



IMPACTS OF CLIMATE CHANGE ON THE SANTA YNEZ BAND OF CHUMASH INDIANS

Sea level rise, flooding, erosion, drought, air quality and changes in flora and fauna are threatening the physical, cultural, and spiritual health of the Tribe, its habitats and ecosystems, and its built environment.

Background

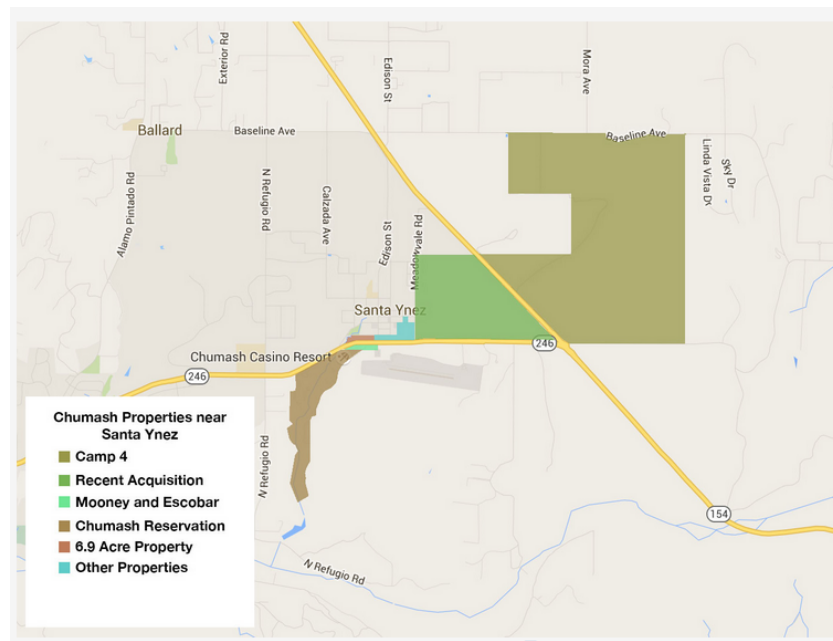
The Santa Ynez Band of Chumash Indians is a sovereign nation located in Santa Barbara County. They are currently the only federally recognized band of Chumash Indians. Santa Ynez is leading a coordinated effort of 11 of the 14 (SYBCI, 2020b) bands of Chumash Indians to document the impacts of climate change on the traditional Chumash territory (SYBCI, 2020a).

The culture of the Santa Ynez Band of Chumash Indians is deep within the souls of every tribal member and rests within our hearts. Throughout time, and in spite of challenges, the Tribe has maintained a connection to its ancestors and to a core identity of being Chumash. The Chumash have survived because of their strength as a Tribe and their spiritual connection to Chumash heritage and lands”

~Nakia Zavalla, Santa Ynez Chumash Cultural Director

For over 15,000 years the Chumash lived in a territory that encompassed approximately 7,000 square miles and ranged from the Channel Islands and Malibu to Paso Robles, then inland to the western edge of the San Joaquin Valley (Thornton, 2000). The Chumash population of approximately 25,000 people was decimated by disease and genocide, first by the Spanish starting in 1769, then by the

Figure 1. Chumash properties near Santa Ynez



Source: County of Santa Barbara, 2021

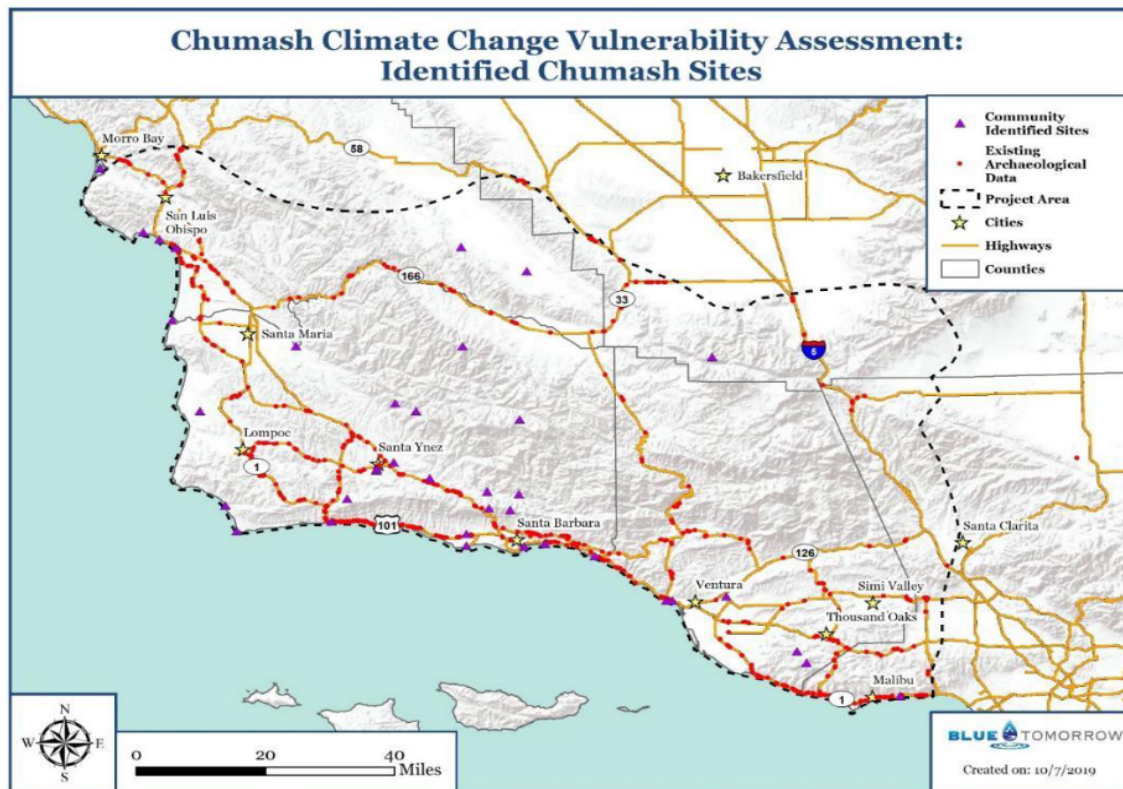


Mission system and immigrant Americans colonizing the West (McWilliams, 1983). Today there are approximately 3,000 Chumash.

