

6.8 Impacts of Climate Change on the Wiyot Tribe



Sea level rise and increasing weather variability are contributing to the loss of critical habitats and species in Wiyot territory and threatening the culture and economy of the Wiyot Tribe, including their food sovereignty, culturally important species and places, and cultural artifacts.

Background

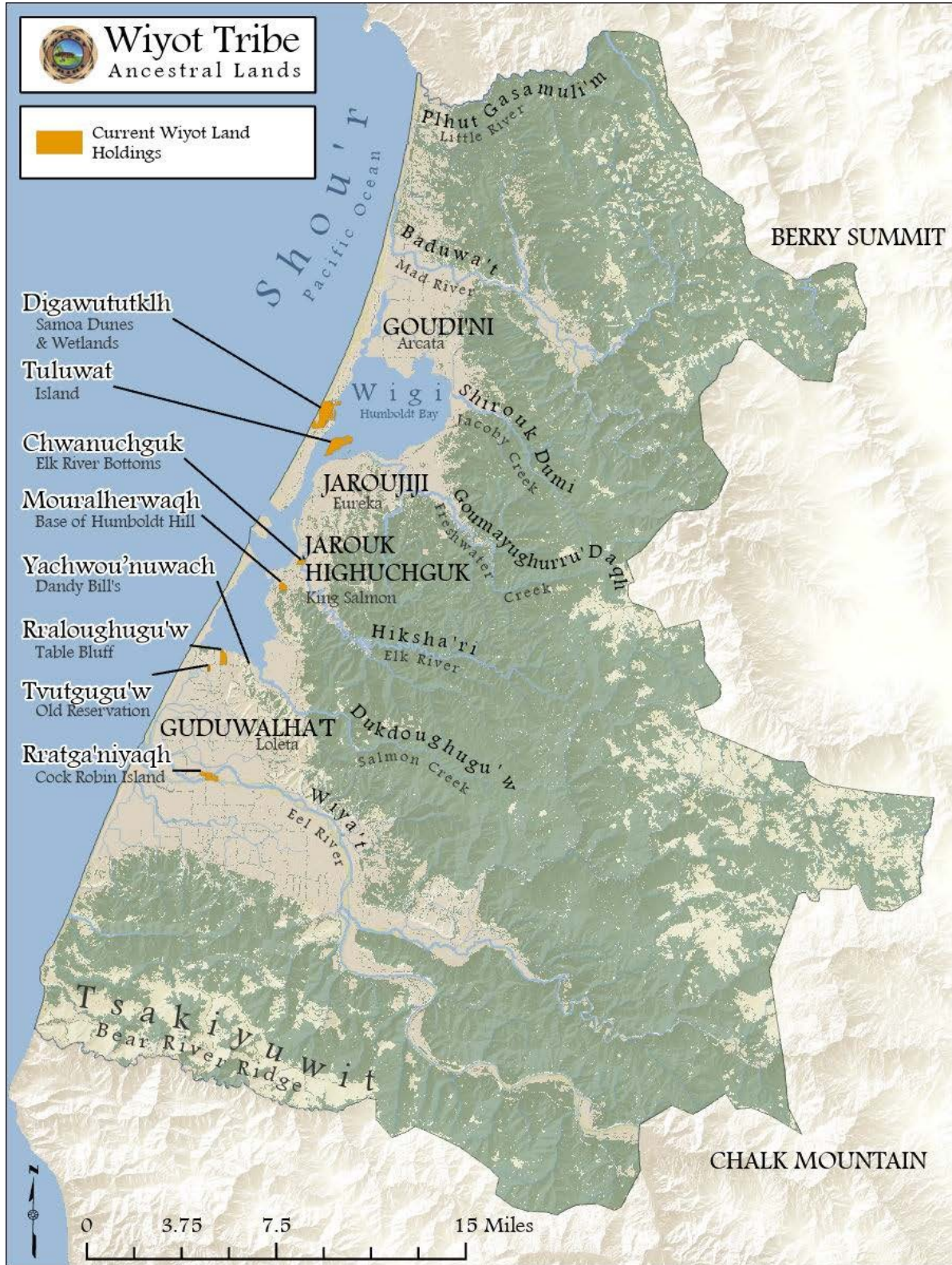
Since time immemorial, the Wiyot people have lived amongst the diverse landscapes of present-day Humboldt County, California. This area includes geographically and ecologically diverse ecosystems such as tidal mudflats, eelgrass beds, salt marshes, estuaries, dunes and wetlands. Forested, prairie and grassland ecosystems also occur in more inland regions. Wiyot traditional homelands extend on much of the Humboldt County coast, from Little River in the North to Bear River Ridge in the South and encompass significant waterways such as Baduwa't (the Mad River), Wigi (Humboldt Bay) and Wiya't (the Eel River) which are shown in [Figure 6.8.1](#), below. These vital waterways served not only as travel and trade routes, but permanent Wiyot village sites as well.

Climate of the northern coast is characterized by mild wet winters and cool, fog-heavy summers. On average, Humboldt County experiences 40 inches of rain per year, with about 90% of the precipitation occurring from October through April. Additionally, the Humboldt Bay region is seismically active with the Gorda plate, the North American plate and the Pacific plate meeting in the Pacific Ocean, forming the Triple Junction (Patton et al., 2023).

Through complex and sustained stewardship of these landscapes, the Wiyot people gathered and tended to many species for traditional lifeways, sustenance and basketry material. Traditional stewardship included cultural fire, coppicing, pruning, cultivating edible bulbs and performing the World Renewal Ceremony to bring balance to the land. Culturally significant plant and animal species include acorns, berries, hazelnut, salmon,



Figure 6.8.1. Map of Wiyot Ancestral Territory.



Source: Wiyot Tribe (2025)



Pacific lamprey, sturgeon, crab, shellfish, various surf fish and more. For the Wiyot people, these landscapes represent both a cultural and moral space where community members can tend to and sustain reciprocal relationships with the land and pass down knowledge to future generations.

The Wiyot Tribe has worked diligently to re-acquire traditional homelands. Currently, the land held in trust for the Wiyot Tribe is Table Bluff Reservation (TBR) – which is an 88-acre plot located several miles outside the small town of Loleta, near the South Jetty of Wigi. Through grassroots activism, determination and community programs such as the Wiyot Sacred Sites Fund, the Wiyot Tribe has been successful in purchasing land and other sites of religious and cultural significance for future generations. In 2000, the Wiyot Tribe purchased 1.5 acres of the historic village site of Tuluwat. In May 2004, the Eureka City Council approved a resolution to return an additional 45 acres to the Tribe. In late 2018, the Eureka City Council approved a resolution to relinquish the deed to the remaining 202 acres of Tuluwat, returning it to the Wiyot People. The return of Tuluwat represents the first municipality in the United States to return land without an accompanying sale or lawsuit. In addition to Tuluwat, the Wiyot Tribe acquired 46 acres of Mouralherwaqh in 2022 and 360 acres of Digawutuklh in 2024 ([Figure 6.8.1](#)).

Climate change and the Wiyot Tribe

The Wiyot people have stewarded and tended to their traditional landscapes since time immemorial. Traditional Ecological Knowledge (TEK) and an intricate, reciprocal relationship with the land have allowed the Wiyot people to adapt to and mitigate changes within the landscape as they arise. However, the severity of climate change impacts to the region are paramount. Due to the diverse landscapes and species of the region, climate change impacts are numerous and include sea level rise, changes in precipitation and changes in air temperatures.

Currently, the Wiyot Tribe has limited capacity to implement robust mitigation measures for climate change impacts. One of the biggest challenges the Wiyot Tribe faces is the loss of traditional homelands. Current Tribal land holdings account for less than 0.2% of their traditional homelands, and the Tribe has few discretionary funds or economic development opportunities to acquire more. Nevertheless, the Wiyot Tribe perseveres

