian Water Rights Settlement Act (PL 100-675) quantified the Tribe's prior and paramount water rights and provided for the construction of water projects to facilitate the exercise of Pala's rights. The source of the reservation's domestic water supply, which is drawn from wells scattered throughout the reservation, is the aquifer and underground stream of the Pala Groundwater Basin. The Basin lies directly underneath the San Luis Rey River and the Pala village area. It is replenished by rain events and surface water flows from local creeks and rivers (Pala, 2017).

The people of the Pala Band of Mission Indians have lived from time immemorial in this



part of Southern California. Pala's Tribal members have a rich and diverse Tribal history with members that come from Cupeño, Luiseño, and Kumeyaay ancestry. They have endured and adapted to many significant impacts on their lands and community which have disrupted culture and traditions, political and social systems, and ecological environments for over hundreds of years beginning with the arrival of Spanish missionaries in 1769 (Goode et al., 2018). In 1903 the Cupeño Indians were forcibly removed from Warner Springs, shown on the map in [Figure 6.7.1](#), and brought 40 miles west to Pala, joining with the Luiseño Indians already living there, ultimately combining to form the Pala Band. Ongoing development impacts the Pala community's ability to maintain traditional subsistence practices. The Pala people, however, continue to thrive, buoyed by their strong community and culture connectedness, co-existence with nature, and spiritual connections.

## Climate change and the Pala Tribe

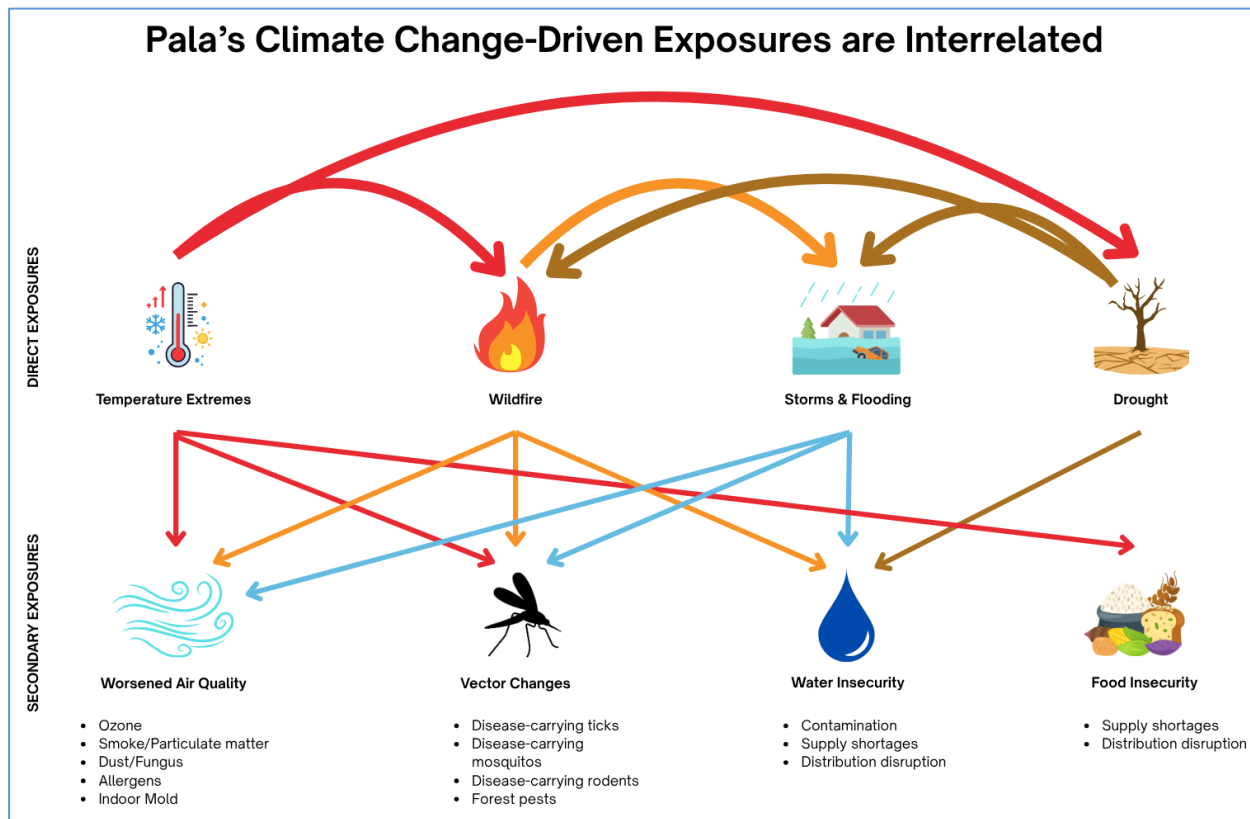
Pala's climate has been characterized by moist, mild winters and dry, warm summers, also known as "Mediterranean summers." Temperatures in the Pala Valley are historically relatively moderate, ranging from an average of 60 degrees Fahrenheit (°F) (15.5 degrees Celsius, °C) during the winter months to an average of 80°F (26.7°C) during the summer. Annual precipitation within the Pala Valley averages about 10 to 12 inches a year, and between 25 to 45 inches in the Palomar Mountains, 12 miles east of Pala. Roughly 75% of the annual precipitation falls within the basin between December and March (Pala, 2016).