The Santa Ynez area is primarily rural, with vegetable and flower fields, cattle and horse ranches, vineyards, and wineries. As shown in Figure 1, access to the Santa Ynez reservation is via State Route 246, which connects on the west to Highway 101 and on the east to Highway 154. A creek bed separates the reservation into the Upper Reservation (west) and Lower Reservation (east). The original reservation covered 99 acres. In 2010, the tribe purchased 1,427 acres of land known as the Camp 4 property. The Camp 4 addition brought the size of the reservation to 1,526 acres (SYBCI, 2019). This addition also improved the overall lands of the Santa Ynez Chumash as the original reservation was intentionally placed along a floodplain (McCormick, 1996).

In assessing the impacts of climate change, the Chumash considered the approximate range of traditional Chumash tribal lands as those lands still hold important Chumash cultural sites (see map, Figure 2). Non-federally recognized Chumash bands and sacred and important Chumash cultural sites are located throughout this area (SYBCI, 2020a).

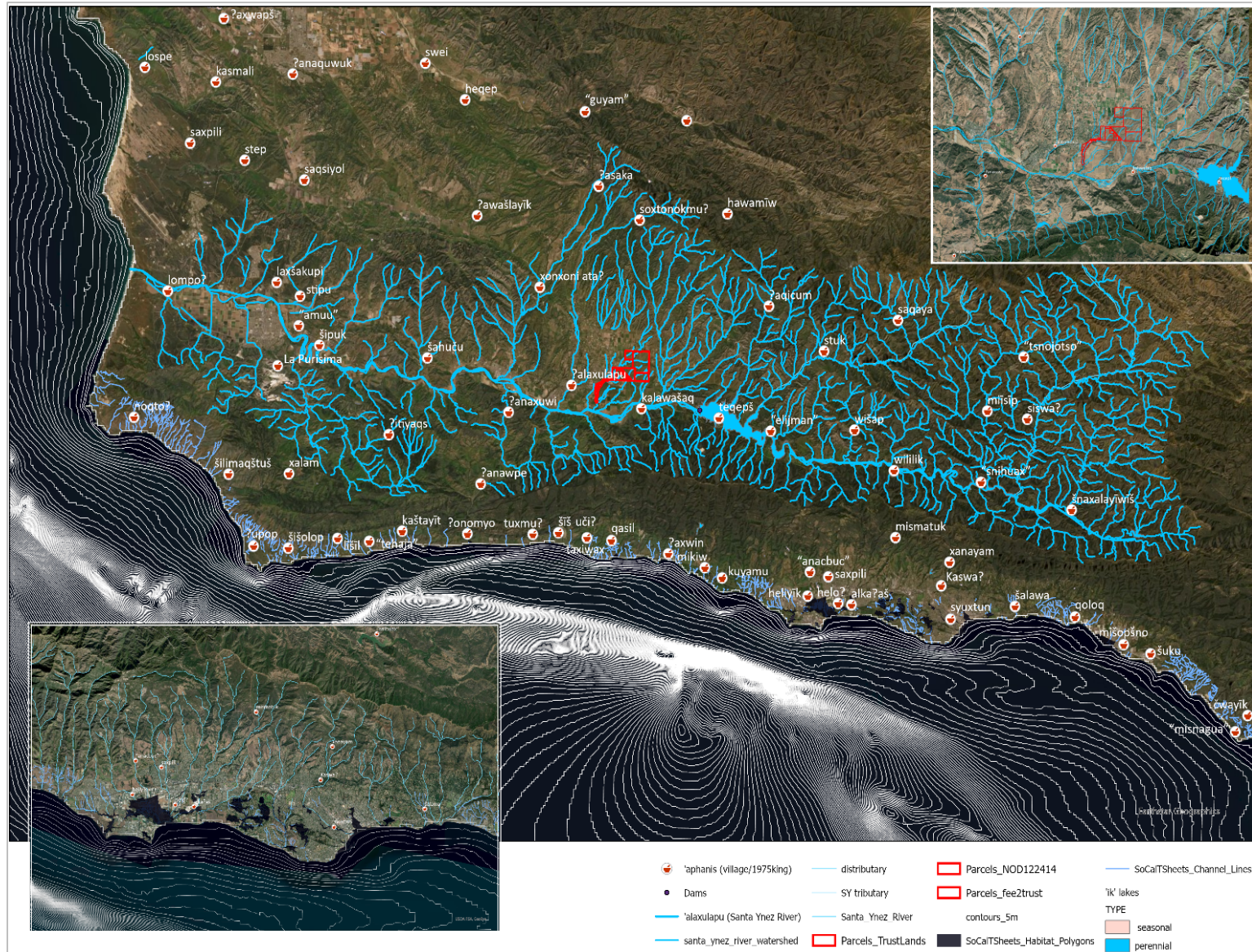
Figure 2. Chumash area considered in assessing the Tribe's vulnerability to climate change ("Project Area," dotted line), and sites of cultural significance to the Tribe



Source: SYBCI, 2020a



Figure 3. Watershed areas and creeks listed in Samala



Source: SYCEO, 2021a



Samala is the primary language traditionally spoken by the Santa Ynez Chumash people. Recent years have seen a renaissance of Chumash pride and identity, including efforts to continue to teach Samala and other Chumash languages (SYBCI, 2020a). For example, the watershed map in Figure 3 identifies creeks using their Samala names within the Chumash tribal area.

Climate change and the Santa Ynez Tribe

According to the Santa Ynez Chumash Environmental Office (SYCEO) Tribal Hazard Mitigation Plan, by 2100 the average temperatures are predicted to rise by over 7 degrees Fahrenheit (°F), resulting in over six times as many extreme heat days. Average precipitation, currently about 16 inches per year (SB County, 2021), will increase by approximately 4 inches and hectares burned in wildfire will increase by over 20%.

Increasing temperatures, changing precipitation patterns, sea-level rise, wildfires, drought, and debris flows can all cause impacts to the Chumash by disturbing plants and animals, potentially leading to their local extinction. These disturbances in turn may impact traditional hunting and gathering practices, the timing of spiritual practices, and the loss of local food sources, traditional medicinal plants, and traditional materials used for jewelry, sculptures, ceremonial pieces, basketry, nets, and lodgings (SYBCI, 2020a).

