PENINSULA RESILIENCE PLANNING PROJECT

# PACIFICA
# VULNERABILITY ASSESSMENT SUMMARY

**Public Draft**

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# Introduction

There are nine jurisdictions in San Mateo County working collaboratively on the Peninsula Resilience Planning (PREP) project: San Mateo County; the Town of Atherton; and the cities of Belmont, Brisbane, Burlingame, East Palo Alto, Half Moon Bay, Pacifica, and San Bruno. The PREP project is a coordinated effort to identify the hazards facing Pacifica and other communities across San Mateo County, evaluate how these hazards may change with the changing climate, recognize the communities and features that are most vulnerable, and develop strategies for improving community safety and resilience.

As a participant in PREP, Pacifica is conducting a comprehensive update of its Safety Element. As part of the technical background work for the update to the San Mateo County Safety Element, the PREP team prepared an updated Climate Change Vulnerability Assessment to analyze how climate-related hazards may harm the community. California law requires that, as part of the need to assess and protect against hazards, that safety elements analyze climate vulnerability, which is the degree to which people, nature, the built environment, and other systems are susceptible to harm from climate change and associated hazards. This includes physical and mental injuries, property damage or destruction, environmental harm, economic damage, and other factors.

**What is a General Plan?**

A General Plan is each local government's blueprint for meeting the community's long-term vision for the future, with goals, policies, and actions for achieving the vision. All cities and counties in California are required to have General Plans. These General Plans must cover eight mandatory topics: Land Use, Circulation, Housing, Conservation, Open Space, Noise, Safety, and Environmental Justice (if applicable). General Plans typically organize one or more of these topics into dedicated chapters, known as Elements.

Source: Governor's Office of Planning and Research. 2017. *State of California General Plan Guidelines.*

The Vulnerability Assessment helps community members, City staff, and decision makers understand how climate change hazards may alter community conditions and what parts of the community (people and places) should be prioritized for adaptation and resilience. The Vulnerability Assessment identifies how City and community resources help to improve resiliency in Pacifica in an integrated, thorough, and tailored way. The findings from the Vulnerability Assessment process will support future updates to the Safety Element, working in combination with the San Mateo County Multijurisdictional Local Hazard Mitigation Plan (LHMP) to help safeguard Pacifica against both current and future hazard conditions, including the changes in hazard events from climate change. This assessment does not include hazards that are present in the community but are not affected by climate change, such as earthquakes.

# Community Profile

*Pacifica State Beach in southern Pacifica. Photo provided by San Mateo County staff.*

Pacifica is a community of approximately 38,000 people on the northern coast side of San Mateo County. The city sits on a series of plains, backing up into the canyons and slopes of the Santa Cruz Mountains. A series of ridgelines divide Pacifica into several neighborhoods, all linked by Highway 1, which runs the length of the community near the ocean. Several beaches throughout Pacifica are regional recreational destinations, while rocky cliffs line the coast in other parts of the community. While neighborhoods in northern Pacifica transition smoothly to neighborhoods in Daly City and San Bruno, the rest of the community is more isolated from the developed areas of San Mateo County.

Pacifica's downtown is a mix of small commercial shops and offices, bungalows, small apartments, and mixed-use buildings between Highway 1 and the ocean, anchored by the Pacifica Pier. Outside of downtown, Pacifica's developed areas are mostly residential neighborhoods of varying densities, with some commercial centers, public facilities such as schools, and hotels. Most of the rest of the community is open space hills and ridges, including the Milagra Ridge, Sweeney Ridge, and Mori Point sites that are managed by the National Park Service as part of the Golden Gate National Recreation Areas.

Retail, professional services, and hospitality are among the major industries in Pacifica. Recreation is also a large and growing part of Pacifica's economy, supporting retail and hospitality jobs. Pacifica is home to events such as the Pacific Coast Fog Festival and the World Dog Surfing Championships, which both attract thousands of visitors from across the region and beyond.

Pacifica's demographics are similar to that of San Mateo County in many ways, although there are a few key differences, as illustrated in **Table 1**. Pacifica has a higher proportion of older adults than San Mateo County and a significantly lower rate of linguistically isolated persons (adults who are not proficient in English). Compared to the county average, Pacifica has more people working outdoors, which reflects the recreation industries in the community and may also include people working in the agricultural operations farther south along the coast.

While Pacifica has a slightly lower median income than the county-wide average, it does have a significantly higher homeownership rate than the overall county, along with more households that have access to vehicles. Pacifica also has a lower rate of cost-burdened households (those that pay at least 30 percent of their income on housing costs) than the county average, although about a third of Pacifica households still fall into this category. Pacifica's poverty rate is slightly lower than the county average as well. Notably, the most recent San Mateo County Homeless

Count and Survey identified 180 unhoused persons in Pacifica, which is approximately 16 percent of all unhoused persons counted in San Mateo County, despite being home to only about 5 percent of the county's total population.

### Table 1: Demographics in Pacifica and San Mateo County

| Demographic | Pacifica | | San Mateo County | |
|---|---|---|---|---|
| | Number | Percentage | Number | Percentage |
| **Population** | **38,048** | - | **754,250** | - |
| Children (under 18 years old) | 7,338 | 19.30% | 150,187 | 19.90% |
| Linguistically isolated persons | 3,025 | 8.40% | 116,306 | 16.30% |
| Older adults (65 years and older) | 7,262 | 19.10% | 127,520 | 16.90% |
| Persons with disabilities | 3,099 | 8.20% | 65,466 | 8.70% |
| Persons working outdoors | 2,504 | 6.58% | 41,748 | 5.44% |
| Persons in poverty | 2,097 | 5.60% | 48,137 | 6.40% |
| Unhoused persons | 180 | - | 1,145 | - |
| **Number of households** | **13,938** | - | **264,323** | - |
| Median household income | $151,849 | - | $175,000 | - |
| Cost-burdened households | 4,464 | 32.60% | 94,625 | 36.55% |
| Households without a vehicle | 340 | 2.40% | 14,752 | 5.58% |
| Overcrowded households | 437 | 3.14% | 19,366 | 7.33% |
| Households in mobile homes | 143 | 1.00% | 3,111 | 1.10% |
| Rental households | 4,396 | 31.54% | 106,955 | 40.46% |

Source: American Community Survey, 2022, ACS 5-Year Estimates.