Climate change impacts that the Tribe has seen threaten a variety of Pala's community assets and values, ranging from water resources to human health and Tribal sovereignty (Pala, 2019). Pala conducted a vulnerability assessment, based on Tribal science, knowledge and observations shared by Pala's residents, which matches the more recent scientific evidence and literature on the impacts of climate change. The Tribe plans to update its climate vulnerability assessment and adaptation plan in 2026 to incorporate the latest data. Extreme weather events, including heat waves and wildfires, have increased in frequency, if not intensity, since the publication of the 2019 assessment. Pala's location in the southwest region of the United States, within the



inland valley and mountainous areas of San Diego County, makes it susceptible to a variety of climate-related direct and secondary exposures (**Figure 6.7.2**, below). The secondary exposures (e.g., worsened air quality, water insecurity, etc.) occur as a result of direct exposures. The color of an arrow in **Figure 6.7.2** corresponds to the direct exposure from which it stems.

**Figure 6.7.2. Interrelated Climate Change Exposures.**



Source: Pala Environmental Department

There are characteristics of the area and of the Tribe that make Pala either more vulnerable to possible impacts of climate change, or more capable of adapting to these impacts. For example, Pala has buildings considered at high risk of flooding and critical facilities in a high-risk wildfire area (Pala, 2016), and nearly half of residents do not have air conditioning in their homes to buffer them from heat impacts. However, Pala also has more tree canopy cover, lower percentages of impervious surfaces, and a lower



urban heat island index than most census tracts in California, (Public Health Alliance of Southern California, 2018) which may help buffer residents from expected impacts of extreme heat. Having overcome ecological and human changes on their lands for thousands of years, the people of Pala have also demonstrated exceptional strength, resourcefulness, and resilience, in the face of continued and increasing climate change impacts.

## **Interrelated climate change impacts and cultural and spiritual health**

At Pala, the people, the culture, and the environment are connected. Thus, it is impossible to tease out specific climate change impacts that affect cultural and spiritual health from those that do not. For example, the plants and animals that are being impacted by climate change are often used in traditional practices and ceremonies. When medicinal plants are impacted by climate change, the Tribe's traditional healing practices are affected. The absence of culturally important foods, such as acorns, limits their use in celebrations.

Habitable climate is critical to protecting Tribal sovereignty, culture, and community cohesion for the people of Pala. Extreme heat days can threaten cultural expressions and traditional ways of life at Pala, including disruptions to culturally and/or spiritually important activities such as traditional gatherings, annual ceremonies, traditional food foraging, performances by traditional bird singers, and basket weaving. As temperatures continue to rise, residents may opt out of these traditions, modify how they are conducted, or relocate their household out of the area; this affects community cohesion and cultural identity and sovereignty (Pala, 2019).

Increased temperatures also result in a variety of ecosystem disruptions. For Pala, that can mean declines or disappearance of culturally important plants and animals. At Pala, members of the community express concerns about culturally important plants including those required for baskets, ceremonial structures, or foods, such as rushes (*Juncus* spp.), sourberry (*Rhus trilobata*), acorns, sage (*Artemisia californica*), willow, and tobacco. Community members report that culturally important plants like basket rush (*Juncus textilis*) and ferns have also become harder to find (Pala, 2018).



Declining trees and plants impact resources that support the Tribe's cultural traditions. The coast live oak (*Quercus agrifolia*) is called wi'awlet in the Cupeño language. For many tribes, oak trees were a key source of nutrition (acorn mush or wi'wish) and are a symbol of life, growth, and the cycle of the seasons. Acorns continue to play an important role in ongoing cultural traditions, such as the annual Púyily 'Áy'enish (Big Meal, A Great Feast) gathering held at Pala every November.

As climate change puts Pala at increased risk, impacts to the psychosocial health of the community are inevitable. Psychosocial health refers to the mental, social, spiritual, and emotional health of a community. While Pala has been committed to addressing these impacts, the stress on the community from heat, drought, severe weather, loss of species and cultural sites, and wildfires cannot be ignored.

## Critical climate concerns in Pala

### Air temperatures

At Pala, both the annual average minimum temperature (nighttime temperature) and annual average maximum temperature (daytime temperature) are rising, with the nighttime temperature rising more quickly. Elevated temperatures affect human health, mental health, cultural and spiritual health, and socio-economic health, as well as the plants and animals that are part of Pala. Elders, children, outdoor workers, and those with existing medical conditions are particularly susceptible to these impacts (Pala, 2019).