In a survey conducted by the SYCEO as part of a Climate Change Vulnerability Assessment, 90% of respondents stated that climate change and the resulting sea level rise, flooding, erosion, wildfires, reduction and extirpation of plants and animals, has already had an effect on access to cultural sites (Figure 2) and resources, including the availability of plant and animal resources (SYBCI, 2020a).

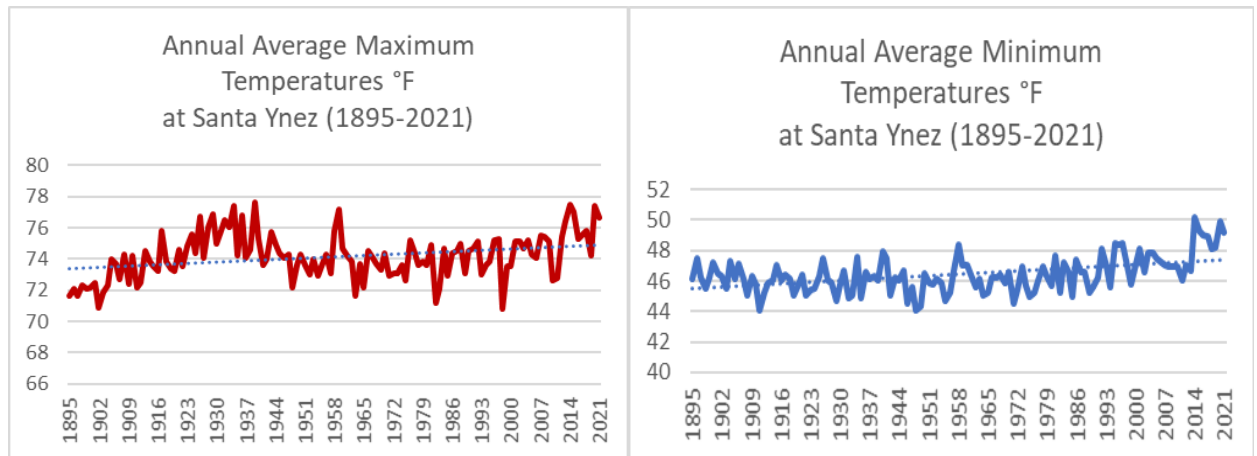
Elevated Temperatures

What does this Indicator show?

At Santa Ynez, both the nighttime temperatures and daytime temperatures are rising, with the nighttime temperatures rising more quickly. As shown in Figure 4, before 1950 the annual average minimum temperature varied between 41.5°F and 46.1°F and the annual average maximum temperature varied between 72.5°F and 77.5°F. Since 1950 the annual average minimum temperature has been between 42.2°F and 48.5°F and the annual average maximum temperatures has ranged from 71.6°F to 77.6°F (PRISM, 2022).

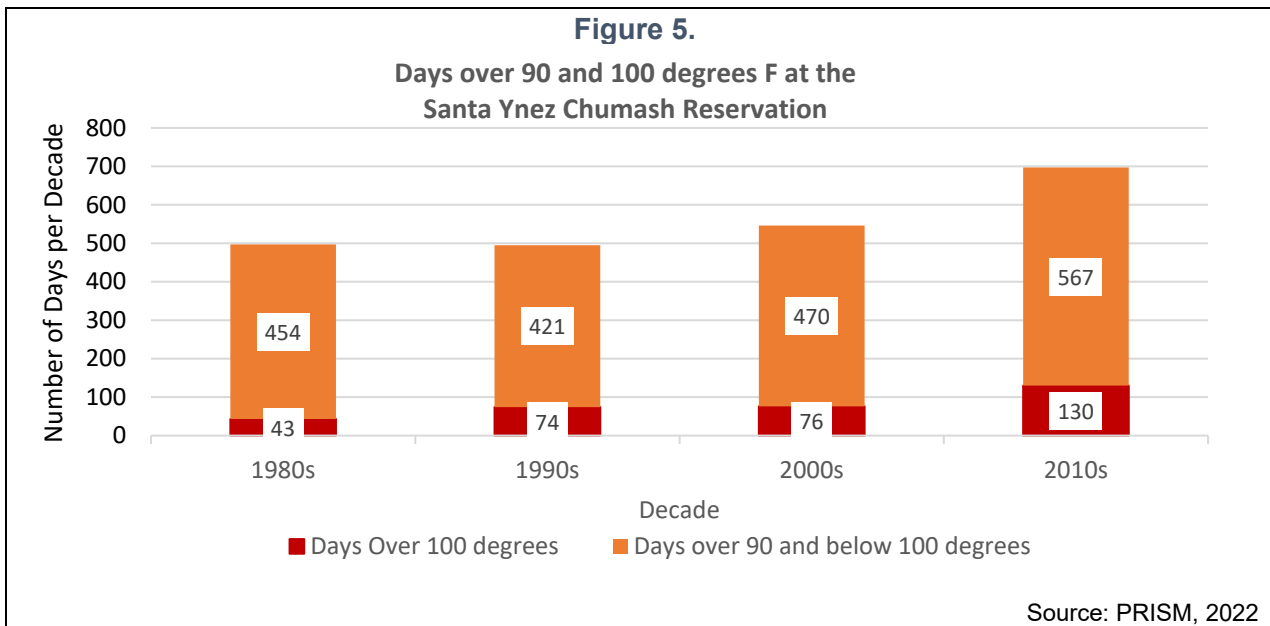


Figure 4. Annual average temperatures at Santa Ynez 1895-2021



Source: PRISM 2022

The number of extreme heat days has increased as well. As shown in Figure 5 the number of days with temperatures over 100°F has more than tripled since the 1980s (PRISM, 2022). In 2020 and 2021 the Tribe experienced 111 days over 90°F and 17 days with temperatures over 100°F.



Source: PRISM, 2022

Why is this indicator important?

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 the Santa Ynez Chumash environment. Elders, children, outdoor workers, and those with existing medical conditions are particularly susceptible to these impacts.