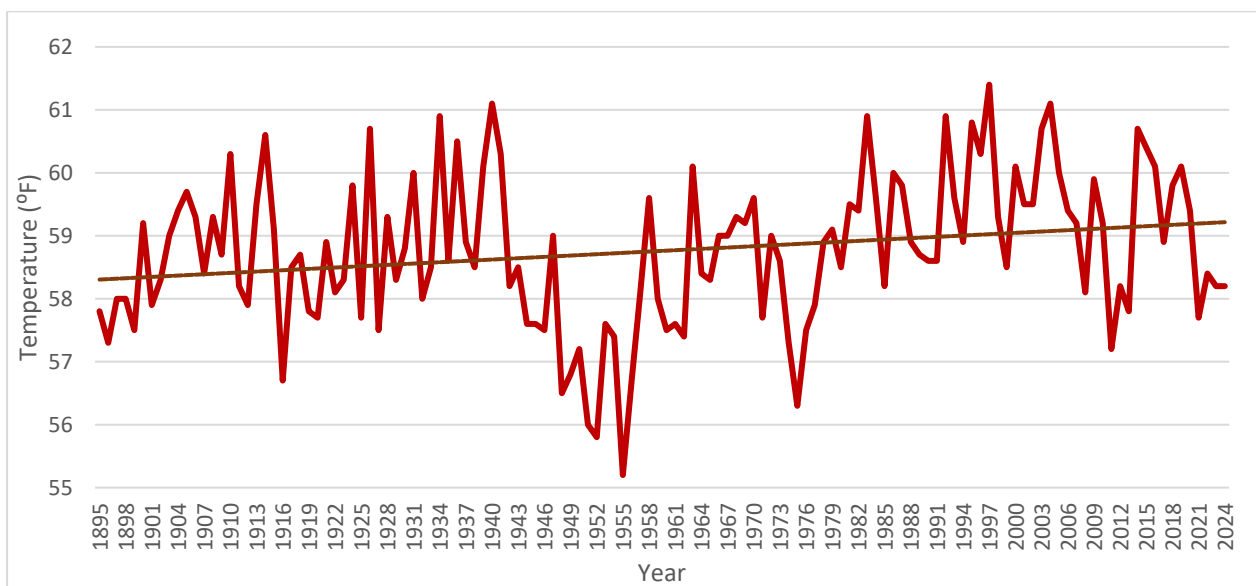


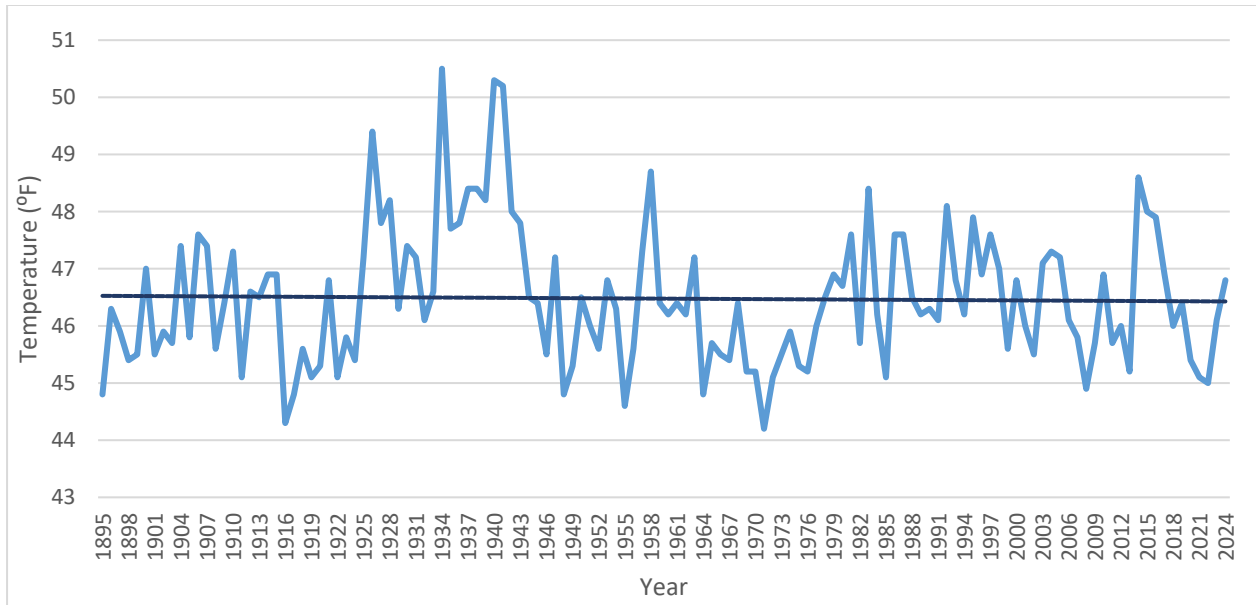
and encourages mitigation measures through grant-funded projects, as well as local partnerships and collaborations. Potential mitigation measures include Shawir Darrudaluduk (Wiyot Natural Resources Department) species monitoring programs, participating in regional planning groups, removal of invasive species, mapping areas of cultural and ethnobotanical significance, establishing a native plant nursery, acquiring more land within Wiyot homelands and advocating for responsible planning and management decisions.

Air temperatures

The Wigi region is characterized by a cool, wet climate with mean temperatures in the 50s (degrees Fahrenheit or °F, or 10 to 15 degrees Celsius or °C). The temperature regime of Wiyot territory is relatively stable compared to other areas of California which are experiencing rapid warming, higher extreme heat, and higher variability. However, because Wiyot Tribal members are accustomed to low and consistent temperatures and most of them do not have air conditioning, even relative heat, such as extended temperatures in the high 70s or 80s °F (24 to 32°C), can be dangerous for vulnerable Tribal members such as elders.

Figure 6.8.2. Daytime (Top) and Nighttime (Bottom) Air Temperatures at Table Bluff Reservation 1895 to 2024.





The top graph shows annual average maximum, or daytime, temperatures with the linear trend. The bottom graph shows annual average minimum, or nighttime, temperatures with the linear trend. Source: PRISM Climate Group (2025)

Figure 6.8.2 shows annual average minimum (nighttime) and annual average maximum (daytime) temperatures at Table Bluff Reservation (TBR) from 1895 to 2024, with linear trendlines on both graphs. Nighttime temperatures have decreased over the 130-year period by 0.1°F (0.06°C), while daytime temperatures have increased by 0.9°F (0.5°C).

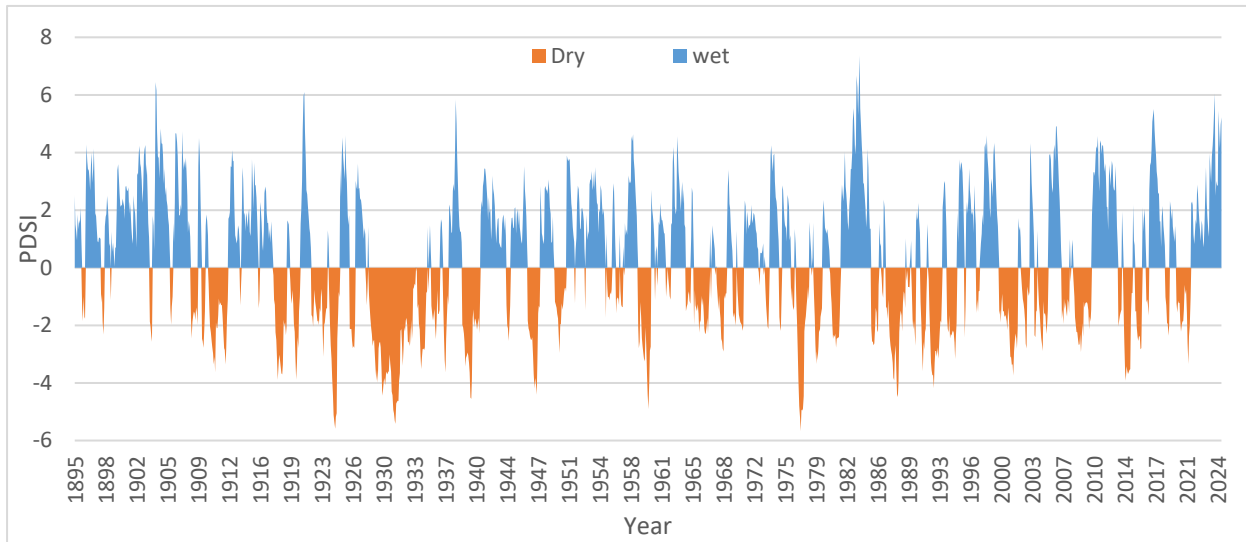
Flood and drought

Figure 6.8.3 shows the monthly Palmer Drought Severity Index (PDSI) at Table Bluff Reservation (TBR) from January 1895 to December 2024. PDSI is a scale derived from air temperature, precipitation, and the moisture-holding capacity of the soil to represent the relative dryness (-10 being the most dry) or wetness (10 being the most wet) of a place over a specific period of time. Values less than negative four (-4) are considered severe drought conditions while numbers greater than four (4) are considered very wet.

Similar to temperature, the long-term trend in PDSI at TBR for the 130-year period of record is relatively stable. However, in the past 30 years, TBR has experienced a wetter climate with an increasing trend of severe flood. Seawater encroachment and saturation of coastal soils may be contributing to this trend and are discussed in the [Sea level rise](#) section (page 209).



Figure 6.8.3. Monthly Palmer Drought Severity Index (PDSI) at Table Bluff Reservation 1895 to 2024.



Source: Abatzoglou et al. (2025)

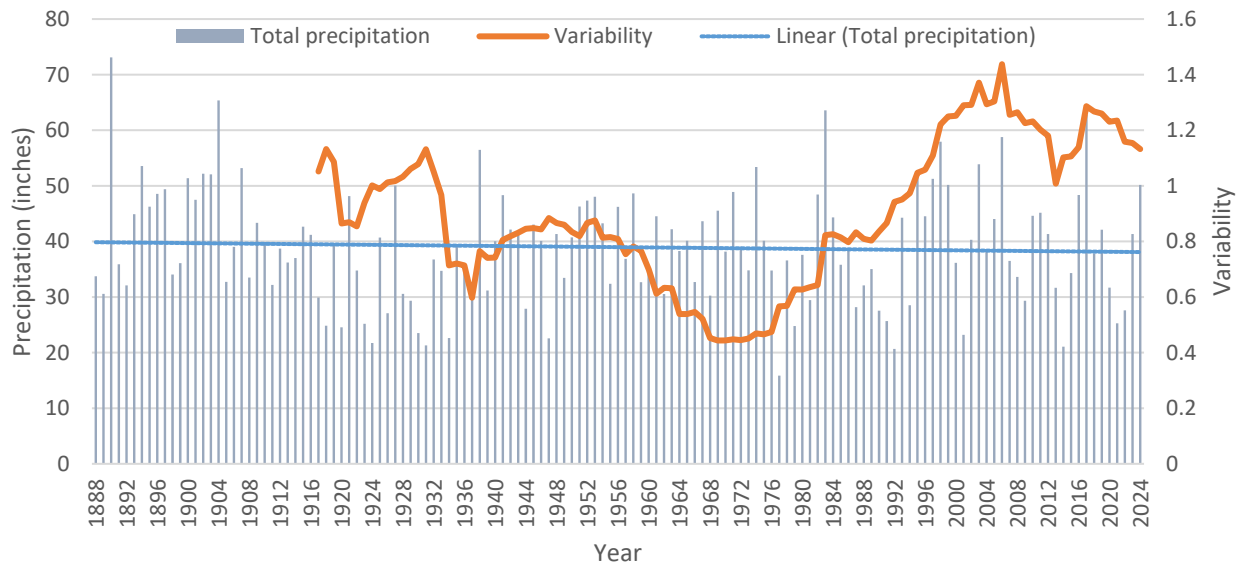
Precipitation

While there has been no observable increase or decrease in total annual precipitation over time ([Figure 6.8.4](#), below), there have been changes in the variability of precipitation, including timing and intensity of rainfall around Wigi. Rainfall has been more variable in the last 30 years, corresponding with the period of increasing flood conditions noted in the previous section. The Wiyot have noticed that fall precipitation has become more variable ([Figure 6.8.A-1](#), page 228), that there are more, larger atmospheric rivers, and that there is less coastal fog, which is essential for the survival of coastal redwoods, in the inland forests.

[Figure 6.8.4](#) shows total annual precipitation from 1895 to 2024 at the weather station on Woodley Island, which is next to Tuluwat Island in the center of Wigi. There is little to no change in the long-term average annual rainfall over this time period. However, the 30-year variability in rainfall has been at its highest for the last 30 years. Rainfall was most consistent in the 1970s and most variable in the late 1990s to early 2000s.