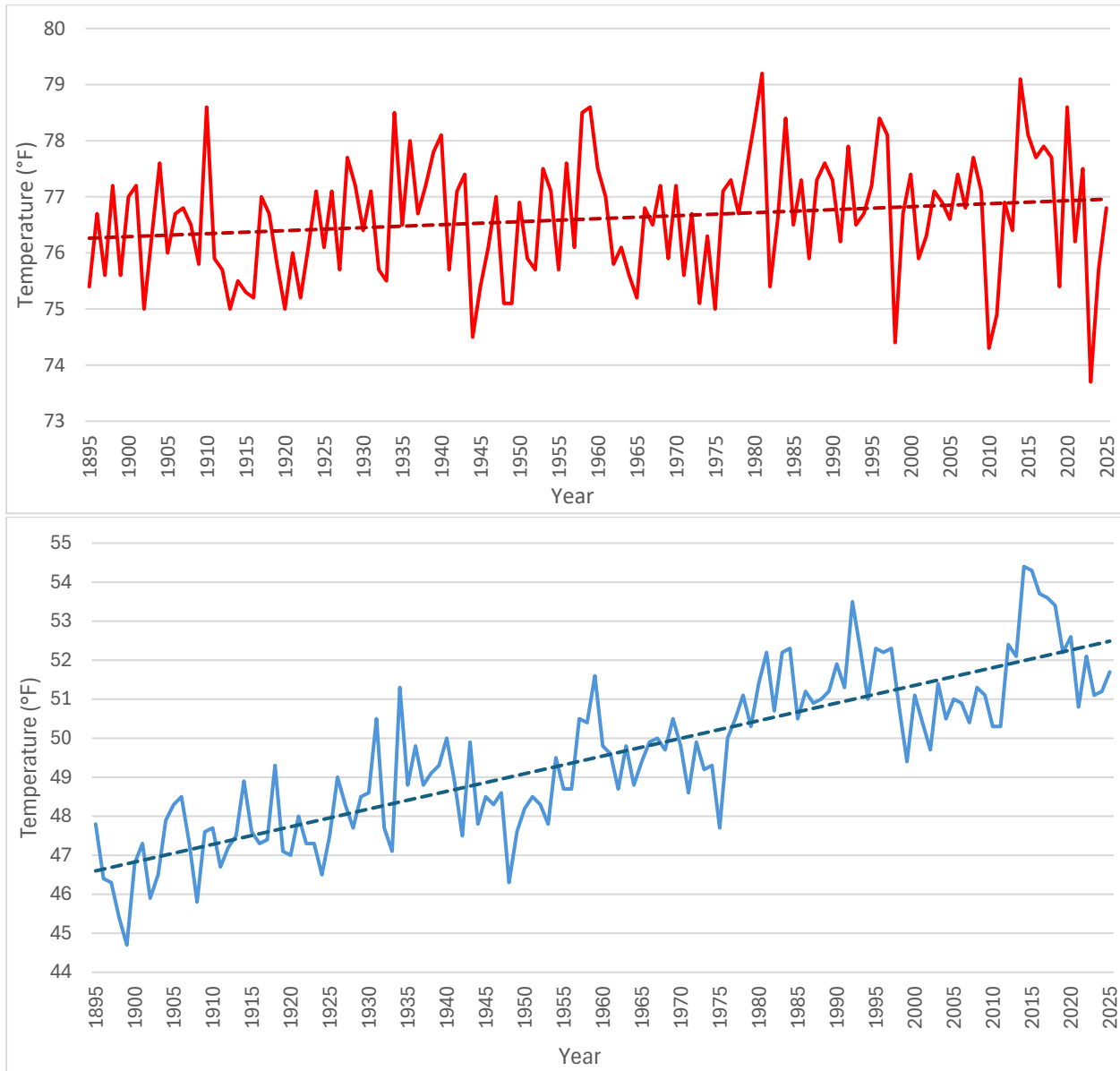
**Figure 6.7.3** shows that before 1950, the nighttime temperature varied between 44.7°F (7.05°C) and 51.3°F (10.72°C), and the daytime temperature varied between 74.5°F (23.61°C) and 78.6°F (25.89°C). Since 1950, the nighttime temperature has ranged from 47.7°F (8.72°C) to 54.4°F (12.44°C) and the annual average maximum temperature has ranged from 73.7°F (23.17°C) to 79.2°F (26.22°C) (PRISM Climate Group, 2026).

Warming temperatures are considered a high-risk exposure for the Pala Tribe. Heat waves consisting of multiple consecutive days of triple-digit heat have increased and are expected to become more common. As is evident from the increasing minimum



temperatures, the cooling nights that Pala is accustomed to are warming over time. The combination of warmer daytime and nighttime temperatures are impacting both the human and the plant communities (Pala, 2016).

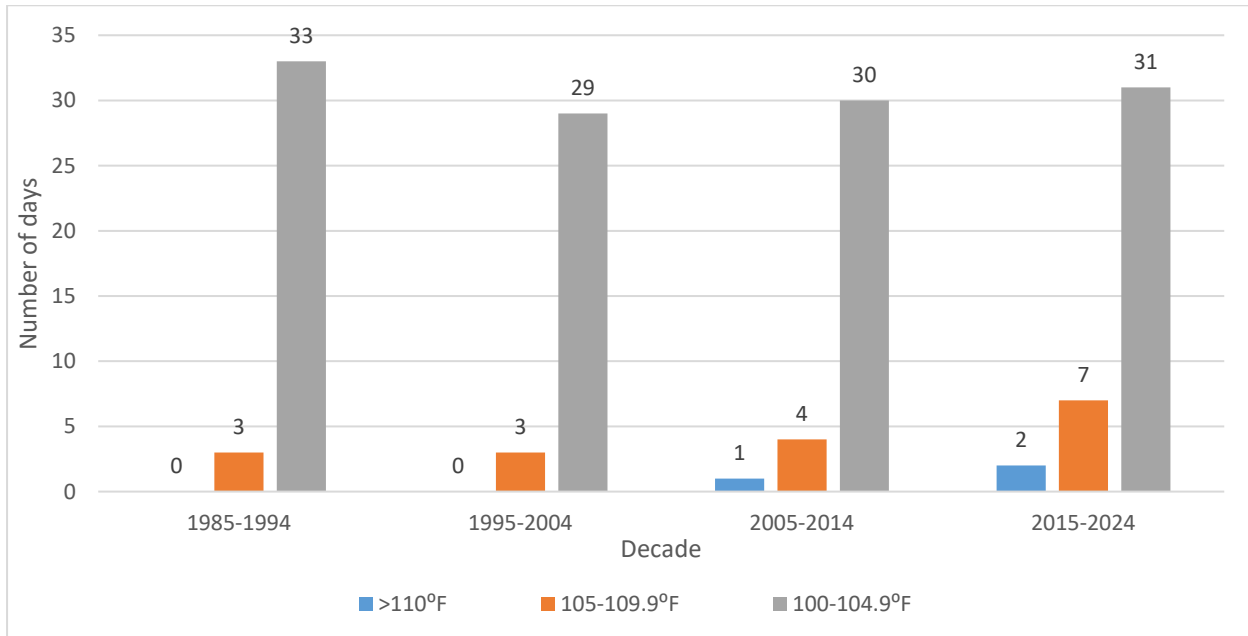
**Figure 6.7.3. Daytime (Top) and Nighttime (Bottom) Temperatures at Pala from 1895 to 2025.**