With the increasing nighttime temperatures, people do not have the chance to cool down. In addition, in traditionally temperate areas such as Santa Ynez, people are not



physiologically acclimated to higher temperatures. The Tribe currently does not have enough cooling centers to help members in need during times of extreme heat.

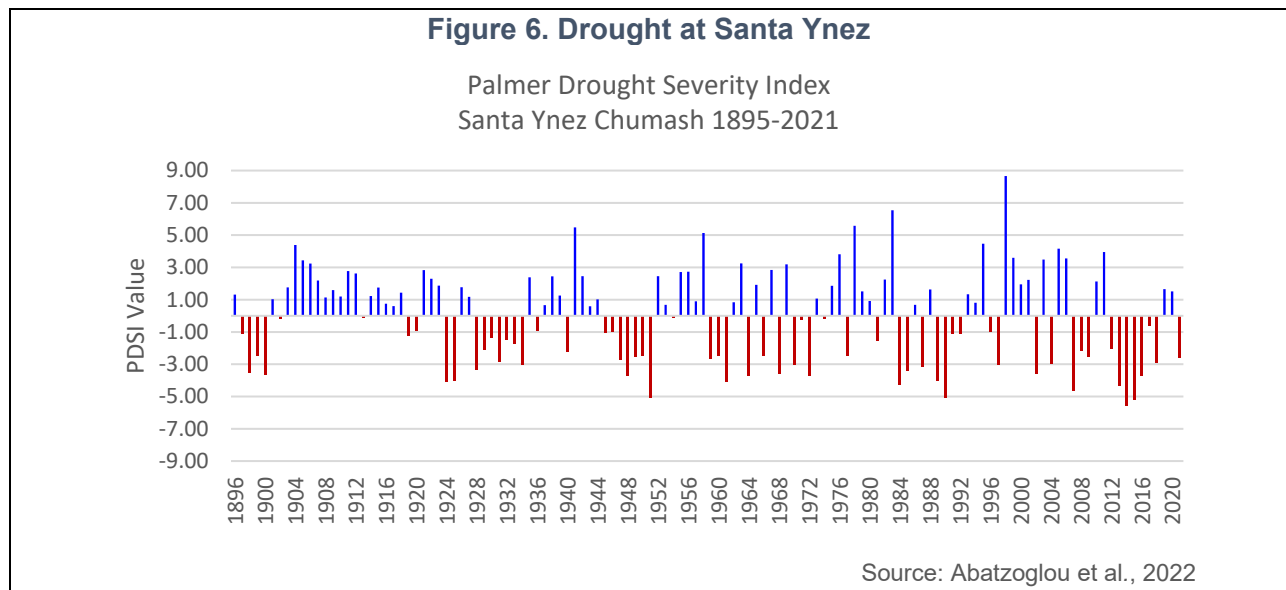
Many indigenous cultural practices rely on natural or seasonal cycles associated with changes in weather patterns, plants, and animals. Increased temperatures, extreme heat, and heat waves affect the traditional timing of Chumash cultural practices due to climate's effect on the landscape. Warmer temperatures and changes to precipitation patterns may cause plants to fail to grow in one area and be able to grow in another. Some species may be able to expand their range, while others may experience a decrease in range. The Tribe has already seen traditional plants migrating to different areas and the off-season blooming and fruiting of many species (SYBCI, 2020a).

Drought

What does this indicator show?

Because of its geography, Santa Barbara County does not always experience drought at the same time as the rest of California. The county has been free of drought at times of state-declared drought emergencies, but also has experienced drought when there is no state-declared drought. For example, after the state lifted its declaration for the drought of 2014 – 2017, Santa Barbara County's local drought declaration remained in place. As a result, examining impacts at a local level reveals a more accurate picture of drought impacts (SYBCI, 2020a).

The Palmer Drought Severity Index (PDSI) combines both temperature and precipitation data to provide data on relative dryness (drought) on a scale from +10 (wet) to -10 (dry). The lower the number the drier the conditions. As is shown below in Figure 6, the Santa Ynez Chumash Tribe is having more, and more intense, dry years. Prior to 1950, dry years (with PDSI values below zero) occurred 26 times, three of which were classified as extreme drought (PDSI at or below -4). From 1951 to 2021 Santa Ynez experienced 35 dry years, including 7 years of extreme drought.



Why is this indicator important?

The Tribe has observed that ground water levels on the Santa Ynez reservation have dropped during drought, and that plants are migrating to higher elevations or are not propagating due to a combination of drought and extreme heat.

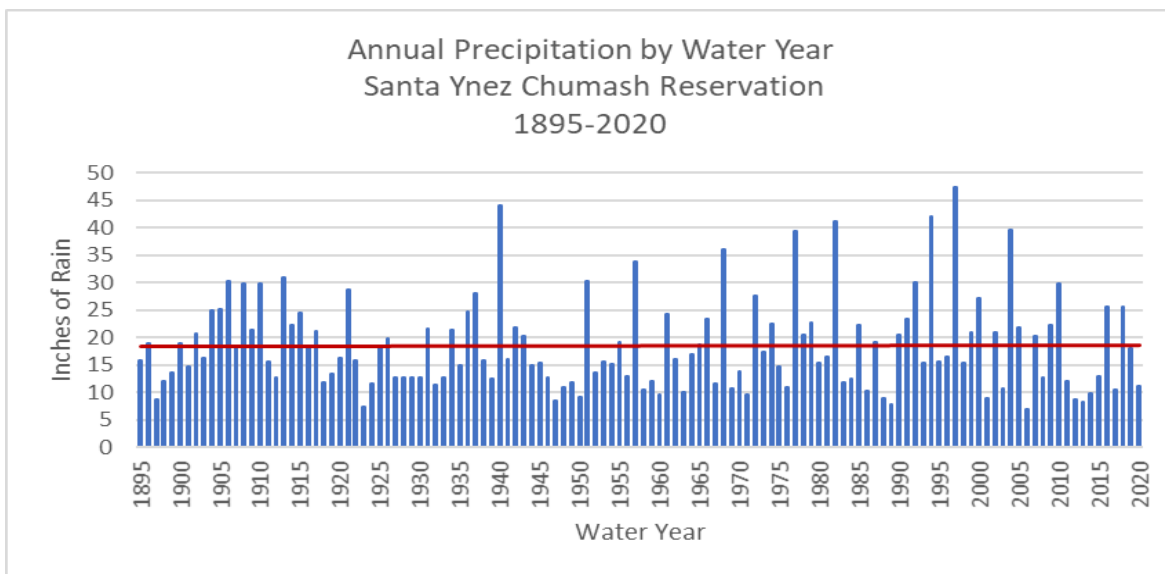
During interviews with the Chumash community, 74 plant species were identified that have traditionally been or currently are gathered. Approximately 76% of respondents (22 individuals) said that they have noticed changes in the availability of plant and animal resources in recent years, with 20 respondents experiencing a decrease in availability. For those respondents who experienced a decrease in plant and animal resource availability, the commonly reported reasons for the decline included: loss of access, overharvest, drought, lack of instream water availability, and development (SYBCI, 2020c).