Figure 6.8.4. Total Annual Precipitation (in Inches) at Woodley Island from 1895 to 2024.



Blue bars represent total water year precipitation on the left y-axis. The orange line represents variability: the ratio of 30-year variance to the variance of all 130 years. When variability is less than one (1), rainfall in the preceding 30 years was more consistent relative to the entire period. When variability is greater than one (1), the preceding 30 years had more variable rainfall compared to the entire period. Source: NCEI (2025)

Fall precipitation arriving at variable times impacts traditional Wiyot lifeways. Wiyot basketweavers and berry pickers must gather plant material and fruit at particular times of year. Gathering camps have traditionally been established around August and September when plants are in the best condition for harvest and traditional uses. This short window is disrupted by early storm activity. Early precipitation can cause less or incomplete ripening of berries, a process which is dependent on there being sunnier days in the period before the cold season arrives.

Losses of material and food due to weather are compounded by the fact that the majority of the Wiyot's historically and culturally important gathering sites were incorporated into National and State Parks. Tribal members are no longer permitted to gather in those areas and may face consequences for trying to access ancestral gathering grounds. This makes it even more important that the sites that Tribal



members can still access are productive.

Increased variability in precipitation has also impacted cultivated resources, such as hay. The Tribe has experienced more losses from both earlier-than-anticipated or excessive precipitation as well as from fire and drought, both of which lead to a loss of income.

Sea level rise

Relative sea level rise is one of the greatest impacts to the developed area around Wigi, including the largely coastal areas that the Wiyot Tribe currently manages and the places where the majority of the population of Humboldt County reside. While sea level change refers to the change in ocean water level relative to land elevation globally, relative sea level change is the way in which seawater level is changing in relation to land in a particular place. Relative sea level change takes into account global sea level change as well as the vertical motion of land and changes in wind and ocean circulation (NOAA, 2025).

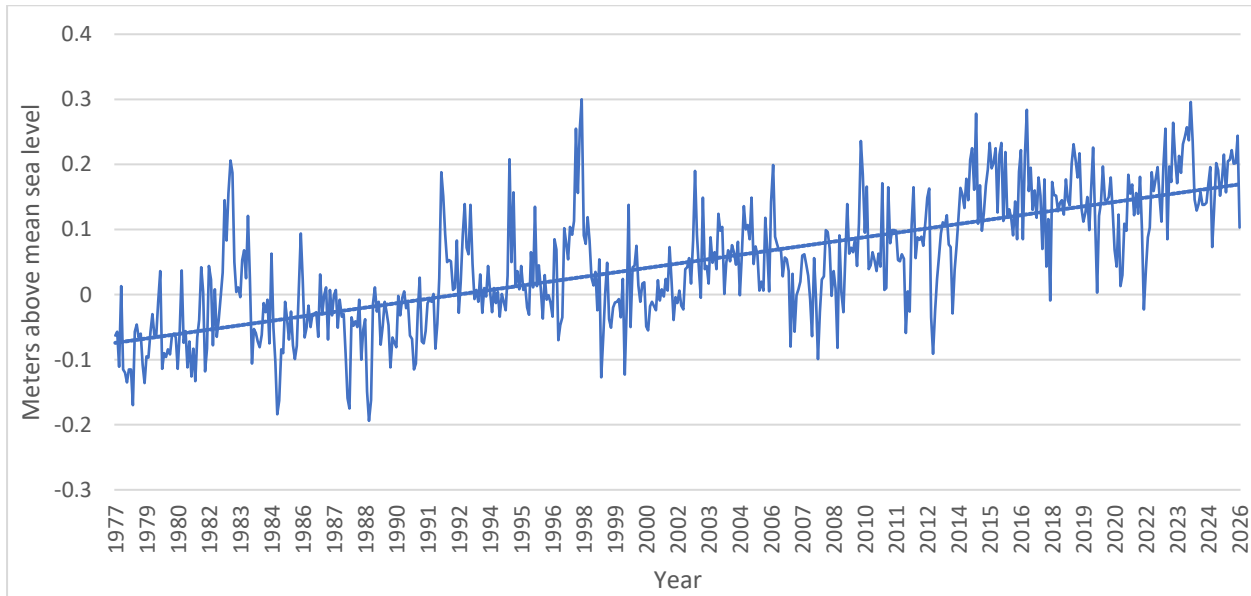
Relative sea level rise around Wigi is driven primarily by plate tectonics, with a small contribution from climate warming-driven global sea level rise. Along with changes in precipitation and storm size, relative sea level rise is increasing the frequency and severity of flood events, expanding the tsunami hazard zone, consuming tidal habitats, and causing saltwater encroachment on culturally significant freshwater habitats and sacred sites of the Wiyot Tribe.

Figure 6.8.5 shows relative sea level measurements at the North Spit Station in Wigi, which is maintained by the National Oceanographic and Atmospheric Administration (NOAA). At North Spit, relative sea level has risen at a rate of 5.08 millimeters per year (1.67 feet over 100 years).

Relative sea level is rising 2–3 times faster in the southern portion of Wigi than anywhere else on the California coast. Analysis of temporary tide gages around Wigi suggests that the rate is as high as 6.2 millimeters per year around Hookton Slough in the southern part of Wigi near TBR (Anderson, 2018; Patton et al., 2023). Approximate locations of North Spit and Hookton Slough are in **Figure 6.8.7** (page 212).



Figure 6.8.5. Relative Sea Level Measured Monthly at North Spit Station, September 1977 to March 2026.



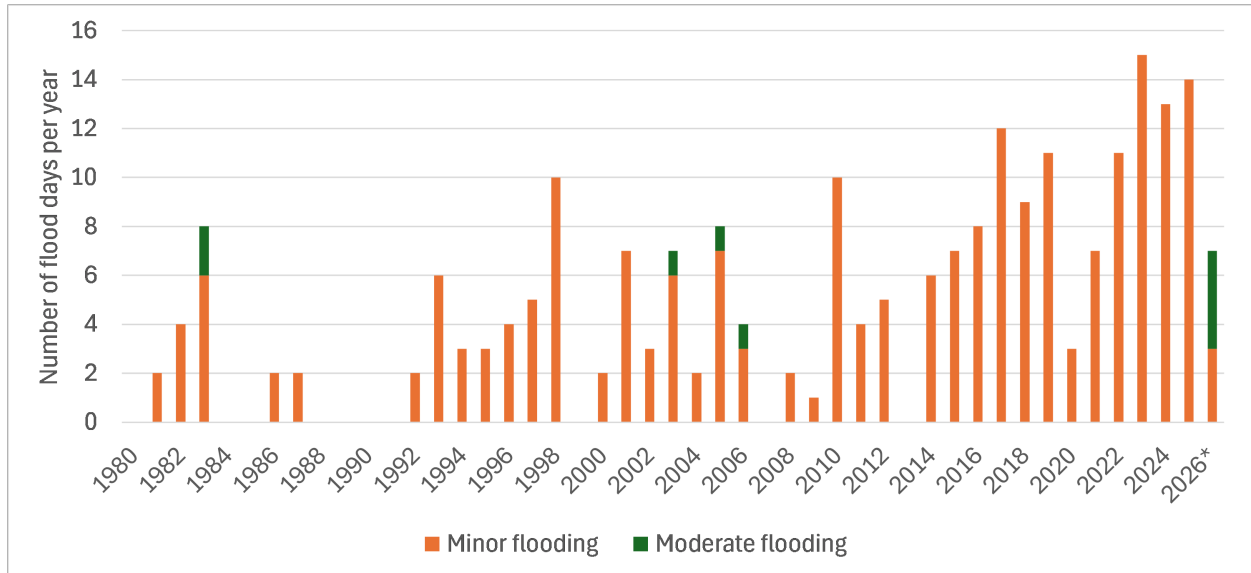
Source: NOAA (2026)

Vertical land motion, or in this case, the subsidence or sinking of the land, is the greatest driver of rising relative sea level around Wigi. The high rate of subsidence around Wigi is caused by elastic deformation of the North American plate as the Gorda plate dips below it along the Cascadia Subduction Zone just off the coast in the Pacific Ocean (Patton et al., 2023). In other words, the coastal land of Wigi is being slowly bent toward the ocean by the force of the plate that is sinking below it to the west (**Figure 6.8.A-2**, page 229).

Relative sea level rise contributes to more severe coastal flooding. The Tribe has experienced an increasing number of high tide flood events over the past 40 years. Annual flood events are shown in **Figure 6.8.6**.



Figure 6.8.6. Annual Flood Fays at North Spit, January 1980 to March 2026.



Data from 2026* is January through March. Source: NOAA (2026)

Flood heights are measured as the height of the water above the average highest tide, or the Mean Higher High Water (MHHW). In other words, the flood level is the height of the water above the highest point that it would reach under average conditions.

Flooding is categorized as minor, moderate or major. The thresholds for minor flooding and moderate flooding are 1.92 feet (0.59 meters) and 2.83 feet (0.86 meters) above MHHW, respectively. In 2023, there were 15 flood events, the greatest number recorded in a single year. The highest tide event recorded at this station was in January 2026 when the water reached 3.52 feet (1.07 meters) above MHHW. As of March 2026, there had been more moderate flood days (four) in 2026 than any other year in the record. Major flooding begins at 4.11 feet (1.25 meters) above MHHW and has not been recorded at this station.

The threat of coastal flooding around Wigi has been made worse by development. Most of the region at risk of inundation was already inundated before settlers arrived to Wigi. Settlers created infrastructure such as dikes, levees, and miles of man-made earthen shoreline to drain these coastal areas and raise the land for their farms and homes.



They destroyed coastal wetlands by cutting them off from Wigi, preventing habitats from adapting gradually and migrating in response to fluctuations in sea level and thus reducing the ecological resiliency of the area overall. King tides already overtop these levees, threatening coastal infrastructure such as the Highway 101 corridor.

Figure 6.8.7. Inundation Map for 1 Meter of Relative Sea Level Rise.