*The coastline south of Pacifica. Photo provided by San Mateo County staff.*

# Climate Hazards

Climate change is the long-term shift in average weather patterns, including significant alterations in temperature, precipitation, and wind patterns over an extended period—typically decades or longer. Rising global temperatures cause more frequent and intense heatwaves, storms, floods, droughts, wildfires, and other hazards. These events are frequently concurrent, resulting in cascading impacts that become progressively more difficult to manage, such as droughts amplifying wildfire risk or extreme heat exacerbating water scarcity. This section outlines the major hazards from climate change in Pacifica and how these hazards are expected to change in the coming years and decades. These hazards are air quality and smoke, coastal erosion, drought, extreme heat and warm nights, flooding, human health hazards, landslides, sea level rise and emergent groundwater, severe weather, and wildfire.

**Cascading and Compounding Effects**

**Cascading Effects:** When an extreme event causes a series of secondary events that are larger than the initial impact.

**Compounding Effects:** When multiple hazards or drivers occur simultaneously, amplifying their collective impact.

Source: IPCC. 2019. *Extremes, Abrupt Changes and Managing Risk*.

## Air Quality and Smoke

Air quality directly affects the health, well-being, and everyday quality of life for residents in Pacifica and deters visitors from traveling to the area. Poor air quality poses significant health risks, such as respiratory and cardiovascular illness, and these concerns have become especially urgent due to the increasing frequency of wildfires in the region and other climate-related factors.[1] Mobile sources, such as cars and trucks, dust from construction sites, smoke from wildfires, and other sources generate air pollutants. Climate change directly impacts and exacerbates air quality through increased temperatures, severe weather, wildfires, changes in precipitation patterns, and other mechanisms. Warmer temperatures lengthen the growing seasons of plants and trees, increasing allergen production. Poor air quality leads to more health issues, strains healthcare systems, and restricts outdoor activities.

Exposure to air pollutants, such as ozone and particulate matter, can lead to respiratory conditions, exacerbate asthma, and increase the risks of heart attacks, strokes, and certain types of cancer. According to the Bay Air Quality Management District's (BAAQMD's) *2017 Clean Air Plan*, the financial burden of poor air quality in the Bay Area region is estimated at $32 billion annually, which includes costs associated with premature deaths, healthcare expenses, reduced productivity, and other related issues.[2] BAAQMD plays a key role in monitoring and improving air quality throughout the region, resulting in notable progress even as population, traffic, and industrial activities have grown.[3]

**Bay Area Air Quality Management District Programs**

BAAQMD has several programs to reduce air pollution from multiple sources.

The **Spare the Air Program** issues alerts on days when air quality is expected to be poor due to high levels of ozone or particulate matter. On Spare the Air days, residents are encouraged to limit activities that contribute to air pollution, such as driving, using gas-powered equipment, or wood burning.

Employers with 50 or more full-time employees in the Bay Area are required to provide **Commuter Benefits Programs** to encourage the use of alternative modes of transportation, such as public transit, vanpool, or biking to reduce emissions from commuting.

In Pacifica, the greatest air quality threat is smoke from wildfires in the region. Wildfire smoke contains a complex mix of gases and fine particulate matter, especially fine particulate matter ($PM_{2.5}$), which consists of tiny particles that can penetrate deeply into lung tissue and impact cardiovascular health.[4] According to the U.S. Environmental Protection Agency, the health risks associated with wildfire smoke are particularly severe for vulnerable populations, including children, older adults, individuals with pre-existing respiratory or cardiovascular conditions, and low-resourced residents, who may experience more severe acute and chronic health effects.[5] The frequency of wildfires has been rising, driven by hotter and drier conditions associated with climate change and resulting in more frequent exposure to hazardous air quality conditions for many residents and visitors.

## Coastal Erosion

Coastal erosion is the process by which local sea level rise, strong wave action, and coastal flooding wear down or carry away rocks, soils, and sands along the coast. This includes erosion of beaches, dunes, bluffs, and cliffs. The dune areas consist of open space and parks in the form of low-lying beaches, such as Pacifica State Beach, California Coastal Trail, and Sharp Beach Park, while bluff areas contain homes, roadways, parks, and commercial buildings that could be damaged or destroyed by coastal erosion. Bluff erosion is particularly dangerous because bluffs collapse rapidly and with little warning, harming people and community assets both above and below the bluffs.

Climate change is expected to increase sea level rise and therefore increase the rate of coastal erosion along the Pacific coastline of Pacifica. The

"Erosion presents a different type of hazard than flooding. For example, unlike flooding, erosion in the County is not experienced incrementally in the way that floodwaters can slowly rise onto a landscape, nor does erosion "recede" like floodwaters do after an event. In the case of erosion, some sections of coastline may be unaffected by waves for a long period of time, and then a single event or storm could dramatically erode a large portion of the coastline or beach".

- County of San Mateo's *Sea Level Rise Vulnerability Assessment and Adaptation Report*

exact rate of dune and bluff erosion is uncertain and according to the County of San Mateo *Sea Level Rise Vulnerability Assessment and Adaptation Report*, coastal erosion may occur in short periods as catastrophic bluff collapse, followed by periods with very little erosion. Coastal erosion can destroy dune habitat that protects Highway 1, Beach Boulevard, and key recreation and tourism areas, as well as undermine the foundations of structures along the bluffs leading to damage or destruction of key facilities.

## Drought

A drought is where conditions are drier than normal for an extended period, making less water available for people and ecosystems. Drought is part of a normal climate cycle in California, but prolonged drought conditions can harm ecosystems and the regional economy. Though droughts do not typically cause direct loss of life or structural damage, they can lead to critical environmental and economic harm, including higher water costs, habitat degradation, and wildfire risks. Water demands, such as population growth and irrigation, exacerbate these impacts, complicating water allocation and potentially leading to restrictions and water quality issues.