Precipitation and Flooding

What does this indicator show?

As shown in Figure 7, while the total amount of rain over time has remained steady, the fluctuation in wet and dry years has grown greater over time. Looking at water years, which start in October and run through September the following year, between 1895 and 1958 the Santa Ynez Chumash experienced one year with rainfall over 35 inches. From 1959 to 2020 the Santa Ynez Chumash experienced six years with rainfall of over 35 inches per year. This high intensity rain is matched with high runoff and the Chumash have seen that groundwater is not being recharged as a result (PBMI and SYBCI, 2021).

Figure 7. Annual Precipitation at the Santa Ynez Chumash reservation



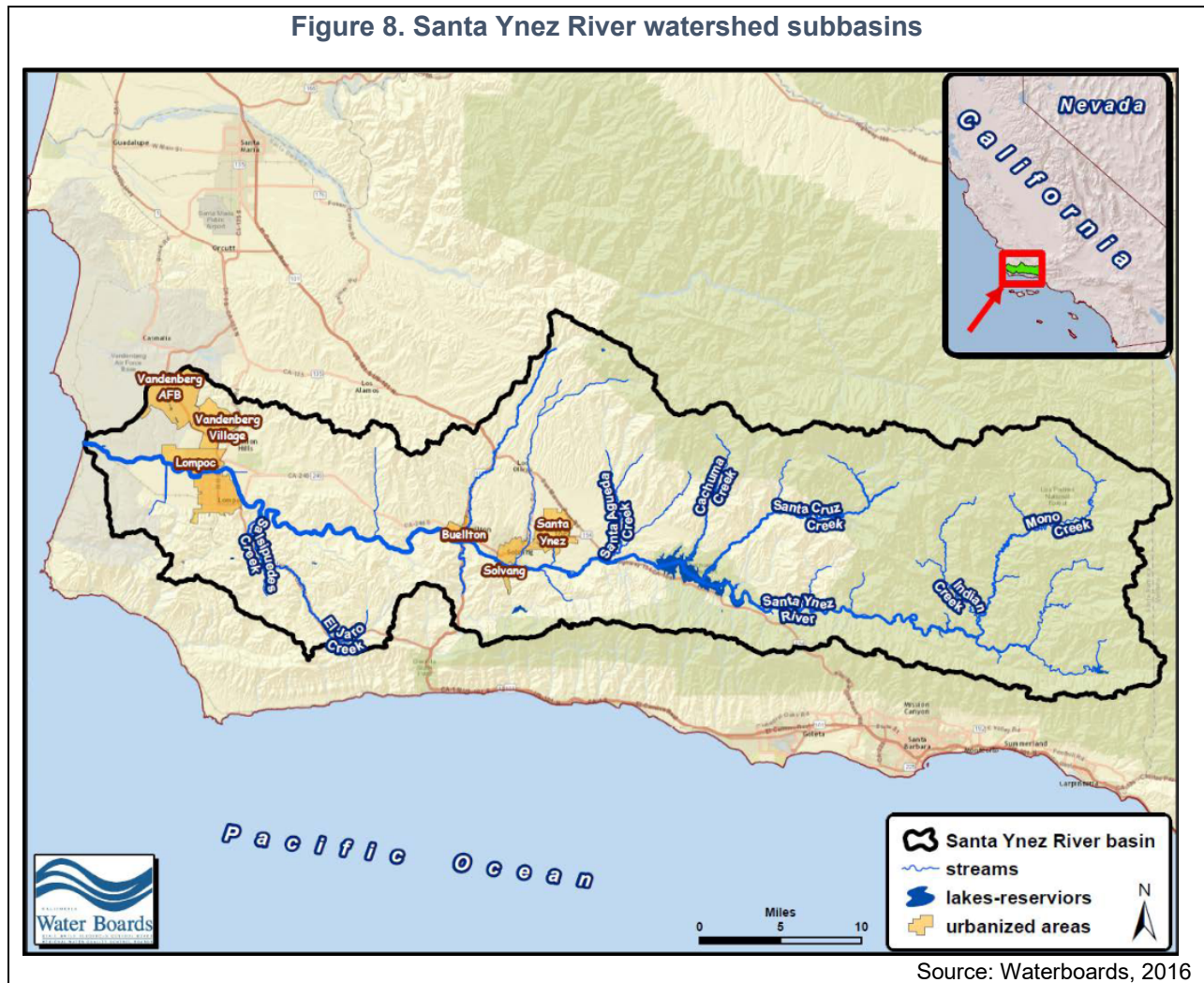
Source: PRISM 2022



Why is this indicator important?

The Santa Ynez Reservation lies within the Santa Ynez River Watershed (See Figure 8, Watershed subbasins). The Santa Ynez River borders the southerly edge of the Santa Ynez Valley, along the northern slopes of the Santa Ynez Mountains. One of the largest rivers on the Central Coast of California, the Santa Ynez River is 92 miles long, flowing east to west across the valley, through Solvang, Buellton, and Lompoc. The watershed encompasses 897 square miles. It drains from the Santa Ynez River's headwaters in the Santa Ynez Mountains west through the Santa Ynez Valley before emptying directly into the Pacific Ocean north of Surf Beach. Elevations range from 4 feet at the head of the estuary to 6,820 feet in the Santa Ynez Mountain headwaters.