Coastal areas (darker blue) and tidal areas (lighter blue) in Wiyot territory that would be inundated with sea level rise of 1 meter above the average highest tide. Source: NOAA (2025)



Figure 6.8.7 shows the inland flooding extent around Wigi based on elevation when sea level is 1 meter above MHHW. The coastal area (darker blue) which would be inundated is over 83 square kilometers (km), or 20,500 acres. Tuluwat, outlined in purple, and other islands in the bay along with tidal mud flats (lighter blue) make up an additional 24 square km or 6,000 acres likely to be inundated. This map does not take subsidence into account, and thus the inundated area is likely to be larger in the future.

Impacts to Tuluwat Island

Inundation of cultural sites such as Tuluwat is a major concern of the Tribe for the next century. Located in the center of Wigi, Tuluwat is the center of the universe for the Wiyot people. Since time immemorial, the Wiyot people have served as stewards of Tuluwat, performing an annual World Renewal Ceremony to bring balance to the land and its people. Tuluwat is home to sacred village and gathering sites, as well as a historic shell midden. Shell middens, which are commonly found along coastlines, are sites formed through the accumulation of shells from shellfish eaten by the Indigenous people from that specific location or region. This 6-acre, 14-foot deep shell midden covers a smaller village site on the island. The shell midden contains remnants of Wiyot daily life including tools, ceremonial items, meals, and burial sites (EPA, 2018).

In 1860, Tuluwat was seized by Robert Gunther. Gunther diked the island and ran cattle on the land. Additionally, a shipyard repair facility with a dry dock was constructed on the island in 1870. For over a hundred years, the shipyard repair facility utilized various hazardous materials to repair and service boats – such as paints, solvents, petroleum products, and other chemicals (EPA, 2018). Due to the long history of environmentally sensitive operations and improper handling of hazardous materials, Tuluwat was left highly contaminated. In 2001, the Wiyot Tribe received a Targeted Brownfield Assessment (TBA) grant from the US Environmental Protection Agency (EPA) to cleanup and remediate the island. Cleanup and remediation focused on minimizing disturbance – such as protecting the shell midden and burial grounds, while ensuring the island met cleanup levels necessary for ceremonial uses. Today, the Wiyot Tribe continues to protect this site from erosion and corrosion as the water rises.



Tsunami risk

In addition to increased flooding during high tide and storm events, Wigi faces an expansion of inundated areas during tsunamis. The Tohoku Tsunami occurred in March 2011 following a large earthquake in Japan. It reached California during a low tide, and although the inland flooding was not extensive, storm surge caused over \$50 million in damage to the state and killed one person, with the majority of damages occurring in Crescent City (Wilson, 2013).

In response to this and other tsunami events and national guidelines, California produced tsunami evacuation area maps between 2020 and 2022, with the next update planned for 2030. The update will take relative sea level rise into account for the first time. The maps are based on a model with a high degree of conservatism, which may have a greater impact on area designations than the contribution from sea level (Patton, 2025).

Impacts to eelgrass and wetland habitats

Sea level rise and increased storm severity, along with ocean warming and acidification, pose a threat to Wigi eelgrass habitat. Eelgrass is a vital habitat for many species, including Dungeness crab, juvenile salmonids, rockfish, and migratory birds (Merkel and Associates, Inc., 2017). As part of their mitigation efforts to help habitats and species migrate inland, the Tribe is working on an eelgrass suitability distribution model. This model will take temperature, salinity, depth, substrate conditions, and other eelgrass habitat parameters into account to help the Wiyot find locations for future eelgrass survival and protection.

“Some places the Tribe already got back will be inundated.

People are always trying to give back low-lying land

that will be flooded.” ~Adam Canter

Sea level rise and larger storm surges contribute to gradual beach loss and acute scarping, or the erosion of front dunes by waves. These processes are destroying the habitat of bulb species that the Wiyot Tribe depends on, such as various Indian



potatoes (*Brodeia* and *Dichelostemma congestum*), native lilies (*Fritillaria affinis*), and more. Surviving harvesting locations are further threatened by invasive species such as cord grass, ice plant, and pampas grass.

The Wiyot Tribe bolsters ecological resilience to changing ocean conditions by removing invasive species, planting native species, and encouraging the inland migration of salt marshes and dunes to help attenuate wave energy and protect vulnerable habitats. Mad River Slough is one area lacking this critical natural infrastructure that has been identified as needing additional stewardship. To implement its adaptation plan, the Tribe seeks to protect or acquire more lands of different habitat types along the coastal fringe, where habitats can naturally migrate inland. For example, they have identified freshwater wetlands that would be suitable to convert to salt marsh. A particular challenge for the Tribe in implementation is acquiring more upland habitats, of which they currently have or manage very little. The Tribe has established a Sacred Sites Fund to help them reclaim these lands that are critical for ecological and cultural resilience.

Estuarine system warming, salinization and acidification

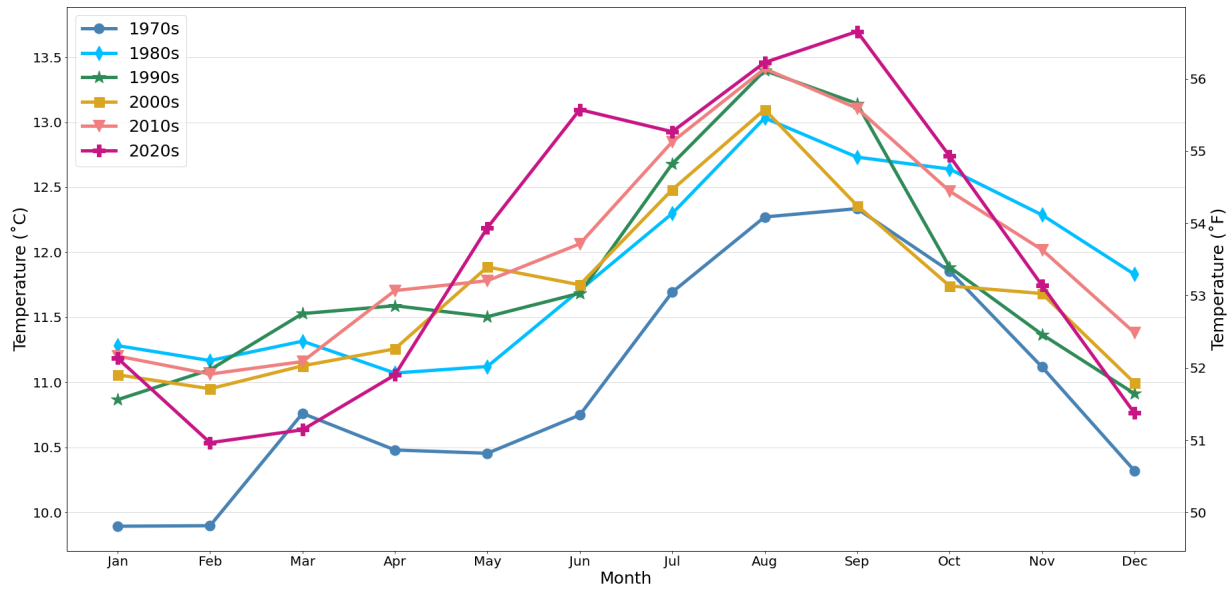
As sea level rises, saltwater penetrates higher into marshes and tributaries which are already experiencing stress from drought, heat, and increased salinity. Warming and salinization in the Wigi estuary system are related, but also highly variable and controlled by complex interactions of terrestrial and marine drivers. On land, drought and high air temperatures decrease streamflow and freshwater inputs to Wigi and increase evaporation, which can cause reduced, warmer, and saltier streamflows in tributaries, particularly in the late summer and fall (Merkel and Associates, 2017; Brennan et al., 2022; CDFW, 2025). In the summer, these phenomena often occur at the same time that coastal upwelling brings colder, saltier water to the marine-influenced portions of the Bay (Schlosser and Eicher, 2012). At this dynamic intersection of land and ocean, Wigi's estuaries are impacted by the fluctuating conditions of both.

There is a long-term trend of sea surface warming and salinization in the Pacific Ocean (see the *Coastal Ocean Temperature* chapter). **Figure 6.8.8** shows that sea surface



temperature (SST) measured at Trinidad Beach just north of Wigi has been warming over the last 50 years. The greatest increases have been observed in the months of May through September (Figure 6.8.A-3, page 230).

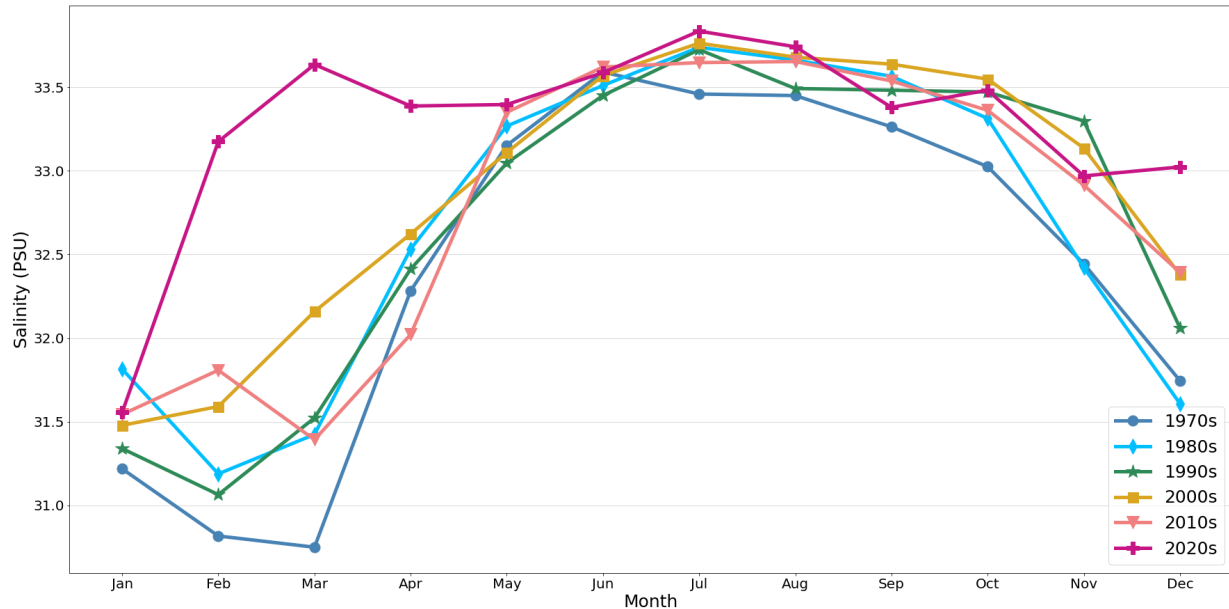
Figure 6.8.8. Monthly Mean SST at Trinidad Beach.