The top graph shows annual average maximum (daytime) temperatures at Pala and the bottom graph shows annual average minimum (nighttime) temperatures. Both are shown in degrees Fahrenheit with linear trendlines. Source: PRISM Climate Group (2026)



**Figure 6.7.4. Number of Extreme Heat Days Per Decade at Pala from 1985 to 2024.**



Source: PRISM Climate Group (2025)

**Figure 6.7.4** shows that over the past three decades, there have been an average of 35.75 days per decade with temperatures over 100°F (37.8°C) at Pala. The number of days of the most extreme heat, above 105°F (41°C) and 110°F (43.3°C), are increasing over time.

As temperatures have increased, Pala's Environmental Department staff have observed declining areas of important habitats including chaparral, native grasslands, wetlands, riparian, and upland habitats and increasing areas of non-native grasslands. Pala has observed impacts to production of some crops cultivated on the Reservation, including avocado and citrus fruit. These trees need a certain number of chilling hours in the winter when temperatures are between 32 and 50°F (0 to 10°C); as temperatures increase and chilling hours are reduced, crop yield decreases (Pala, 2019).

Climate changes are also causing certain native animal populations to decline in Pala's region. Temperature increases are altering habitat suitability for endemic species like



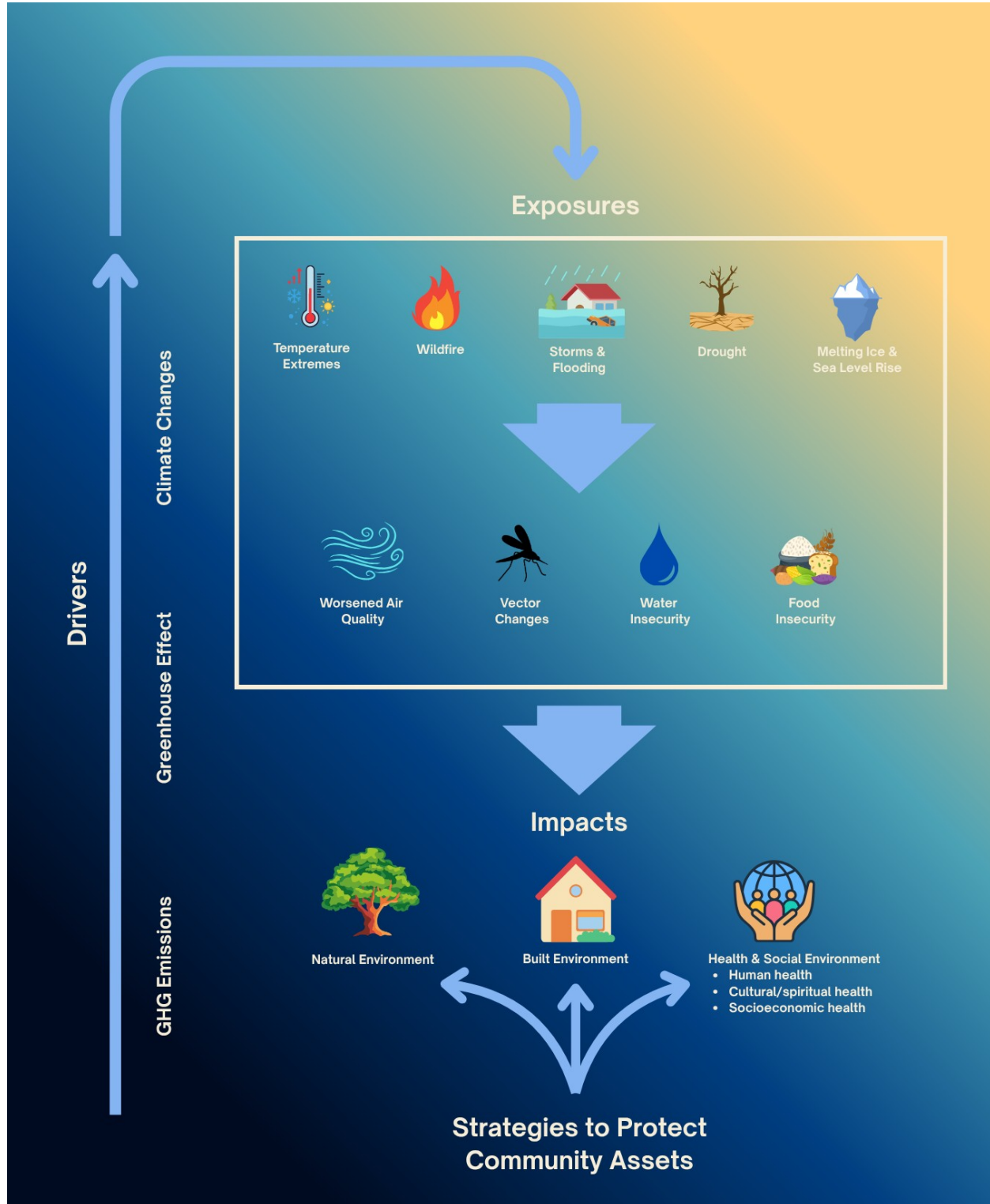
the federally endangered Quino checkerspot butterfly and California gnatcatcher, for which range shifts have been observed (Parmesan, 2015). These temperature shifts can also impact the breeding cycles of aquatic species that are triggered by warming temperatures, like the federally endangered arroyo toad (*Anaxyrus californicus*).