Figure 8. Santa Ynez River watershed subbasins

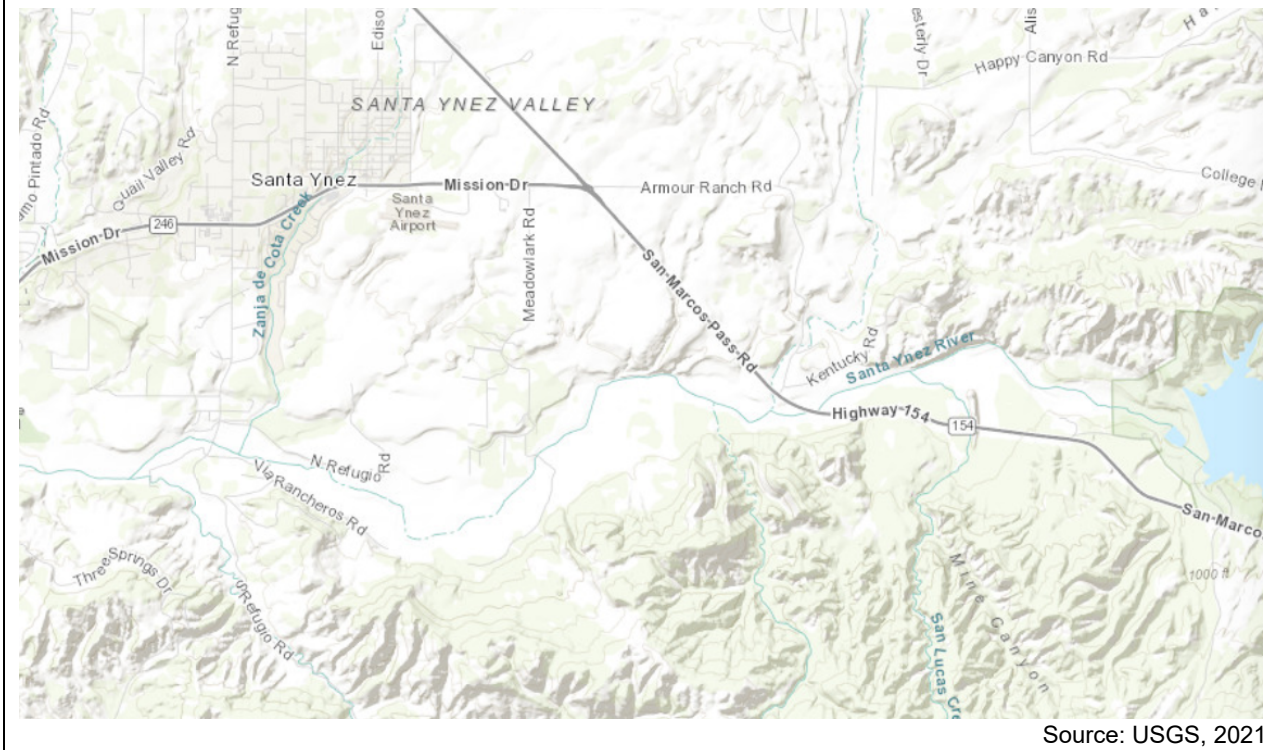


The USGS designates the Santa Ynez River as a fourth-order river (medium sized) with 2,077 miles of total tributary stream length: 1,663 intermittent miles, 350 perennial miles, and 63 miles of man-made channels. Drainages exiting the hills and draining to the Santa Ynez River cross the valley northeast to southwest. The most significant



surface water for the Santa Ynez Tribe is the Zanja de Cota Creek (see Figure 9) which bisects the original Santa Ynez Chumash reservation lands.

Figure 9. Zanja de Cota Creek



With increasingly variable precipitation, extreme rainfall events are projected to pose a risk of flooding. (Coastal Resilience, 2020). Santa Barbara County experienced 14 significant floods between 1862 and the 1998. Eight of these floods were declared state and federal disasters. The Santa Ynez Reservation has seen major flooding along Zanja de Cota Creek and the Santa Ynez River. In recent years, major flooding along the creek occurred in 1980, 1995 and 1997.

The 2019 Santa Ynez Band of Chumash Multi-Hazard Mitigation Plan (SYBCI, 2019) provides an account of flooding on the reservation along Zanja de Cota Creek and the Santa Ynez River. As is summarized below in the first 130 years of modern flood records the Santa Ynez Chumash endured four major floods; in the last 30 years the Santa Ynez Chumash have experienced five major floods.

Summary of major flood events

- 1862—Great Flood
- 1907—Flood flows on the Santa Ynez River engulfed the entire Lompoc Valley
- 1969—California declared Santa Barbara County a disaster area on January 25; major flooding along the Zanja de Cota; Santa Ynez River experienced the highest flows in almost 3,000 years; 16 inches of rain fell at Juncal Dam (Goleta)



in a 24-hour period; in the Upper Santa Ynez watershed, the flood was equivalent to a 100-year storm

- 1980—Major flooding along the Zanja de Cota; mudslides in some areas
- 1992–1993—Santa Ynez Valley received approximately 180 percent of normal rainfall
- 1995—Major flooding along the Zanja de Cota; part of widespread flooding throughout the County
- 1997–1998—Flooding along the Zanja de Cota; several record-breaking rainfalls with 50-year storm event intensities in February 1998
- 2011 (March) Santa Ynez River flooding
- 2018 Montecito debris flow. This debris flow impacted local Chumash cultural resources and caused damage to the reservation.

Sea level rise

What does this Indicator show?

The Nation Oceanic and Atmospheric Administration (NOAA) reports that the mean sea level in Santa Barbara County has increased an average of 1.08 millimeter per year between 1973 and 2020 (NOAA, 2021).

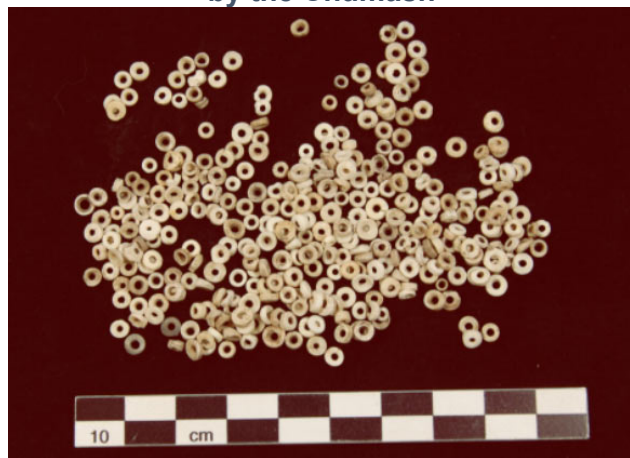
Why is this indicator important?