Source: Carter et al. (2022)



Figure 6.8.9. Monthly Mean Sea Surface Salinity at Trinidad Beach.



The y-axis shows salinity in the unit of Practical Salinity Unit (PSU). Source: Carter et al. (2022)

Figure 6.8.9 shows an increase in salinity measured at the same station over the same time period. Salinization kills culturally-important bulbs, harms eelgrass, and threatens groundwater quality. Changes in estuarine temperature and salinity can also influence the type, timing, and severity of harmful algal blooms (HABs). See [HABs](#) section for more detail.

Rising SST increases the likelihood of marine heatwaves, defined by NOAA as when the 30-day mean SST is above 90% of the normal for a particular place and season. Marine heatwaves observed off the coast of Wigi since 2014 are some of the warmest and longest on record (**Figure 6.8.A-4**, page 231). Marine heatwaves have widespread impacts on ocean ecosystems (NOAA, 2024a). In the Northeast Pacific, marine heatwaves may contribute to the rise in whale entanglement in fishing gear through a combination of factors that influence marine mammal migration and feeding patterns as well as fisheries. The California Department of Fish and Wildlife (CDFW), which



manages the commercial Dungeness crab fishery has responded to the potential for whale entanglement by implementing fishing restrictions or early closures for five of the past six years ([Figure 6.8.A-5](#), page 232). Marine heatwaves can increase the occurrence and severity of HABs which are discussed in the [HABs](#) section, below.

Ocean acidification is also a concern for the Wiyot Tribe as it threatens low-lying cultural sites and many estuarine flora and fauna of great importance, including shellfish. While research is ongoing, there is some evidence that Wigi itself demonstrates a buffering effect against the otherwise rising acidity (lowering of pH) of the ocean. There are several hypotheses for this observation, one of which is that eelgrass plays a critical buffering role, underscoring its ecological importance (Barriquand et al., 2023).

Harmful algal blooms (HABs)

The Wiyot are impacted by both marine and freshwater HABs in their territory, which are caused primarily by certain types of diatoms and dinoflagellates, and cyanobacteria, respectively. While there are many factors that influence the growth of HABs, there are signs that climate change may be exacerbating the impacts of HABs in marine and freshwater environments (see the *Marine Harmful Algal Blooms* chapter and the *Cyanobacterial Harmful Algal Blooms (Freshwater and Estuarine)* chapter). For more information on HABs, see OEHHA's [HABs webpage](#).

Freshwater HABs

The Tribe is involved in monitoring efforts for HABs on the lower Wiya't (Eel River). The California North Coast Regional Water Quality Control Board confirmed the presence of freshwater HABs on the South Fork of the Eel River every year from 2016 to 2023 as well as in 2025 (NCRWQCB, 2022; NCRWQCB, 2024). During the same time period, multiple algal blooms were reported for Baduwa't (Mad River), the mainstem Wiya't, and other regional fresh waterbodies, although not all of the reported blooms were confirmed to be HABs via laboratory testing (SWRCB, 2025). Blooms in these rivers are most common in the late summer and fall.



Marine HABs

Domoic acid is a naturally occurring marine biotoxin that may be produced during “blooms” of some species of algae (*Pseudo-nitzschia* spp.). Scientists are still investigating when, how, and why this happens. While no specific trend is evident, marine HABs, including those that produce domoic acid, are influenced by warming ocean temperatures.

Pseudo-nitzschia spp. blooms off the coast of Wigi have had a particularly negative impact on the Dungeness crab and razor clam fisheries, both species that the Wiyot rely on for subsistence. The body mass of these and other invertebrates can accumulate domoic acid, which is toxic for human consumption above a certain threshold. Dungeness crab is fished commercially and recreationally in Humboldt County, and razor clams are fished recreationally. The Tribe has suffered cultural and economic losses as a result of missed catch and consumption opportunities of these and other species impacted by HABs. Razor clam consumption advisories or closures have been in place in Humboldt County over the majority of the past decade due to domoic acid (Figure 6.8.A-6, page 233). While there are more varied reasons for closures and restrictions in the Dungeness commercial and recreational fisheries (Figure 6.8.A-5, page 232), fishery-dependent communities around Wigi were shown to be particularly economically and socially vulnerable to the 2015 to 2016 domoic acid closure events (Moore et al., 2019).

Impacts on plants and animals

Culturally significant plant and animal species include acorns, berries, hazelnut, malhuk (salmon), gou'daw (Pacific lamprey), sturgeon, crab, shellfish, various surf fish, abalone, and more. Flora and fauna populations have been impacted by ongoing direct human activities, including logging, grazing, agriculture, development, over-harvesting, dewatering and damming as well as by climate change.

Impacts on spruce

Wiyot territory is home to the largest southern-most Sitka spruce population, some of which is under the Tribe's management for fuels reduction and overall ecosystem health



improvement. The spruce population is in decline, and this issue is partly attributable to the invasive green spruce aphid (*Elatobium abietinum*). The aphids are strengthened by warmer winter temperatures, more water-logged soils, and weakened tree defenses.

Impacts on anadromous fish

Climate change harms anadromous fish species within Wiyot territory, including California Coastal Chinook salmon, Northern California Coho salmon, Northern California Summer and Winter steelhead, gou'daw (Pacific lamprey), and ba'm (green sturgeon).

Before colonization, the Wiya't (Eel River) supported large runs of gou'daw, who were mistaken by Europeans as eels. According to the Pacific Lamprey Conservation Initiative, which has included input from the Wiyot Tribe, Pacific lamprey are "imperiled" in the Wiya't and North Coast region and their population is very rapidly declining in the short term. The greatest threats of climate change to lamprey are through reduction in water quality, dewatering (including increasing withdrawals for agriculture) and inadequate flows. While it is difficult to monitor and estimate lamprey populations, *"they are believed to have declined considerably since the 1970's and by 50-70% since 1990, based on anecdotal reports from local residents and the impressions of tribal fishermen"* (PLCI, 2024).

Wiya't was also home to some of the largest salmon runs in California. In Wiyot oral history, there were so many salmon before colonization that one could cross the river by walking on their backs. It is likely that nearly a million salmon returned to the river in a good year (Yoshiyama and Moyle, 2010). Post-colonization damming, logging, agriculture, and over-harvesting reduced salmon populations by as much as 99%, significantly reducing their ability to respond or adapt to climate change-related events.

Salmon and steelhead populations are considered more vulnerable to climate change impacts than lamprey and sturgeon as their migrations and life stages are highly sensitive to changes in freshwater temperature, flow, and quality. They are impacted by declining habitat access and quality both upstream, as freshwater quality and quantity declines, and downstream, as critical salmonid estuarine habitats, such as eelgrass



beds, declines (NOAA, 2024b; NOAA, 2024c). They face increasing challenges at all stages of their life cycle. Threats from climate change include but are not limited to: increased ocean, estuarine and freshwater temperatures; decreased instream flows; lack of habitat of suitable complexity, size or depth; decreased dissolved oxygen; impeded fish passages (around dams) during high winter flows; increased predation by more heat tolerant native and invasive species; increased vulnerability to diseases; and eutrophication (NOAA, 2024d).

The Wiya't, its tributaries, and the Baduwa't support ecologically distinct populations of California Coastal Chinook salmon (*Oncorhynchus tshawytscha*), which are currently listed as threatened under the Federal Endangered Species Act (ESA). Chinook counts have been below average for the past six years and the population shows no long-term trend for recovery, remaining at high risk of climate vulnerability. Coho in the South Fork Wiya't are a critical population listed as threatened under both the Federal and California ESA, although their populations are declining and likely to become endangered in the foreseeable future. Summer steelhead are also listed as endangered under the California ESA and their habitat indicators are getting worse over time (NOAA, 2024d).

Wildfire and wildfire smoke impacts

Contrasting western views of “wilderness” as a pristine and untouched landscape, California was carefully shaped and stewarded by Indigenous peoples through the use of fire. Indigenous fire is the intentional application of fire on the land for cultural purposes – such as increased quantity and quality of basketry material, increased abundance of edible bulbs, seeds, and mushrooms, pest control, removal of dead material, and much more (Anderson, 2005). Unlike western fire suppression regimes, Indigenous application of fire entails important considerations such as frequency, seasonality, and the extent of the fire. More specifically, frequency ensures that Indigenous fire is controlled and low intensity.

Since time immemorial, the Wiyot people have regularly burned to steward their homelands. For example, coastal prairie ecosystems found along Baduwa't, Wigi, and Wiya't were established and maintained through frequent fires. Wiyot fires ensured the



coastal prairie ecosystems were bountiful with grasses, ferns, and various small plants which created nutrient dense regions for animals to graze and congregate. These fires prevented forest encroachment, which can lead to loss of plant and animal biodiversity, as well as increased erosion and hydrology issues. Unfortunately, fire suppression in the American west is inextricably linked with colonization and the history of federal Indian Policy that removed Indigenous peoples from the land (Kimmerer and Lake, 2001). Today, wildfires pose a significant threat throughout the state of California. Climate change and years of fire suppression have created an environment in which wildfires burn out of control and extremely hot – leading to destruction for both the land and the people.

Although a majority of Wiyot traditional homelands are situated within moderate fire-hazard severity zones, Humboldt County contains many high or very high Fire Hazard Severity Zones, or FHSZ (CAL FIRE, 2025). FHSZ are used to predict the physical damage a fire is likely to cause based on factors that influence fire such as fire history, terrain, weather, and existing and potential fuel sources. Wildfire frequency in the region is expected to intensify, with Humboldt County projected to have one of the highest increases in burn areas in California (Cal Poly Humboldt, 2025). The Wiyot community may not experience frequent wildfires in their traditional homelands; however, increased local wildfires will expose community members to poor or dangerous air quality. More specifically, atmospheric conditions will drive smoke, ash, and soot into the region. Wildfire smoke is composed of particulate matter (PM) and gases which can vary between burn sites and types of fuel burned, such as natural fuel sources (vegetation) versus synthetic fuel sources (plastics). Inhalation of wildfire smoke can cause immediate health symptoms such as difficulty breathing, coughing, wheezing, and irritation of the throat, nose, and eyes. Studies regarding prolonged or chronic exposure to wildfire smoke are ongoing. However, preliminary data suggests significant decreases in lung function and increases of inflammatory markers throughout the entire body (Lein et al., 2023). In addition to smoke, wildfires produce ash and soot. Ash is the powder created from the combustion of vegetation or synthetic materials, and soot is the powder made from the incomplete combustion of carbon materials. Both ash and soot can accumulate and persist within the environment, leading to long term negative



health consequences for community members and the environment.