A Tribe's social and economic institutions are an important factor in its overall community health. Extreme heat and its effects on human health can result in a variety of negative socio-economic impacts. **Figure 6.7.5** shows how changing exposures impact health, social, natural, and built environments (Pala, 2019). Health impacts and power disruptions triggered by extreme heat can result in lost work days and revenues for Tribal businesses. For Pala, critical economic drivers include gaming, entertainment, hospitality, and other business ventures. Health impacts and power outages due to extreme heat can also result in lost school days and closures of school and afterschool activities that impact Pala's youth.

Elevated temperatures at Pala increase water evaporation and lower water levels in rivers, streams, and aquifers. This presents a challenging scenario as Pala already relies on groundwater for domestic water and irrigation. Increased water demand from development in the region, coupled with declining water supply from the California snowpack and the Colorado River, will place additional burdens on local water resources.



Figure 6.7.5. Interaction of Climate Change Impacts.

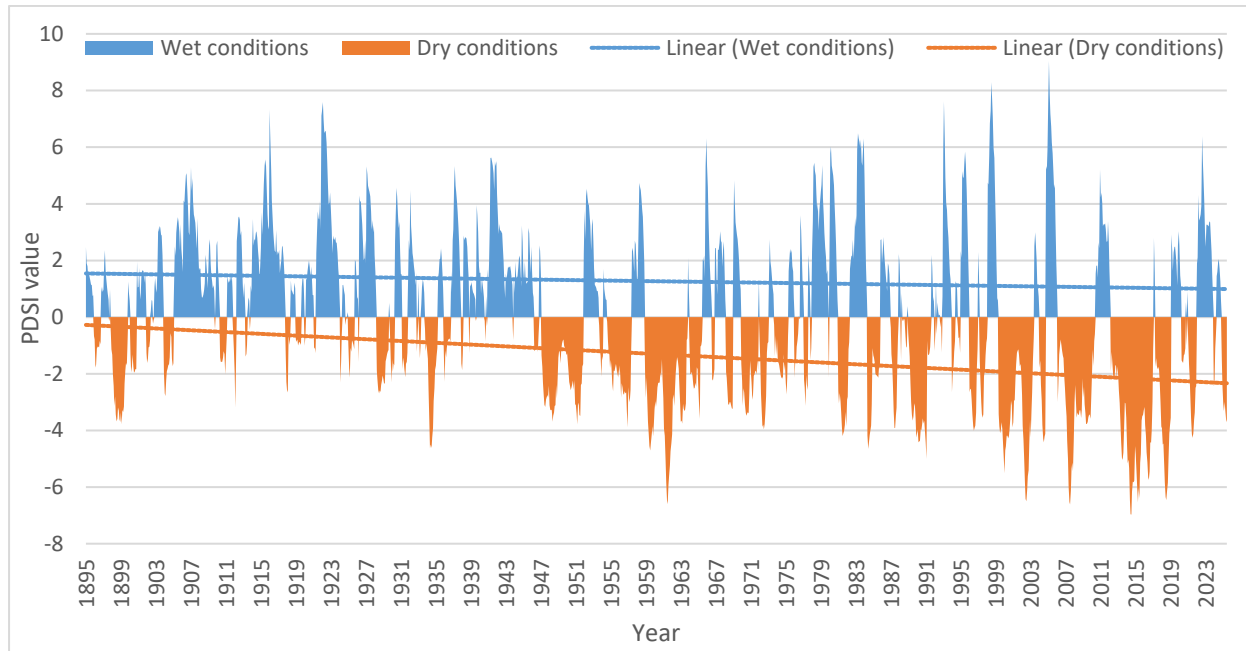


Source: Pala Environmental Department



## Drought

**Figure 6.7.6. Monthly Palmer Drought Severity at Pala, 1895 to 2025.**



Source: Abatzoglou et al. (2025)

**Figure 6.7.6** shows the monthly Palmer Drought Severity Index (PDSI) at Pala from January 1895 to June 2025. Over this period, drought has become more severe. PDSI is a scale derived from air temperature, precipitation, and the moisture-holding capacity of the soil to represent the relative wetness (10 being the most wet) or dryness (-10 being the most dry) of a place over a specific period of time. Values less than negative four (-4) are considered severe drought while numbers greater than four (4) are considered severe flood. In the past 30 years, Pala has had 12 years during which they experienced severe drought conditions, and five years during which they experienced severe flood conditions.

Drought, combined with climate change-driven extreme heat, season shifts, and insect and pest outbreaks can weaken plants, trees, and forests or shift growth patterns. There is ample evidence of such drought impacts in Southern California. Some vegetation types in Southern California (e.g., chaparral and coastal sage scrub) have experienced



declines in vegetation greenness over the last 17 years (Pala, 2019).

Pala Environmental Department staff note that manzanita and other upland plants are moving into the riverbed as riparian vegetation and wetlands dry up. Reduced riparian vegetation lowers the area's natural capacity to absorb storm water, which exacerbates flooding threats on the Reservation. Gold spotted oak borer beetle is a concern for the oak groves on the reservation, particularly in light of the increased drought, which has taken a toll on native oak species (see [Invasive insect pests](#) section, below). Pala Environmental Department staff note declining numbers of Englemann oak (*Quercus engelmannii*) and coast live oak (*Quercus agrifolia*) trees, which are considered culturally important (Pala, 2019).