Sea level rise and the resulting erosion are already impacting important Chumash cultural sites along the coast (PBMI and SYBMI, 2021). Like many cultures, the Santa Ynez Chumash youth are taught by parents or elders in the group. As sea levels rise, sites previously used for gathering are no longer accessible. In addition, the Tribe has seen damage to cultural sites due to erosion along the coast. Without access to these traditional sites, knowledge can be disrupted, and the weight of that loss is felt by generations of tribal members (PBMI and SYBMI, 2021).

Olivella shells (Figure 10), are gathered by the Tribe for use in shell money, jewelry, and regalia, are becoming more scarce and traditional areas for gathering are often no longer accessible (PBMI and SYBMI, 2021).

While sea water intrusion is not expected to impact the Santa Ynez reservation directly, its impact on other aquifers will likely increase dependency on the other groundwater basins between the Santa Ynez Mountains and the Pacific Ocean (Coastal Resilience, 2020).

Figure 10. Olivella shells carved by the Chumash



Source: Science News, 2021



Impacts on Plants and Animals

What does this indicator show?

The Santa Ynez Chumash have already seen a reduction or extirpation of species such as steelhead, red-legged frogs, kelp, sea grass and Olivella. Both Chia Sage (*Salvia columbariae*) and Chuchupate (*Ligusticum porter*) are no longer found in the area and grow only at higher elevations where temperatures are cooler, and more water is available.

Plant communities and animal habitats are anticipated to be further affected by changes to primary (temperature, precipitation, sea-level rise) and secondary (drought, wildfire, flooding, flooding, cliff erosion, debris flows, and wildfire) climate change impacts (SYBCI, 2020a).

Why is this indicator important?

The Chumash have always harvested from both the land and the sea. Changes in ocean temperature and ocean acidification have impacted species important to the tribe (PBMI and SYBMI, 2021). In 2013 sea stars, the main predator of purple urchin, were decimated by the sea star wasting disease virus; while the causes of the incident have not been established, it is hypothesized that elevated ocean water temperatures may have been an exacerbating factor (Miner et al., 2018). With sea stars gone, the urchin population grew unchecked.

2014 brought a marine heat wave, which was followed in 2015 by an El Niño causing the ocean waters to warm further. These warm waters contained fewer nutrients than the normally cold coastal California waters, which caused kelp to grow more slowly. Urchin and abalone both mainly eat kelp. The explosion in the urchin population and the reduction in kelp due to warming waters impacted two species important to the Chumash: kelp and abalone (UCD, 2021).

Many species which are important to the Santa Ynez Chumash are currently threatened by climate change such as: Belding's Savannah Sparrow, tidewater goby, steelhead,

Figure 11. Waqaq' (California red-legged frog)



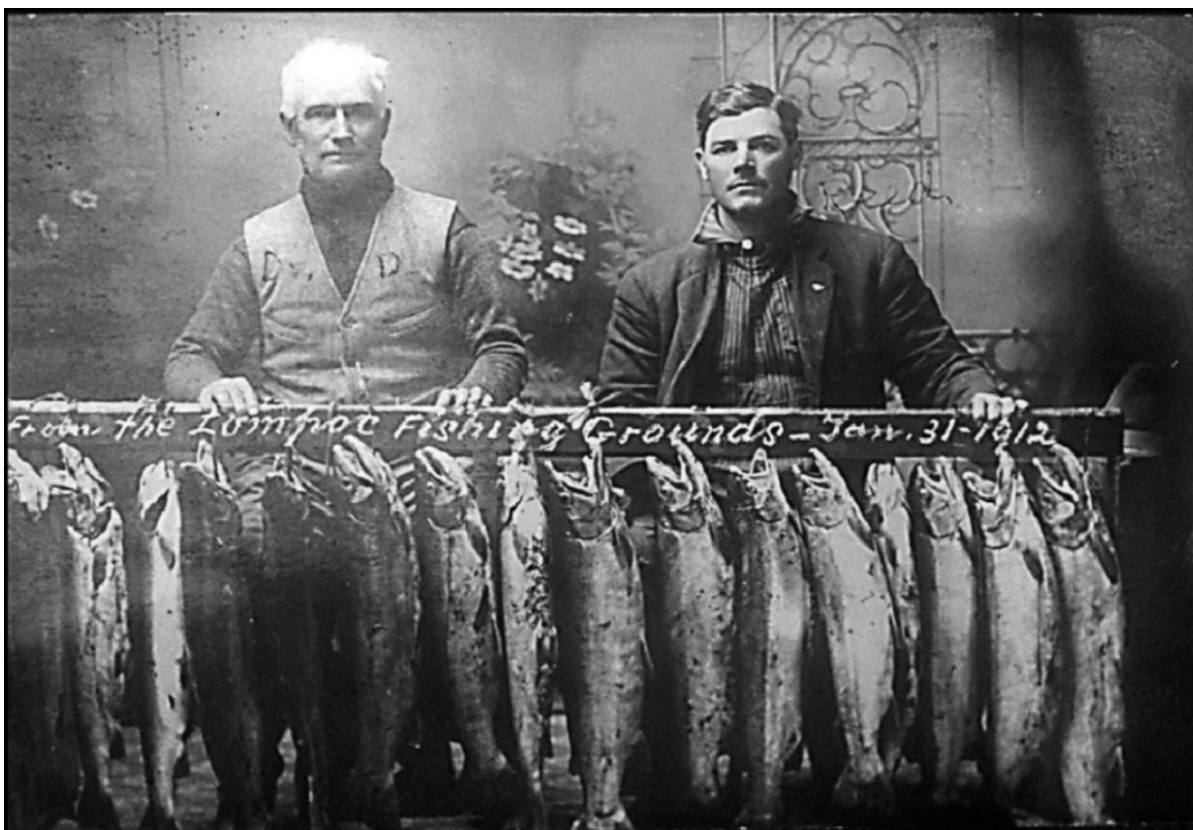
Source: Los Padres Forest Watch

snowy plover, willow flycatcher, white-tailed kite, monarch butterfly, Coastal Range newt, Western Pond Turtle, and brown pelican. Waqaq' (red-legged frogs, Figure 11), in particular, used to thrive on the reservation, are no longer present.