Water supplies for the city come from North Coast County Water District (NCCWD). Nearly all NCCWD's water supply is purchased from the San Francisco Public Utilities Commission (SFPUC) as treated water from San Andreas Lake and the Harry Tracey Water Treatment Plant in Millbrae and delivered from the Hetch Hetchy Regional Water System. A small portion of NCCWD's water supply comes from surface water from the South Fork of San Pedro Creek for six months of the year. According to the Pacifica General Plan 2040, NCCWD's system includes 11 storage tanks totaling 18.3 million gallons of storage capacity, enough to supply the service area with water for almost six days.

Scientists predict climate change will result in more frequent and severe droughts across the state. Overall, precipitation levels are expected to increase slightly in Pacifica;[6] however, climate change will result in more years with extreme levels of precipitation, both high and low, affecting the water levels in San Pedro Creek and Laguna Salada. Reduced winter precipitation levels and warmer temperatures have greatly decreased the size of the Sierra Nevada snowpack (the volume of accumulated snow), which in turn makes less fresh water available for communities throughout California, including those that receive water from the Hetch Hetchy Regional Water System.[7] More intense droughts are expected to compact and harden soils. When

**Water Delivery via San Francisco Public Utilities Commission**

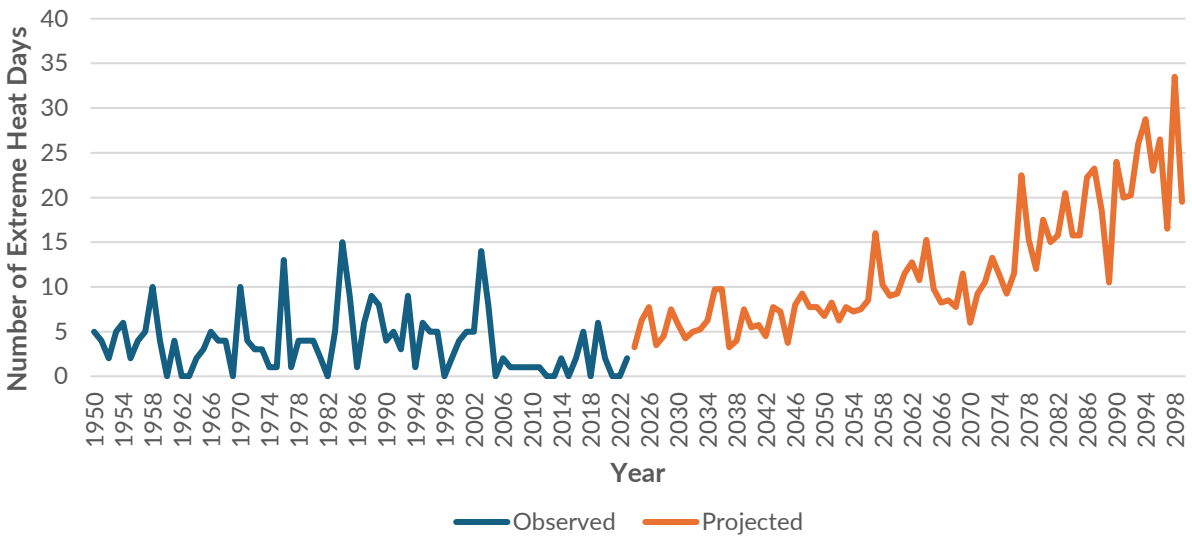
Many of the cities in San Mateo County, including Pacifica, rely on the Hetch Hetchy Regional Water System for water supplies. Approximately 85 percent of the water comes from Sierra Nevada snowmelt stored in the Hetch Hetchy reservoir on the Tuolumne River in Yosemite National Park. Hetch Hetchy water travels 160 miles via gravity from Yosemite to the San Francisco Bay Area. The remaining 15 percent of water comes from runoff in the Alameda County and Peninsula watersheds. The regional system consists of over 280 miles of pipelines, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants.

rains return, more water will run off rather than infiltrate into the soil, causing downstream flooding. Higher temperatures will further increase evaporation in reservoirs such as San Andreas Lake, worsening drought conditions.

## Extreme Heat and Warm Nights

Pacifica community members and the local natural resources are accustomed to lower temperatures due to the influence of the Pacific Ocean and fog. However, extreme heat is an increasing issue for Pacifica as the climate changes, threatening public health and the environment. According to Cal-Adapt, an extreme heat day occurs when temperatures exceed 98 percent of historical highs, and these events are becoming more frequent and intense due to climate change. Extended periods of extreme heat, known as heat waves, threaten community safety and drive up energy costs. An extreme heat day in Pacifica is one where the maximum temperature soars above 84.2 degrees Fahrenheit. As shown in **Figure 1,*** climate change is expected to increase extreme heat days in the city from a historic annual average (as measured between 1961 and 1990) of 3 days per year to an average of 8 days per year by midcentury (2035 to 2064) and an average of 18 days per year by late century (2070 to 2099).[8, *]