Lastly, increased wildfire frequency throughout California has led the northwest coast of Humboldt County to be referred to as climate refugia. Climate refugia are generally defined as areas relatively buffered from contemporary climate change which can safeguard plants, wildlife, and ecosystems (Morelli et al., 2020). The northwest coast is not immune to climate change; however, climate change impacts different parts of the world in different ways. For Wiyot traditional homelands, the proximity to the Pacific Ocean and the Redwood Belt helps moderate and sustain a cooler, wetter climate. When compared to other regions of California, the local climate is relatively “stable” – making it a destination for individuals fleeing wildfires and other climate change impacts. Catastrophic fires, such as the 2018 Camp Fire, created an influx of people into the region who were escaping the aftermath of the fire. Furthermore, as temperatures increase throughout California, many state residents flock to the region for relief from dangerous temperatures. People flocking to the region and putting increased demand on the poor infrastructure and limited resources within Wiyot traditional homelands pose a significant risk to the Wiyot community.

Impacts on Tribal health

Climate change continues to negatively affect the livelihoods, health and cultural practices of the Wiyot people. Climate change not only affects the landscapes but significantly impacts overall tribal health and wellbeing by exacerbating health disparities. Some health related impacts include wildfire smoke inhalation and increased risk of vector-borne diseases. As mentioned previously, increased local wildfires will expose community members to poor or dangerous air quality. Inhalation of wildfire smoke can cause immediate health symptoms such as difficulty breathing, coughing, wheezing, and irritation of the throat, nose, and eyes (Lein et al., 2023). Furthermore, Wiyot community members have noticed an increase of disease-carrying ticks within the region. Changes in temperature allows ticks to become more active in the spring and fall seasons. Humboldt County, as well as Santa Cruz, and Sonoma, have the higher average rate of Lyme disease (from 2013 through 2019) when compared to other regions of California (CDPH, 2021).



The Wiyot Tribe conducted climate change surveys among community members over a several month period in 2020 and 2021. The survey, conducted by Shawir Darrudaluduk, consisted of basic participatory information, as well as a series of questions. Community responses to the questions highlighted climate change disruptions to cultural practices, gathering traditional foods, and overall mental health well-being. More specifically, responses noted deep concerns for sacred village sites, gathering sites for food and basketry material, ceremonial sites, land back, and the overall loss of cultural stories, memories, and knowledge.

Summary

The Wiyot Tribe continues to be stewards of their traditional homelands around Wigi (Humboldt Bay) and of the watersheds and upland regions surrounding and connected to it. The Tribe is seeing rising and more destructive tides; loss of estuaries, wetlands and the plants that live there; changing precipitation patterns; losses of freshwater flows and critical fish species; increased losses of flora and fauna to invasive species and pathogens; and increasing impacts from regional wildfire and drought. The health of the Wiyot Tribe is impacted by the loss of lifeways associated with these plants, animals, waterways and landscapes, as well as by increases in vector-borne diseases and smoke inhalation. The Wiyot bolster ecological resiliency in their region by protecting, restoring and assisting in the migration of critical habitats as climatic conditions continue to change.

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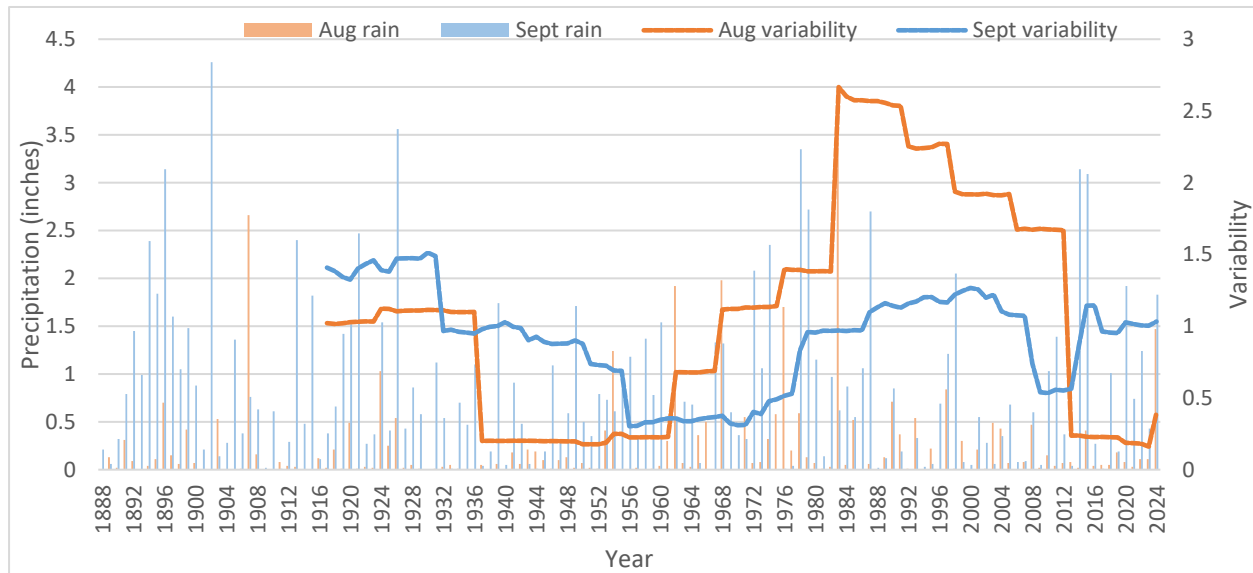
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Appendix

Figure 6.8.A-1. Variability in August and September Precipitation at Woodley Island 1895 to 2024.

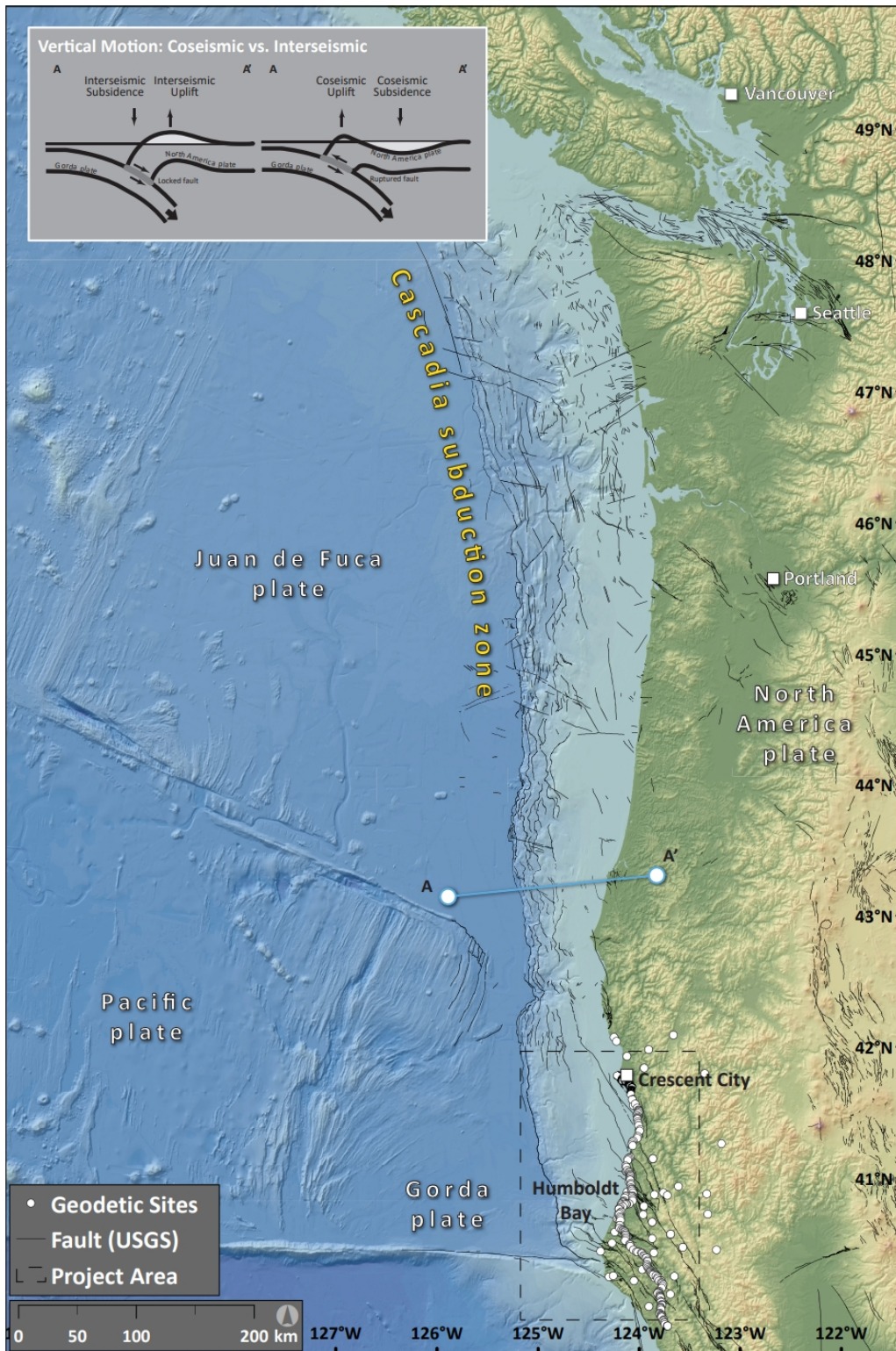


The vertical bars represent total August (in orange) and September (in blue) precipitation each year. Variability is calculated using the same method as in [Figure 6.8.4](#) (page 208). Source: NCEI (2025)

Figure 6.8.A-1 shows that August rainfall at Woodley Island was most variable between 1982 and 2013, peaking at its highest variability around 1983. August rainfall has been more consistent in the past decade. Total September rainfall has been less variable than August overall. It was most variable at the end of the 20th century, and again around 2015 when there were two years of very high September rainfall after a period of low rainfall.