Pala Creek used to flow for many days after a substantial precipitation event, but that is no longer the case since repeated droughts have reduced the groundwater basin. Pala staff report that the San Luis Rey River and Pala Creek no longer have regular flow. Because water levels have been so low in the river and streams, Pala Environmental Department notes that aquatic species such as the arroyo toad and anadromous fish such as Steelhead and Pacific Lamprey are no longer present in significant numbers.

The Pala reservation is home to endangered or threatened plant species including Parry's tetracoccus (*Tetracoccus dioicus*) and Rainbow manzanita (*Arctostaphylos rainbowensis*). Drought, along with increased temperature, stresses these plants and creates conditions for certain non-native, invasive species to thrive. Examples of invasive species present on the Pala Reservation are eucalyptus, arundo, and tamarisk. These species can degrade habitat quality for native wildlife and contribute to increased wildfire frequencies.

The degradation and loss of habitat combined with drought is assumed to be the cause of the disappearance of the southwestern willow flycatcher (*Empidonax trailii extimus*). Southwestern willow flycatchers ([Figure 6.7.7](#), below) live in moist microclimatic and vegetative conditions and breed only in dense riparian vegetation near surface water or saturated soil. Southwestern willow flycatchers have not been seen at Pala since 2013 and are assumed to be extirpated (Pala, 2019).



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Figure 6.7.7. Southwestern Willow Flycatcher.



Photo credit: USFWS

Source: NPS (2026)

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Drought and changes in precipitation contribute to species migration and range shifts. Native bird species at Pala are dependent on native vegetation for habitat, which has declined during severe drought (National Fish, Wildlife and Plants Climate Adaptation Partnership, 2012). At Pala, tree and habitat losses have affected several bird species. In addition to the southwestern willow flycatcher, Pala Environmental Department staff have also observed a reduction of acorn woodpeckers (*Melanerpes formicivorus*), a species tied to oak trees.

### Storms and flooding

As precipitation becomes less predictable and more intense, flooding is a high concern for Pala and has impacted the Tribe (Prosper Sustainably, 2018). Drought conditions and lower soil moisture lead to flash floods in inland areas, as well as mudslides and landslides, especially in areas recently affected by wildfire.

Since 1895, Pala has received less annual rainfall over time. When the rains come, these rain events are becoming more intense, causing flooding that rises and falls



quickly (Prosper Sustainably, 2018). The Pala Environmental Department tracks rainfall, water flows, stream levels, storm damage, and flooding at multiple locations on the Reservation. Flooding has become a regular occurrence at Pala. Between 1917 and 1997 there were two major flood events. Since 1997 there have been 23 major floods that covered roads, damaged property, and trapped residents (Pala ED, 2025).

Flooding can weaken and remove vegetation and soil leading to downed trees, erosion, and mudslides. Pala staff have observed that floods have shifted riparian habitats. For example, shifting river sediments and braided water flows during heavy storms have created new San Luis Rey River channels in some areas, while silting and blocking previous flow channels. This leads to a shifting riparian regime that can change between major flood events.

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Figure 6.7.8. Flood Damage on Lilac Road in Pala, February 2024.



Source: Pala Environmental Department

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Loss of riparian vegetation reduces the ability of the floodplain to naturally absorb and manage high levels of stormwater. Certain invasive species on Pala lands, such as *Arundo donax* and tamarisk easily spread in flood conditions.



Animals that depend on the riparian habitat and may be temporarily or permanently displaced by storms and flooding including endangered species at Pala such as the southwestern willow flycatcher, yellow-billed cuckoo, coastal California gnatcatcher, and the arroyo toad. The yellow-billed cuckoo (*Coccyzus americanus*) historically nested on or near the San Luis Rey River (CWHR, 1999; Mitchell, 2020). According to a 2015 study (HT Harvey and Associates, 2015), habitat at Bubble Up Creek and Pala Creek (south of the San Luis Rey River), was of poor quality and unsuitable for breeding, due in part to the minimal width of the riparian habitat.

Severe storms, flooding, and runoff can contaminate water supplies with bacteria, viruses, and other pathogens and toxins, limiting the availability of safe drinking water. For example, the 2017 flood event at Pala exposed drinking water pipelines and caused a substantial rise in influent into the wastewater treatment plant (Pala, 2017).

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Figure 6.7.9. Flooding at a Pala Home.