**Figure 1. Observed and Projected Extreme Heat Days in Pacifica**

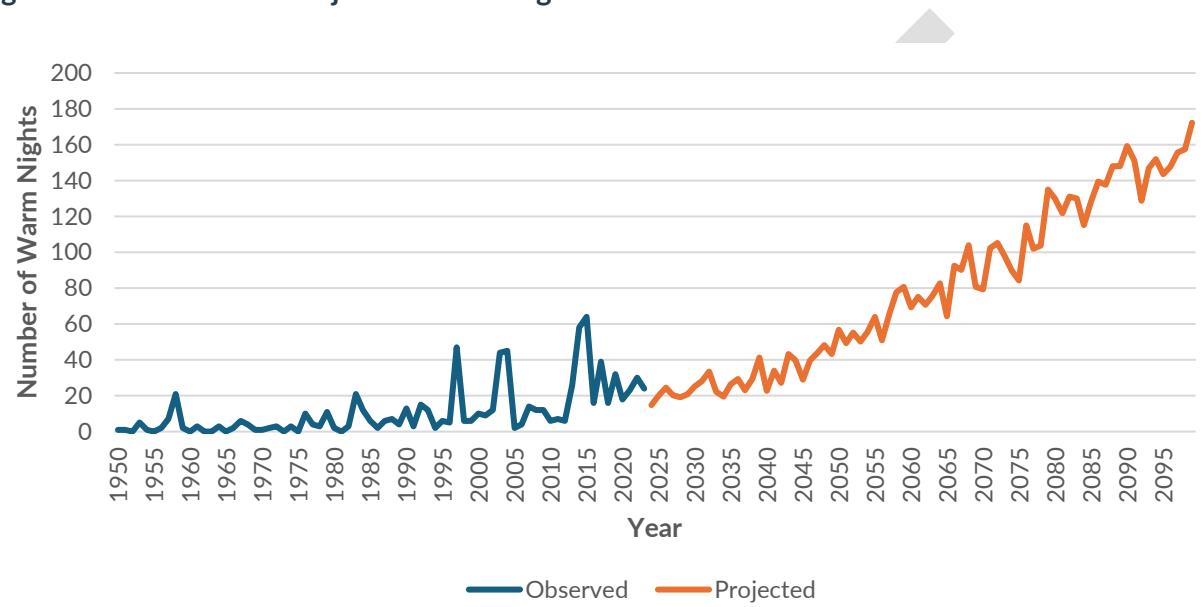



* The Cal-Adapt database at time of writing uses Representative Concentration Pathways (RCPs) to project future conditions. The projections listed in this report use RCP 8.5, which assumes global emissions continue to increase at least until the end of century, which is consistent with the International Panel on Climate Change Sixth Assessment Report.

* Figures 1 and 2 use observed data from the Cal-Adapt database, which provides data from 1950 to 2005, the nearest National Weather Service weather stations, which provides data from 2006 to 2023, and projected data from the Cal-Adapt database, which provides data from 2024 to 2099. Due to the different database sources, the observed and projected data may not match.

When the daily minimum temperatures remain significantly above normal, warm nights can worsen an extreme heat day because overnight temperatures don't get low enough to provide the community with any relief from high temperatures. A warm night is when temperatures remain above 57 degrees Fahrenheit in Pacifica. As shown in **Figure 2**, warm nights are projected to increase from a historic (as measured between 1961 and 1990) 9 nights per year to 50 nights per year by midcentury and 129 nights per year by late century.[9]

**Figure 2. Observed and Projected Warm Nights in Pacifica**




According to the U.S. Center for Disease Control and the U.S. Department of Human and Health Services, extreme heat is one of the deadliest climate-related hazards nationwide; the Center for Disease Control and Prevention noted a rise in heat-related deaths—from 297 in 2004 to over 2,300 in 2023.[10, 11] These numbers are likely a significant undercount, as they do not include deaths caused by other factors that are exacerbated by extreme heat. The rising frequency and intensity of extreme heat and warm nights pose significant public health concerns, especially in communities like Pacifica that are used to more mild temperatures. Even slight increases in temperature can overwhelm the ability of community members to cope with extreme heat and warm nights, straining an already limited public health system and infrastructure. This leads to higher risks of dehydration, heat-related illnesses, and respiratory issues, disrupting daily life and economic activity.[12] Extreme heat also stresses infrastructure, as more residents install air conditioning units and electricity demand increases, it can overload the power grid and cause outages. Rising temperatures also harm local ecosystems by increasing water temperatures in local creeks and streams, harming fish and plant species.

## Flooding

Flooding occurs when water surpasses the capacity of local water bodies to contain it, creeks to carry it, or soil to absorb it, which is a significant concern for Pacifica due to the proximity to the Pacific Ocean, San Pedro Creek, Calera Creek, and Laguna Salada. Floods are among the costliest natural disasters in terms of human hardship and economic loss nationwide, significantly threatening the health and life of community members and causing substantial damage to structures, landscapes, and utilities serving the city. Flooding can lead to long-term public health problems if mold and mildew grow in buildings, displace communities if homes are destroyed or become uninhabitable, and increase economic burdens such as rising home insurance costs.

Floods are a chronic issue in Pacifica and climate change is expected to make flood events worse due to fewer yet more intense rainfall events, in the form of atmospheric rivers. For example, what is currently a 200-year storm, or one that has a 1 in 200 chance of occurring each year, by 2100 could increase in frequency by 40 to 50 years (to a 1 in 150/160 chance each year).[13] This means that the 100-year and 500-year floodplains may expand, and the current floodplains may become 40- to 50-year floodplains. Climate change is also likely to increase the frequency and severity of droughts that cause soil to dry out and become hard. When rainfall does return, more water runs off the surface than is absorbed into the ground, which can increase flooding downstream.

**Atmospheric Rivers**

An atmospheric river is a long, narrow band of moisture in the atmosphere moving from the tropics that can cause heavy rain or snow when it moves over land. These storms are responsible for over half of California's water supply, but also the majority of the flooding and mudslide events across the state.