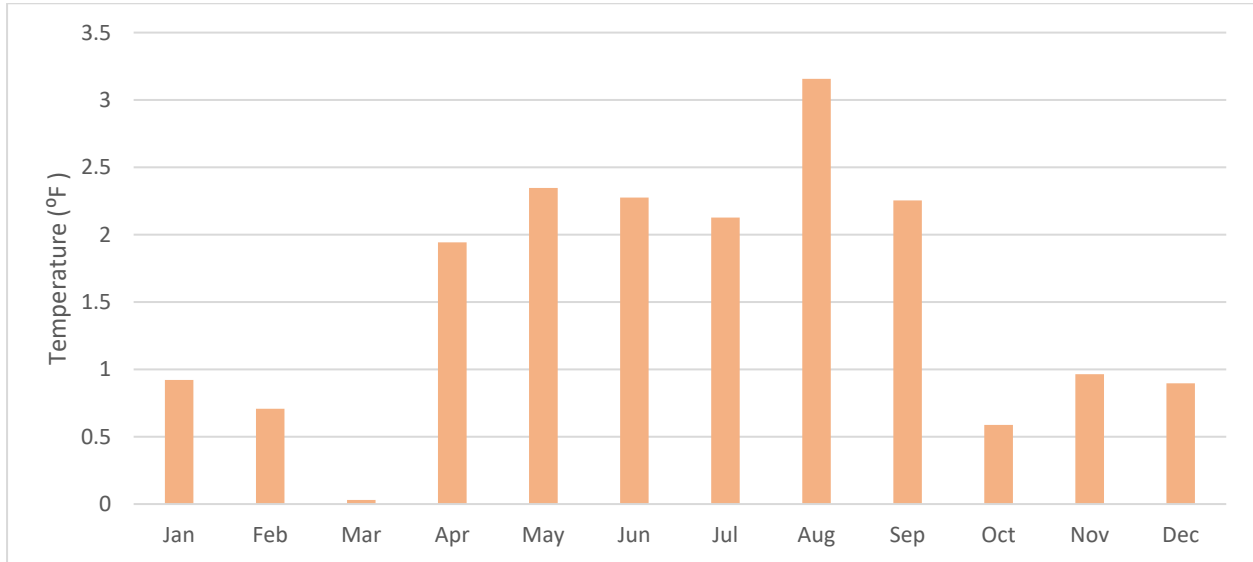
Figure 6.8.A-2. Cascadia Subduction Zone Map.



A plate tectonics diagram superimposed on a map of the Cascadia Subduction Zone region along the California coast. Source: Patton et al. (2023)



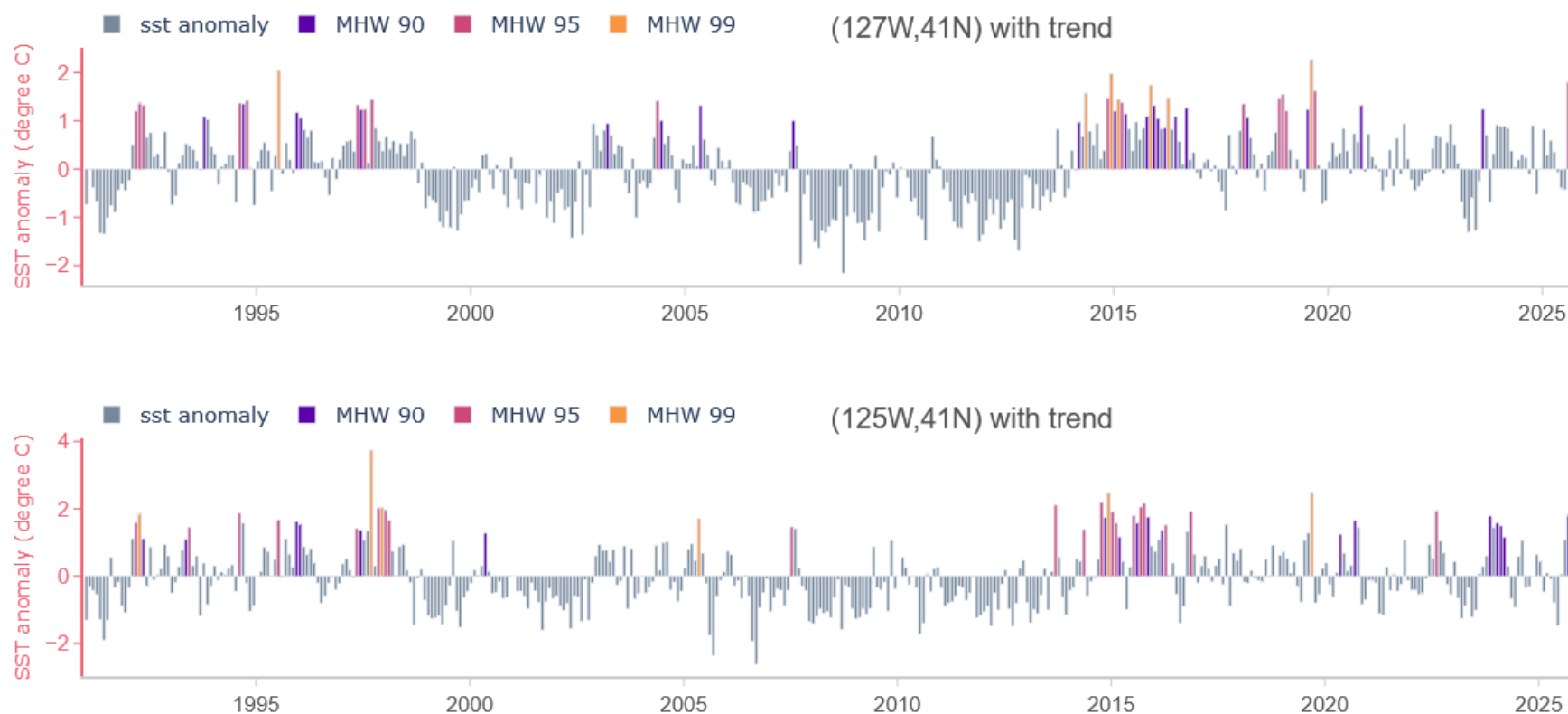
Figure 6.8.A-3. Increase in Monthly Average Sea Surface Temperature from 1975 to 2024 at Trinidad Beach.

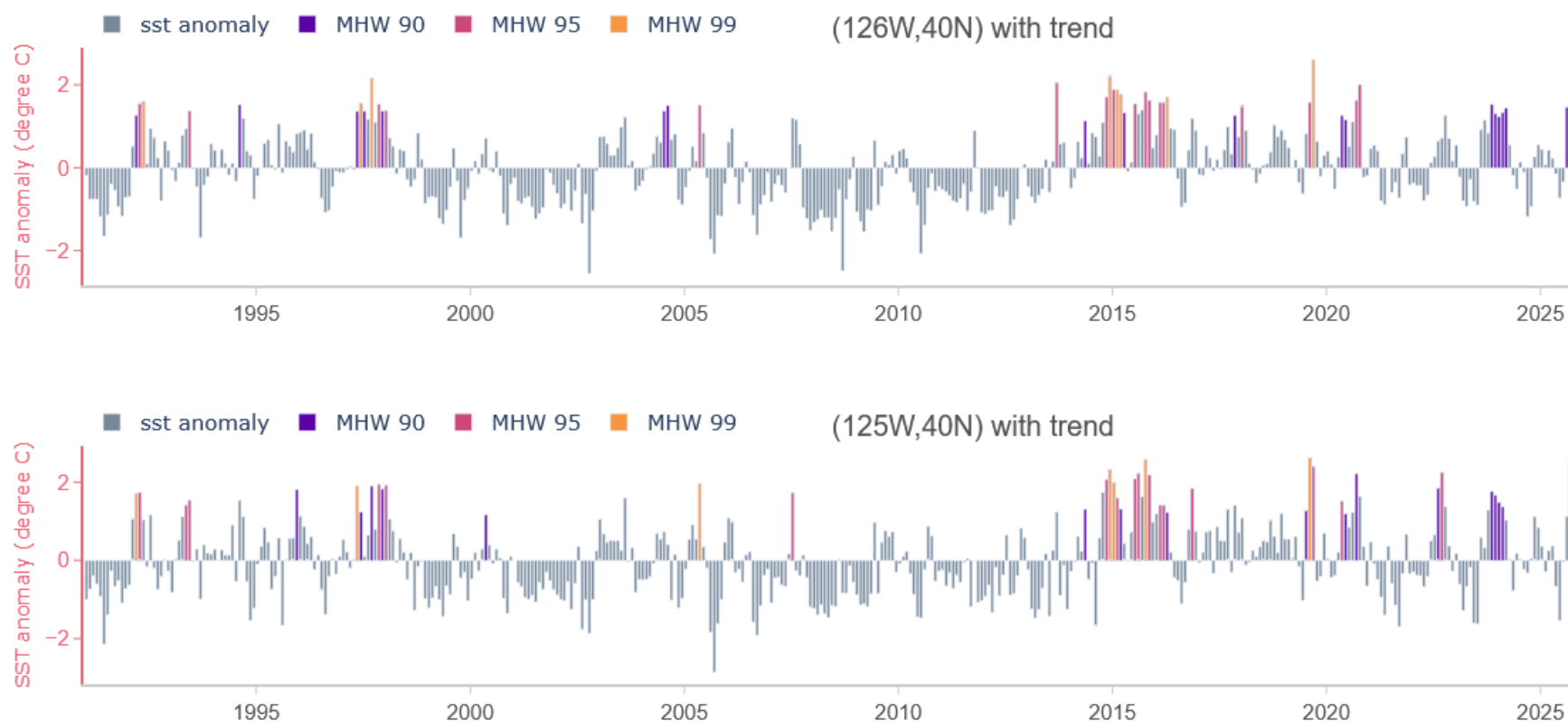


Average increases in sea surface temperature from 1975 to 2024 at Trinidad State Beach, approximately 10 miles (16.1 km) north of Wigi. The greatest increases have occurred in April through September, with a maximum of +3.16°F (+1.76°C) change in August. Source: Carter et al. (2022)



Figure 6.8.A-4. Sea Surface Temperature (SST) Anomaly and Marine Heatwaves (MHW) off the Coast of Wigi.