The Zanja de Cota Creek that flows through the reservation used to be the site of steelhead fishing derbies (Figure 12). Due to the drop in water in the creeks, and an increase in pesticide runoff, there are no steelhead remaining in the creeks.



Figure 12. Historic photo - steelhead caught along Zanja de Cota Creek (1912)



Source: Lompoc Historic Society

Wildfire

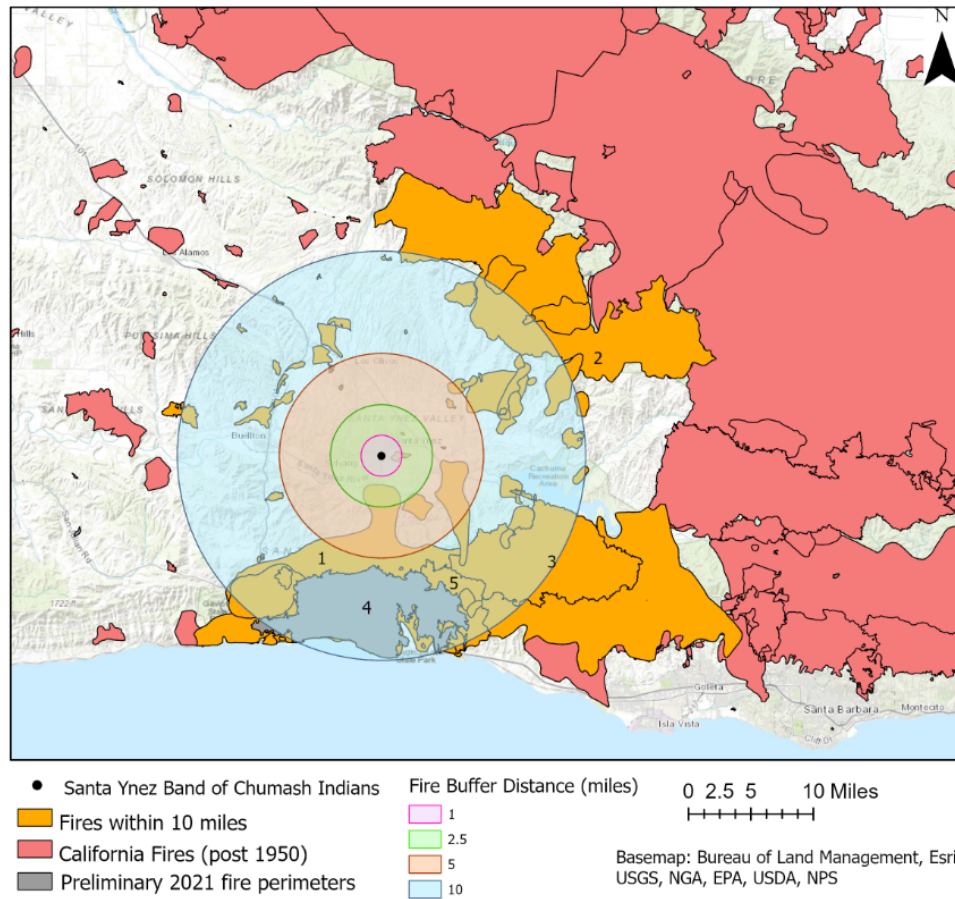
What does the indicator show?

The incidence of large forest fires in the western United States has increased since the early 1980s (Wehner et al., 2018). Fire season in California is starting earlier and ending later each year (CAL FIRE, 2020). A study of microscopic charcoal from the Santa Barbara Channel indicates that over the past 560 years large wildfires (greater than 500 acres) occurred in the Santa Barbara County area an average of every 20 to 30 years (Mensing et al., 1999). Prior to the 1950s, the greater Santa Barbara area averaged one large fire per decade; however, the number of large fires within and adjacent to the County has increased substantially. There were 93 large fires within Santa Barbara County between 1955 and 2021 that burned over 1,475,042 acres. This equates to 1.4 significant fires every year (SB Fire Safe Council, 2021, CAL FIRE 2021). Figure 13 shows the fires that came from within one to ten miles of the Santa Ynez Chumash reservation between 1950 and 2021.



Figure 13.

Fires Impacting the Santa Ynez Band of Chumash Indians (1950-2021)



Source: CAL FIRE, 2021. Map generated using fire perimeter data from CAL FIRE

Why is this indicator important?

Wildfire is considered a high-risk exposure for the Santa Ynez Chumash tribe. Climate factors including Santa Barbara's Sundowner winds (Ryan et al., 1992), increasing temperatures, and severe drought conditions are increasing the wildfire risk at Santa Ynez.

Firefighting equipment can expose and destroy cultural sites. Burned areas that are then subjected to heavy rain will be subject to flooding, landslides and rockfalls. Cleanup of burned areas can expose cultural artifacts and destroy sites important to the Tribe. SYCEO has begun studying impacts in burn scar areas, including loss of trees and species that are returning to these areas. Some burn scar areas are not supporting the growth and reproduction of tree seedlings, likely due to warmer temperatures or insufficient moisture related to climate change, in addition to the wildfires.

Poor air quality, caused by wildfire smoke, is of great concern on the reservation; when wildfire smoke is present outdoor activities cannot occur, ceremonies and gathering



activities are cancelled. Smoke more heavily impacts Tribal members who have asthma, or other respiratory related health issues such as chronic obstructive pulmonary disease (COPD).

Summary

Warming temperatures, drought, increasingly variable rainfall – and ensuing floods – erosion resulting from sea level rise, and wildfires have impacted the people of the Santa Ynez Band of Chumash Indians and their environment. In addition to exposures to temperatures much warmer than they are acclimated to, these changes have altered and disrupted the ecosystems within and around Santa Ynez, impacting many species of cultural importance to the Tribe, and interfering with their ability to carry out traditional practices. The 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 of climate change on the Santa Ynez Chumash Tribe'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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