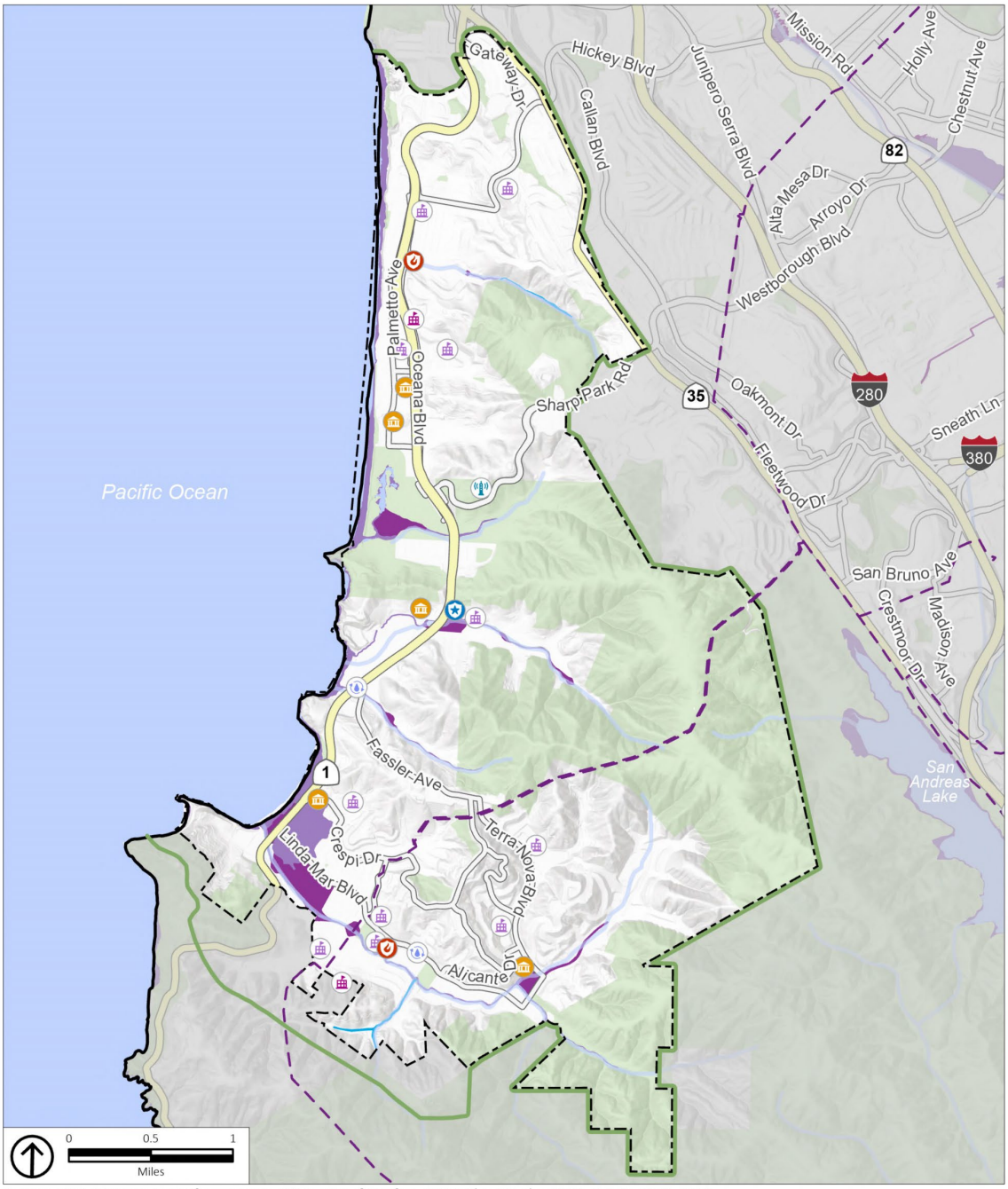
Sources: Emily Mendez. 2024. *A Climate Expert Explains Why Atmospheric Rivers Are Causing Historic Rainfall in California*. Lamont-Doherty Earth Observatory: Columbia Climate School.

**Floodplains and Flood Recurrence**

According to the Federal Emergency Management Agency (FEMA), a floodplain is any area of land that could be flooded by water from any source, but are often next to creeks, lakes, oceans, and ponds. The 100-year floodplain is the area that has a 1 percent (1 in 100) chance of being flooded in any given year. This would also be the area that would flood during a 100-year storm. The 500-year floodplain is the area that has a 0.2 percent (1 in 500) chance of being flooded in any given year due to a 500-year storm.

As shown in **Figure 3** and on the online PREP Map Viewer, flood-prone areas in Pacifica include low-lying areas along the creeks and beaches, especially where creeks flow out into the Pacific Ocean, such as Pacifica State Beach and along Linda Mar Boulevard. Climate change will likely cause these flood zones to expand as sea levels rise, heavy rainfall increases in frequency, and the tide regularly moves farther inland. Many of these areas are residential neighborhoods, commercial centers, or visitor-serving areas, such as Pacifica State Beach Parking Lot and Linda Mar Shopping Center, that could be damaged or destroyed by major flooding.

**Figure 3. Flood Hazard Zones in Pacifica**




Source: ESRI, 2023; County of san Mateo, 2023; City of Pacifica, 2023; PlaceWorks, 2023; FEMA; DWR, 2021

- City of Pacifica
- Planning Area
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- Private Schools (K-12)
- Transmission Lines

Designated Flood Hazard Zones

- 100 Year Flood Plain (DWR)
- 100 Year Flood Zone (FEMA)
- 500 Year Flood Zone (FEMA)

## Human Health Hazards

Human health hazards, including bacteria, viruses, parasites, and other pathogens, pose significant concerns in Pacifica. These conditions can result in fatalities and exacerbate pre-existing conditions like asthma and allergies. Common vectors, such as rats, mice, ticks, and mosquitos, often spread the pathogens. Rising temperatures and changing precipitation patterns due to climate change promote the proliferation of disease-carrying vectors. Warmer, wetter conditions allow for increased populations of mosquitoes and ticks, extending their geographic range and spreading diseases like West Nile virus, dengue fever, and Lyme disease, according to the California Office of Health Hazard Assessment.[14] As temperatures rise and extreme weather events, such as heavy rainfall, become more frequent, these vectors can spread more broadly, transmitting diseases that threaten public health.[15]

As mentioned earlier, extreme heat, another increasing hazard due to climate change, can directly impact human health by causing heat-related illnesses and deaths, while also worsening respiratory conditions due to increased air pollution. The combination of these factors suggests that human health hazards will become more widespread and severe as climate change progresses, making proactive public health measures even more critical, especially in areas that have limited healthcare services. The implications of these health hazards extend beyond individual well-being, placing strain on healthcare systems, increasing economic burdens, and affecting mental health.