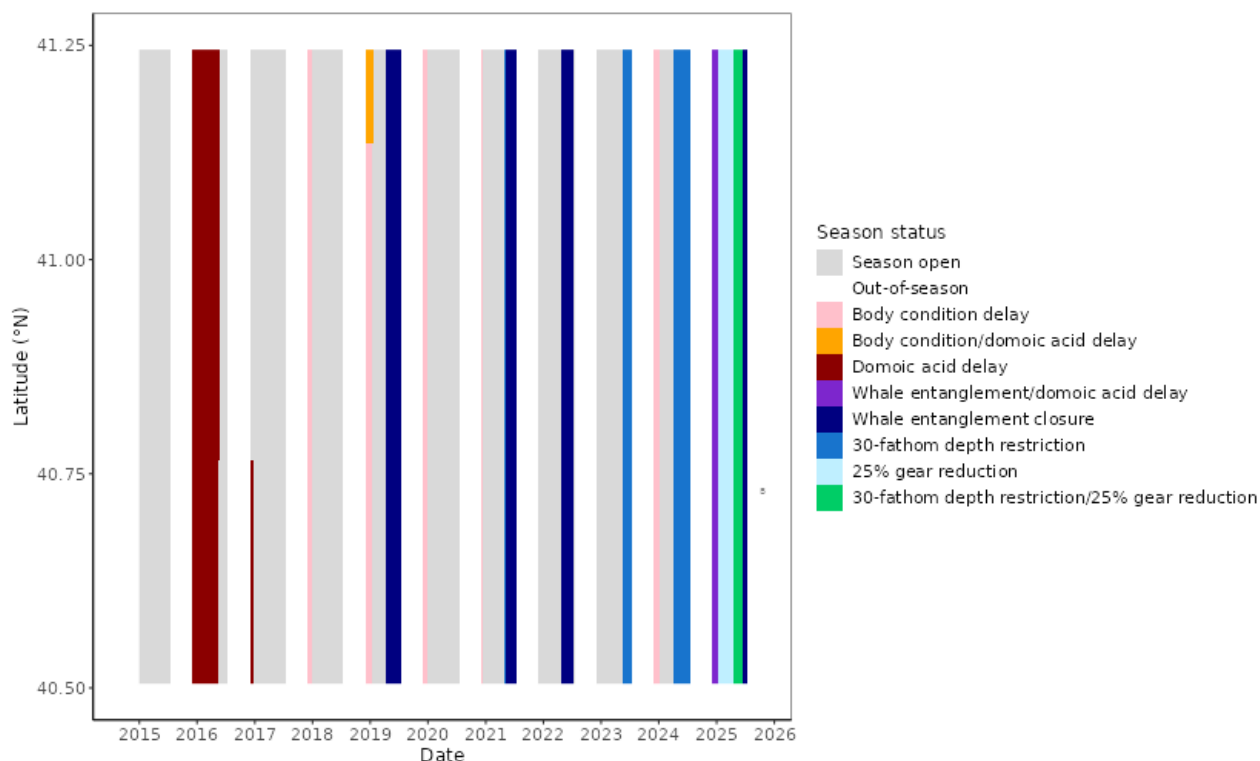




Temperature anomalies, or departures from normal average temperature, are graphed in degrees Celsius ($^{\circ}\text{C}$) for four locations in the Pacific Ocean nearest Wigi from NOAA's Optimum Interpolation Sea Surface Temperature (OISST Version 2) dataset. MHW 90 (purple bars) is defined as average temperatures for a 30-day period that exceed 90% of the normal range of temperatures for a location or region in the relevant season. MHW 95 (pink bars) and MHW 99 (orange bars) are 30-day periods which exceed 95% and 99%, respectively, of normal temperatures. The global trend of climate change-induced sea surface warming has not been removed from these time series. See NOAA's Physical Sciences Laboratory website in source for more information. Source: NOAA OI SST V2 High Resolution Dataset data provided by the NOAA PSL, Boulder, Colorado, USA, from their website at <https://psl.noaa.gov/data/gridded/data.noaa.oisst.v2.highres.html>



Figure 6.8.A-5. Commercial Dungeness Crab Fishery Management Actions.



Source: Free, Moore and Trainer (2022)

Season status

The figure above illustrates the following management actions during the season:

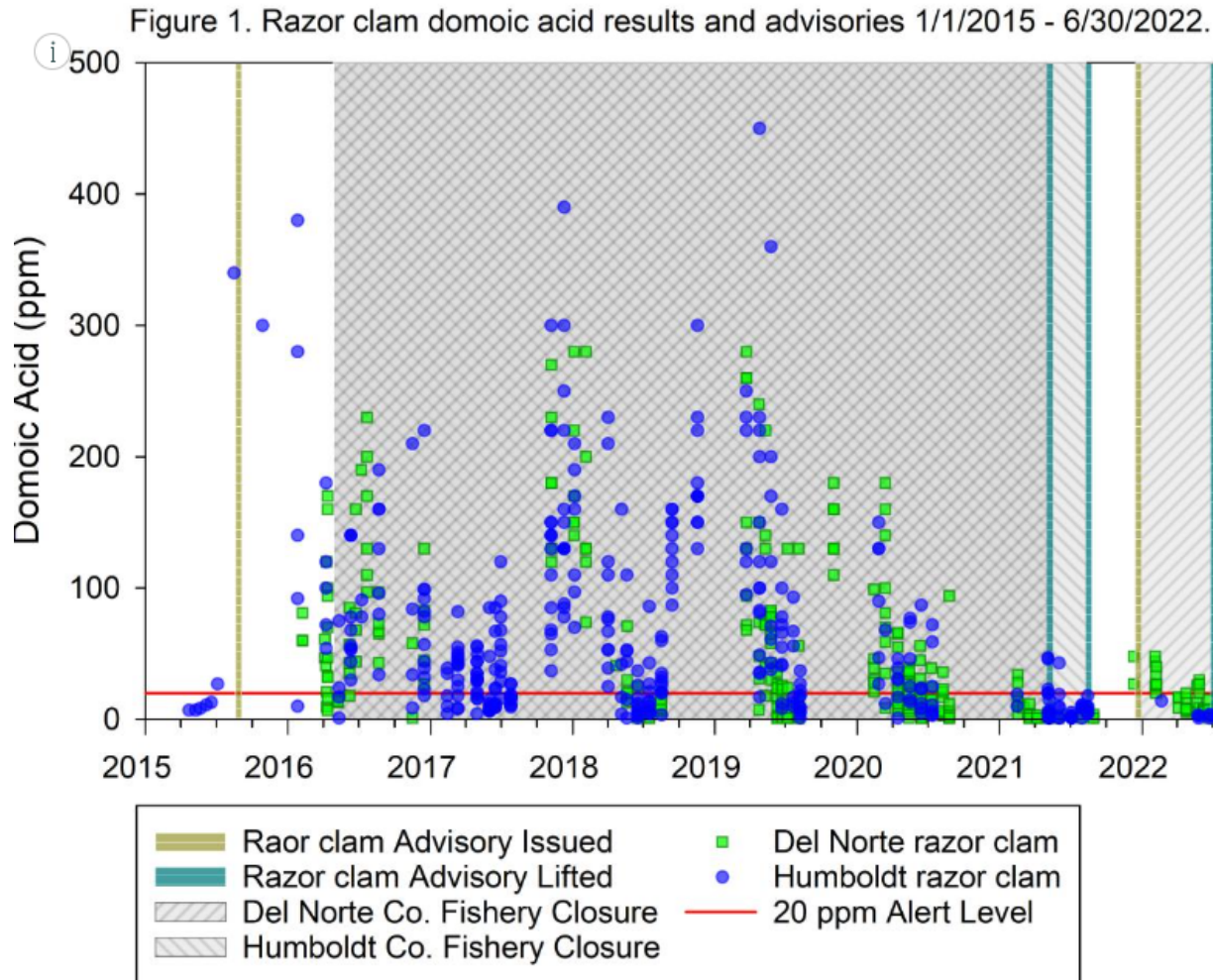
- **Season open:** The season is open without restrictions.
- **Out-of-season:** Outside the Dungeness crab season, which goes from Nov 15-Jun 30 in Central California, Dec 1-Jul 15 in Northern California, Dec 1-Aug 14 in Oregon, and Dec 1-Sep 15 in Washington.
- **Body condition delay:** The season is delayed because body condition (meat quality) does not meet market standards. These are also known as meat quality delays.
- **Body condition/domoic acid delay:** The season is delayed due to both poor body condition (meat quality) and high domoic acid toxicity.
- **Domoic acid delay:** The season is delayed or the area is closed due to high domoic acid toxicity.



- **Evisceration order:** The fishery is allowed to operate in this area with a requirement that the toxic viscera are removed.
- **Evisceration order (+depth/gear restrictions):** The fishery is allowed to operate in this area with a requirement that the toxic viscera are removed. In addition, some depth or gear restrictions are in place.
- **Whale entanglement closure:** The fishery is closed to avoid marine life entanglements (generally whales).
- **XX-fathom depth restriction:** The fishery can only operate in waters shallower than XX-fathoms to avoid marine life entanglements (generally whales).
- **XX% gear reduction:** Vessels can only use XX% of their traps to avoid marine life entanglements (generally whales).
- **XX-fathom depth restriction/XX% gear reduction:** The fishery can only operate in waters shallower than XX-fathoms and vessels can only use XX% of their traps to avoid marine life entanglements (generally whales).



Figure 6.8.A-6. Domoic Acid Concentration in Razor Clam Results and Recreational Fishery Advisories.



For an area with no current advisory, CDPH issues an advisory upon first detection of domoic acid in the clam meat that is greater than or equal to 20 parts per million (ppm), which is the alert level. The advisories for razor clams remain in place until two (2) sets of samples, collected seven (7) days apart, are below the alert level. Source: CDPH (2023)