Source: Pala Environmental Department

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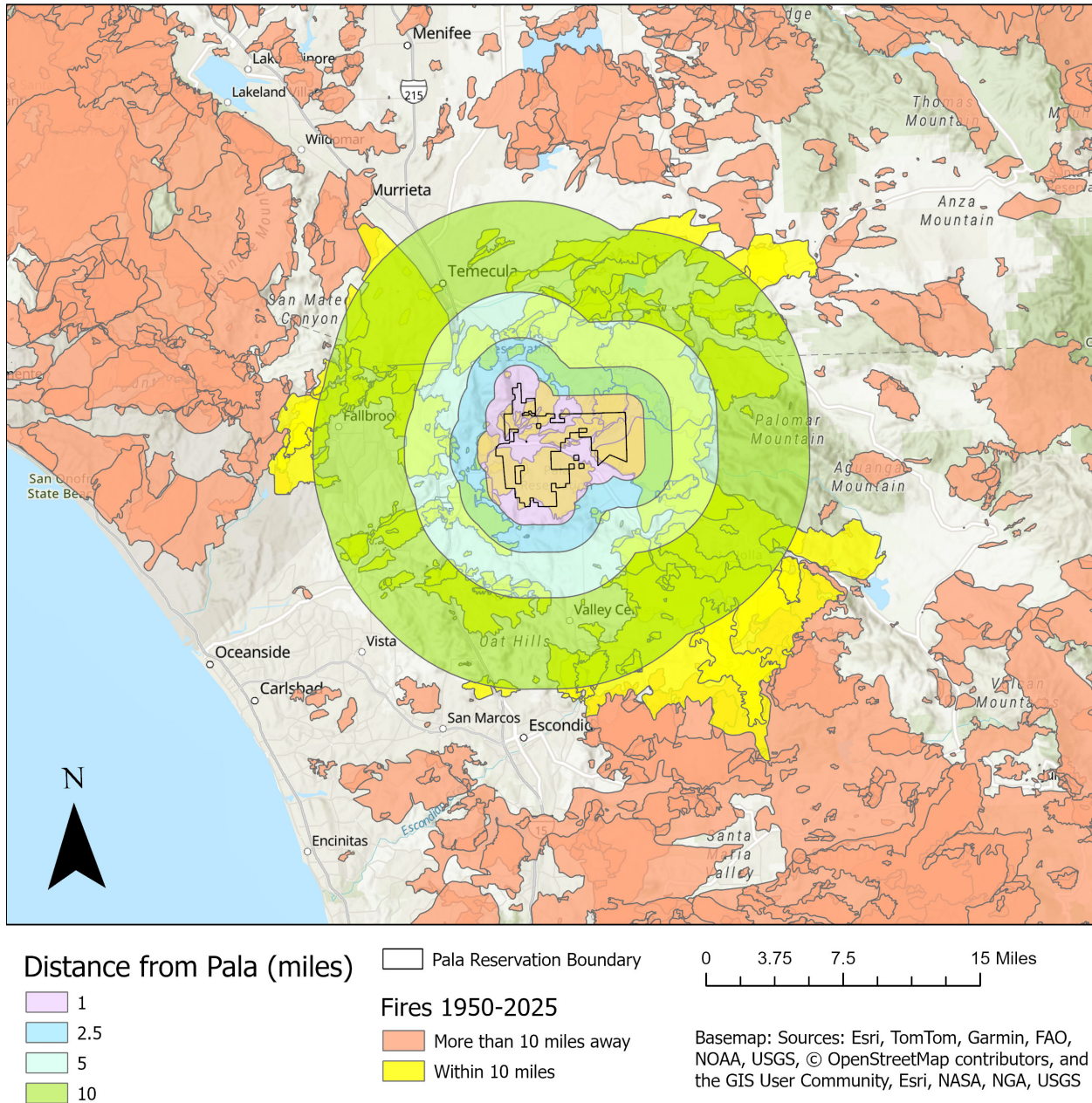
The changing and intensifying storm and flooding patterns Pala has seen have harmful effects on the natural environment. The effects of changing precipitation over time and the difficulty in predicting future rainfall are compounded by uncertainty in how much the inherent resiliency of plants and animals adapted for dry, variable climates can



accommodate changing conditions (Jennings et al., 2018).

## Wildfire

Figure 6.7.10. Wildfire Boundaries Near Pala from 1950 to 2025.



Source: Fire perimeter data from CAL FIRE (2026)

Figure 6.7.10 shows fires in the area of the Pala lands that occurred between 1950 and



2025. The incidence of large forest fires in the western United States has increased since the early 1980s (Wehner et al., 2017). Fire season in California is starting earlier and ending later each year (CAL FIRE, 2020). Between 1910 and 2025, 41 fires burned within Pala's Reservation and 253 fires burned within 10 miles of the Reservation (CAL FIRE, 2026). Recent fires have burned significant portions of Pala's lands. Two of California's largest wildfires have occurred in San Diego County: The Cedar Fire in 2003 and the Poomacha Complex/Witch Fire in 2007. These fires burned 273,246 acres and 240,207 acres, respectively.

Wildfires have caused evacuations and disruptions at Pala. In May 2025, Pala was directly impacted by the 256-acre Henderson Fire, which resulted in mandatory evacuations of some Pala neighborhoods ([Figure 6.7.11](#), below). The Poomacha Fire in 2007 resulted in evacuation of 400 Tribal members and closure of the Pala Casino, causing temporary but significant impacts to educational and economic opportunities. Fires at Pala have also disrupted telecommunication lines, hampering the Tribe's ability to do business (Pala, 2016).

Exposure to smoke-related air pollutants, including particulate matter (PM) from wildfires has been associated with a wide range of human health effects, including cardiovascular consequences, early deaths and low infant birth weight, and acute respiratory illness (US EPA, 2019).

At Pala, water security, compounded by drought, is an ongoing concern. Wildfire can further stress water supplies if watersheds or water treatment infrastructure are damaged during a wildfire, or when domestic water supplies are used to combat the fire.

Wildfire can destroy culturally important ecosystems, sacred sites, and points of access to culturally important places to Pala. Numerous cultural sites, functions or traditions are in danger of wildfire encroachment and damage. This can threaten Pala's traditional practices, sovereignty, and community cohesion, which are considered highly important community assets (Prosper Sustainably, 2018).

Wildfire can initially increase the abundance of ticks and increase the risk of Lyme disease (MacDonald et al., 2018). There have been cases of Lyme disease in the Pala region in recent years. Wildfire risk can also increase due to pest infestations and



disease vectors affecting forest health (e.g., bark beetles, fungus, shothole borer). Invasive forest pests and tree diseases increase wildfire risk by stressing and killing trees, which increases the mass of dead and dying vegetation that can fuel wildfire outbreaks. Pala environmental staff have observed an increase in diseased trees and an overall decline in oak trees as a result of invasive forest pests.