## Landslides and Debris Flows

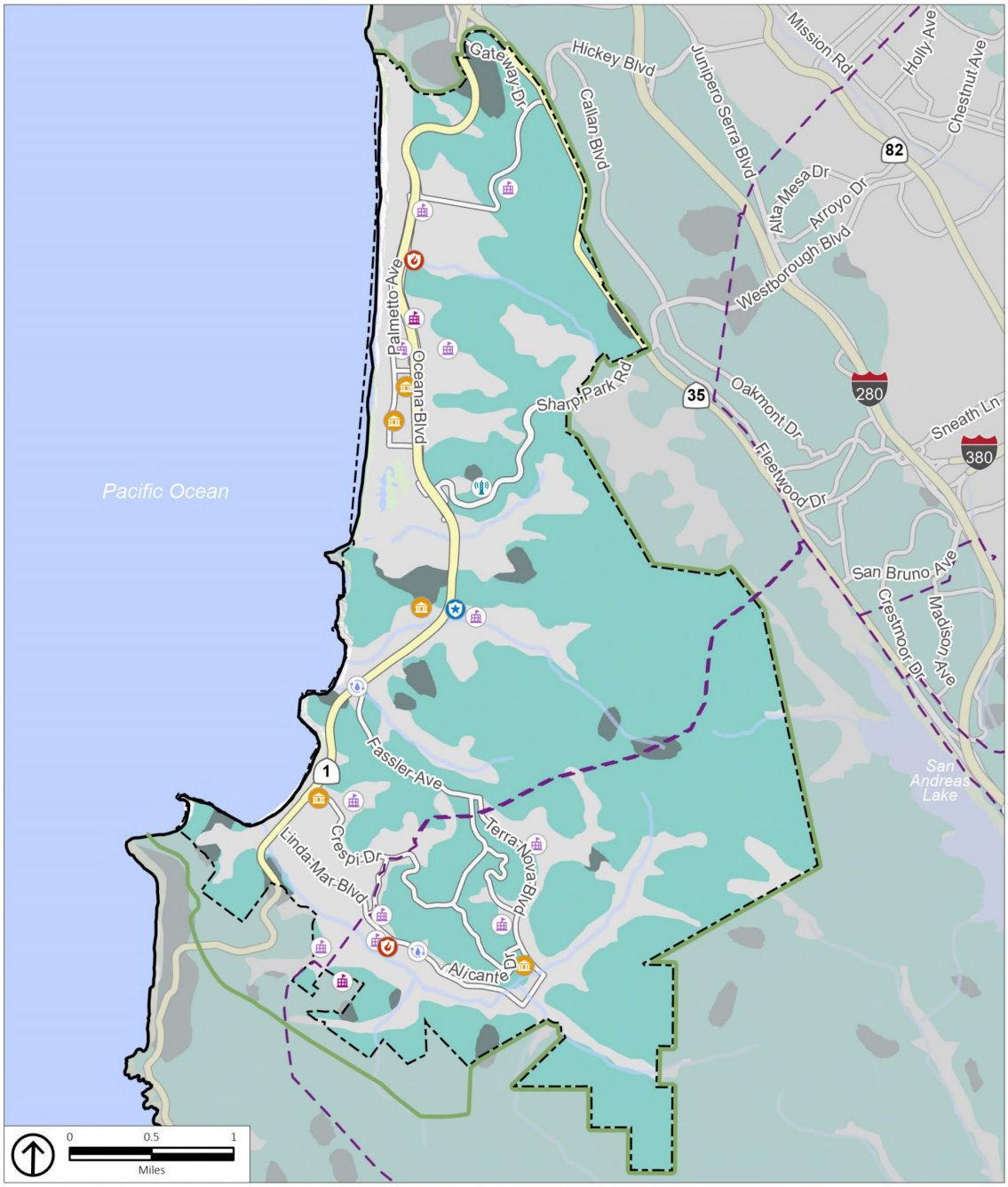
A landslide, the movement of rock, soil, or debris down a slope, is often triggered by natural events such as heavy rainfall, floods, or wildfires. They can also occur as a result of earthquakes. In Pacifica, landslides commonly occur during or after intense rainfall in the eastern and southern open space areas of the city. These events threaten infrastructure, disrupt transportation networks, and contribute to downslope erosion. Landslides can travel significant distances, accumulating debris and amplifying their destructive impact as they move downslope.

As shown in **Figure 4** and on the online PREP Map Viewer, the areas most susceptible to landslides in Pacifica include open space and nearby residential areas throughout the city, most notably the residential neighborhood along Gateway Drive in northern Pacifica as well as Sweeny Ridge, Frontierland Park, and San Pedro Valley Park. The LHMP identifies landslides as the hazard of greatest concern for Pacifica, due to the likelihood of occurrence and risk of damage to critical facilities and infrastructure. Most landslides occur in these areas where the risk is highest. However, landslides can occur outside these high-risk areas, including areas where few landslides occur and areas with only a moderate level of risk. These moderately susceptible regions experience fewer landslides but remain at some risk of future events. In contrast, areas with surficial deposits—where landslides are least likely—present the lowest risk and are the least susceptible to landslide events. Despite these varying levels of risk, the overall annual probability of landslides in Pacifica remains high due to these recurring conditions that contribute to slope instability.

Climate change is expected to exacerbate landslide hazards by increasing frequency of wildfires and severe storms that can likely elevate the risk of landslides, particularly fast-moving debris flows. Wildfires remove stabilizing vegetation and alter soil properties, making slopes more vulnerable to erosion during and after storms. Landslides can displace residents, block Highway 1, and damage critical infrastructure such as electricity, water, and sewer pipelines, disrupting daily life and requiring costly repairs.

*Cliffs on the coastline of Pacifica. Photo provided by San Mateo County staff.*

**Figure 4. Landslide Hazard Areas in Pacifica**




Source: ESRI, 2023; County of san Mateo, 2023; City of Pacifica, 2023; PlaceWorks, 2023; USGS

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Landslide Susceptibility

- Most landslides
- Few landslides
- Surficial deposits

## Sea Level Rise and Emergent Groundwater

As global temperatures rise, glaciers and other polar ice melt, causing sea levels to rise. High average temperatures can also cause ocean water to expand, causing further rising of sea levels. According to the 2024 California Ocean Protection Council's *State of California Sea Level Rise Guidance*, sea levels in Pacifica are projected to increase by as much as 0.4 feet (5 inches) by 2030, 1.3 feet (16 inches) by 2050, and 6.5 feet (78 inches) by 2100. However, sea levels could also rise faster than these projections, with storm surge and King Tide events adding an additional 24 to 36 inches of temporary flooding that would move farther inland.[16]

As shown in **Figure 5** and on the online PREP Map Viewer, sea level rise will cause temporary and/or permanent inundation risks along the entire coast of Pacifica and move into creek systems, such as San Pedro Creek and Calera Creek. **Figure 5** illustrates the spatial data available through the Coastal Storm Modeling System, that is closest to the projections listed above, which ultimately shows a conservative estimate of sea level rise. While the dunes and bluffs along the coast protect many areas of the city from temporary or permanent inundation, facilities such as the Sharp Park Library and Pacifica Community Center could still be damaged by storm surge and wave action moving farther inland due to sea level rise. Sea level rise will also increase the rate of coastal erosion for both bluffs and dunes, threatening homes, parks, recreation areas, and visitor-serving businesses.

**OneWatershed: Building Regional Climate Resilience**

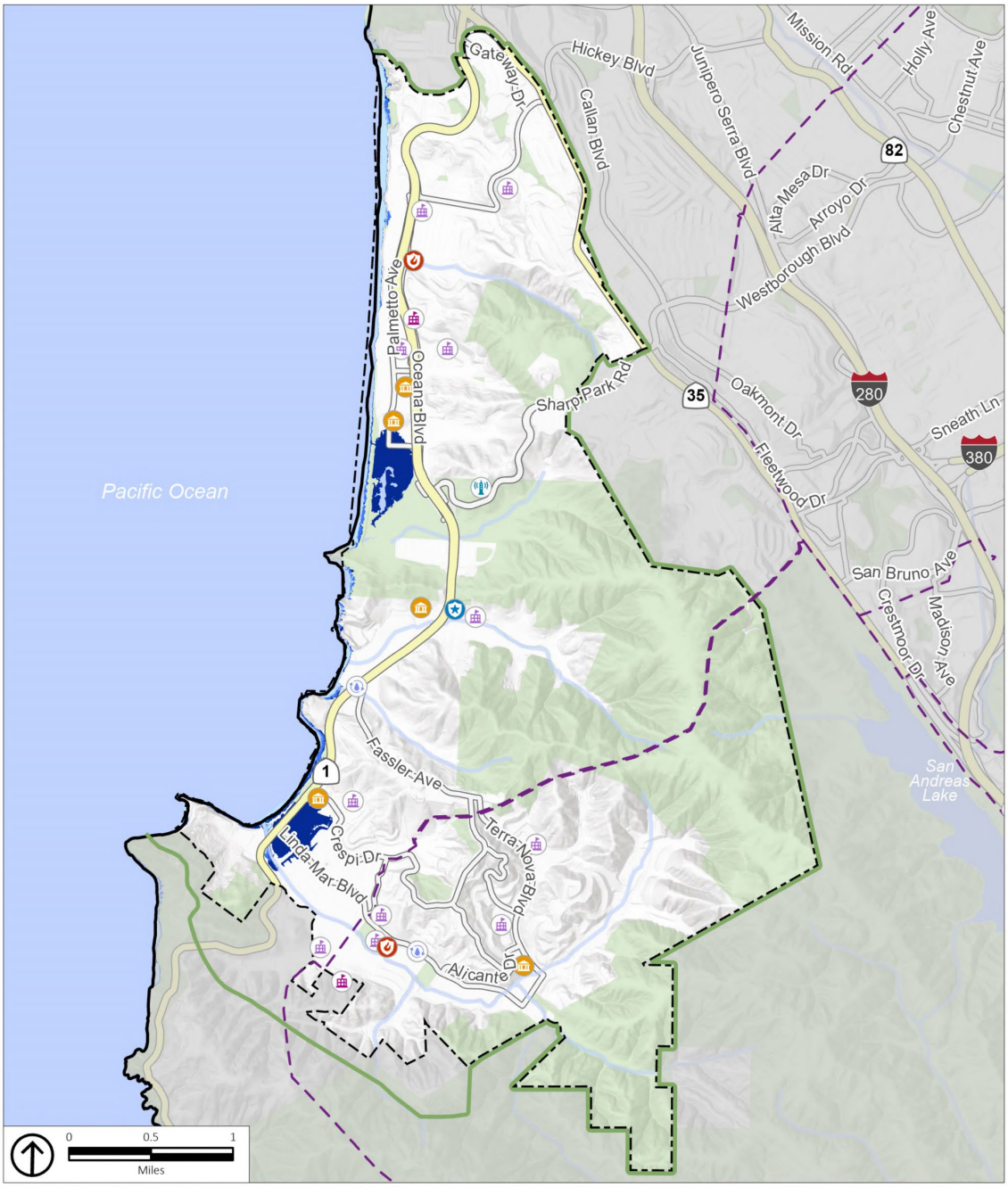
OneWatershed is a comprehensive framework that addresses the shared risks of climate change to water infrastructure and resources across San Mateo County, including stormwater, wastewater, and drinking water systems. This innovative approach emphasizes building adaptive capacity for climate impacts, with a particular focus on the county's most vulnerable communities. OneWatershed builds on years of climate resilience planning, harnessing resources and partnerships under a unified program to advance shared goals around overlapping climate risks. By taking a watershed-based perspective, OneWatershed enables coordinated planning and implementation of climate adaptation strategies that benefit both infrastructure systems and the communities they serve. The framework represents phase one of a multi-year strategy to build systematic and transformational change in how San Mateo County approaches integrated watershed management and climate resilience.