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Figure 6.7.11. Henderson Fire on the Pala Reservation in May 2025.



Source: Pala Environmental Department

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Pala's wildlife depend on healthy, large, and connected habitats to roam, breed, and hunt. Impacts of wildfire include habitat loss, degradation, and fragmentation that result in genetic isolation. Burned areas are subject to increased erosion resulting in the siltation of creeks, streams, and rivers. This can result in channel aggradation (wider, slower channels) and steep slopes destabilized due to the lack of vegetation (Pala, 2019).

Repeated wildfires at intervals too short to allow recovery of natural vegetation facilitate the conversion of natural woody shrublands (e.g., coastal sage scrub) to weedy, flammable annual grasses. For example, the large fire events of 2007 in San Diego resulted in nearly 74,000 acres of overlap with the four-year-old recovering vegetation that burned in the 2003 Cedar Fire. At Pala, the Poomacha fire burned most of the vegetation in the eastern mountainous region, and the area is now dominated by scrub and non-native grasses (Pala, 2016). The US Forest Service documented that shrublands have converted to non-native annual grasslands on a widespread scale across the Cleveland National Forest, which borders the Pala Reservation (Kalansky et al., 2018).

Wildfire and its impact on vegetation conversion, habitat connectivity, food, and freshwater supplies can force animal species to migrate from the area. In San Diego County, repeated fires reduce habitat for shrubland threatened species like the California gnatcatcher (Jennings et al., 2018).

### **Invasive insect pests**

The Pala Tribe has seen an increase in invasive insect pests over time. Three that have been causing significant damage among tree species and tree-harvested crops are the Asian Citrus Psyllid (ACP), Invasive Shot Hole Borers (ISHB), and Gold-Spotted Oak Borer (GSOB). While the relationship between climate change and these specific invasive species is not yet fully studied or known, the impacts are related in terms of how they compound ecologically and increase overall stress on Pala lands and culture.

ACP vectors the bacteria responsible for Huanglongbing (HLB) or citrus-greening disease, which is deadly to citrus trees. There are tens of thousands of acres of harvested citrus in San Diego County (Garcia-Figuera, 2021), and at least 1,756 acres



of quarantined commercial citrus in the Valley Center area near Pala (USDA, 2024). Detections of HLB in the Valley Center Area in recent years have resulted in the inclusion of Pala in the Federal quarantine area and the California Department of Food and Agriculture's (CDFA) emergency program area (CDFA, 2025). No citrus can be transported within or beyond the quarantine area, and impacted areas will be treated with a combination of cyfluthrin and imidacloprid insecticides. Citrus is a significant crop for home growers and farmers in Pala. They are concerned not only about the loss of their citrus orchards and products, but also about the overall impact on the Tribe and land as a result of required direct application or indirect drift of insecticides. Pala Tribal members have gone through great efforts to grow organically and, in some cases, invest in organic certification in order to protect their human, environmental, and economic health.

The ISHB is a pest of hundreds of different tree species in San Diego County (County of San Diego, 2016). There are two species of ISHB in California, which are difficult to tell apart and cause the same type of damage. While they can infect citrus, they are more damaging, deadly and productive in other types of trees, including avocado, native oaks, willows, ornamentals, and more (UCANR, 2023). These tiny beetles carve tunnels through host trees to cultivate a fungus called *Fusarium*, which causes a tree disease known as *Fusarium* dieback or FD. Trees which are already stressed, for example due to drought, are more susceptible. FD has been found throughout the Pala Reservation and causes the loss of tree and shrub species that are of significant cultural importance to the Tribe. Along with the loss of Tribal lifeways associated with those species, FD destroys entire habitats, reducing ecosystem integrity and function. In addition, it creates safety and health hazards resulting from dead limbs, standing dead trees, and a build up of wildfire fuels. As with citrus, the Pala Tribe has valuable and sizeable avocado holdings which are at risk of this disease.

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*"The number one question that Tribal members ask the Environmental Department is, 'Why are our oak trees dying?'" ~Shasta Gaughen*

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Native oaks at Pala are impacted by ISHB as well as, to a much larger extent, by the Goldspotted Oak Borer (GSOB, species *Agrilus auroguttatus*). The GSOB is responsible for the death of hundreds of thousands of native oaks in southern California, and the toll is rising (Don't Move Firewood, 2025). This small beetle is native to Arizona and spreads to new areas primarily through the transport of firewood. While there is no effective natural biological control of GSOB in southern California, one of its natural predators is the acorn woodpecker, whose populations, as previously mentioned, are declining around Pala.

GSOB kills trees of three species, coast live oak, black oak, and canyon live oak. These are species of great central importance to the Pala Tribe, and their decline is compounded by extreme drought, heat, and wildfire. The loss of coast live oaks has been most striking to the Tribe because these evergreens make up a large portion of the landscape and turn brown as they die. GSOB attacks primarily larger and thus older trees. Their death causes cascading impacts to the ecosystem and species that depend on them, including many bird species and arroyo toads, and creates large safety and wildfire fuels hazards, increasing existing threats in ways that are often positive feedback loops.

## Summary

The people of the Pala Band of Mission Indians continue to work to protect and enhance the natural resources and habitat of their lands. Climate change continues to deeply affect the environment and alter and disrupt the ecosystems within and around Pala. The Pala community is actively working to understand, adapt to, and mitigate the effects of climate change. Their goal is to continue to manage and protect their lands and limit the impact climate change is having on Pala's right to hunt, fish, gather, and continue their cultural practices; activities that are integral to their cultural and psychosocial health, well-being, and livelihood.



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