Emergent groundwater is a consequence of sea level rise. It occurs when freshwater is pushed upward by denser saline water that travels farther inland, causing temporary or permanent inundation.[17] Higher groundwater levels, even if it does not emerge to the surface, can infiltrate storm drains, destabilize pipes, spread soil or groundwater contamination, undermine building foundations, corrode infrastructure not designed for saline groundwater, and increase liquefaction hazards.[18] Groundwater is expected to rise at the same rate as sea level rise, causing groundwater to emerge at the surface in low-lying areas.[19]

As shown in **Figure 6** and on the online PREP Map Viewer, emergent groundwater will impact the low-lying beach and lagoon areas of the city, such as Pacifica State Beach, Laguna Salada, Rockaway Beach, and Sharp Park Beach. Emergent groundwater will also likely move inland along San Pedro Creek, Calera Creek, and Laguna Salada, threatening the foundations of community centers, libraries, and schools along the creeks.

Though the exact level of future sea level rise is uncertain, it is expected to increase the frequency, duration, and magnitude of flood events and push groundwater to emergent levels farther inland. Sea level rise and emergent groundwater will interact directly with stormwater from inland sources, causing more severe flooding near creeks and at the outlets of drainage systems.

**Figure 5. Projected Sea Level Rise in Pacifica**




Source: ESRI, 2023; County of san Mateo, 2023; City of Pacifica, 2023; PlaceWorks, 2023; USGS CoSMoS

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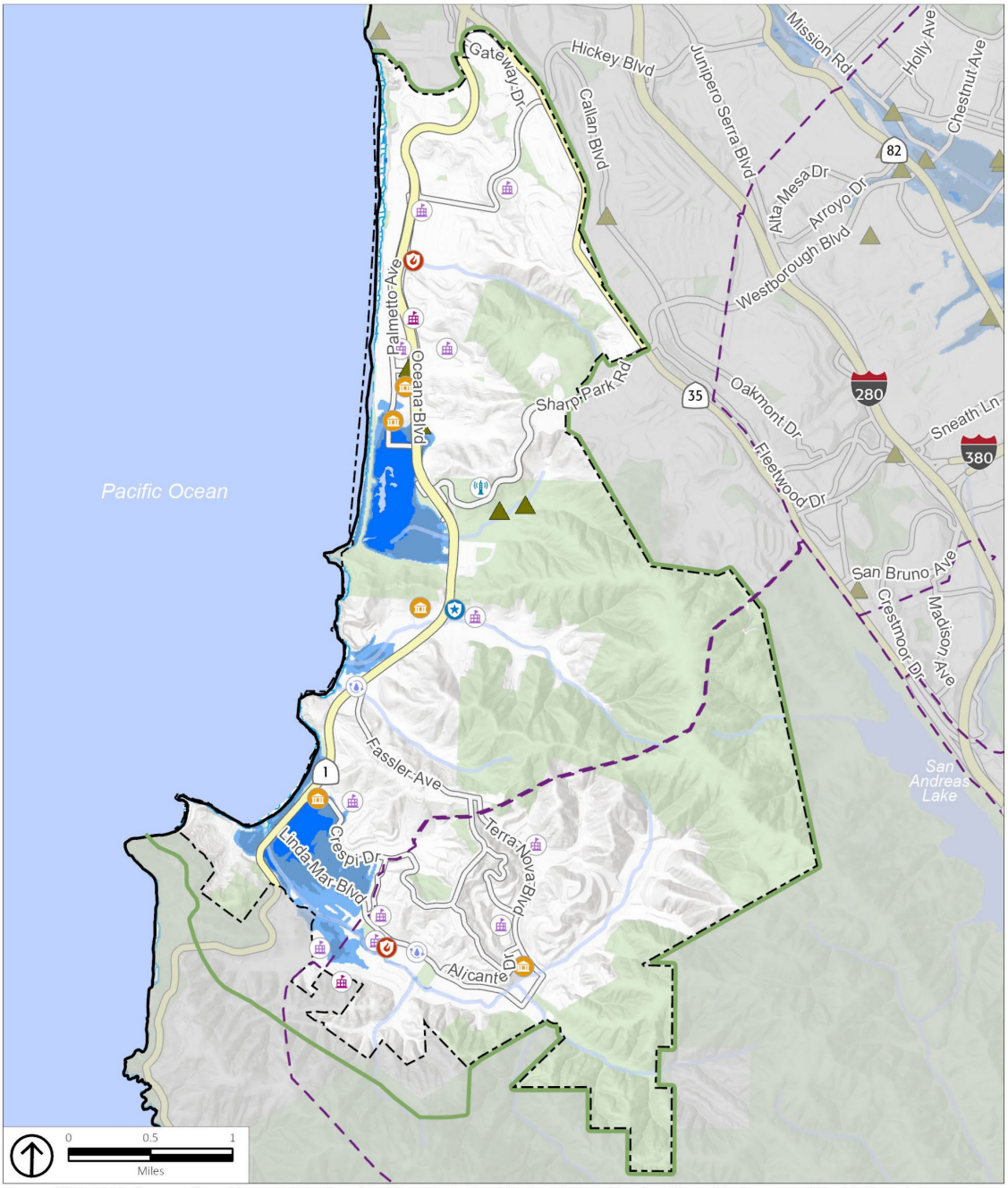
Sea Level Rise

- 0 ft + 100-year storm
- 0.8 ft + 100-year storm
- 3.3 ft
- 3.3 ft + 100-year storm
- 6.6 ft
- 6.6 ft + 100-year storm

**Figure 6. Projected Emergent Groundwater in Pacifica, 2100**




Source: ESRI, 2023; County of san Mateo, 2023; City of Pacifica, 2023; PlaceWorks, 2023; California Office of Environmental Health Hazard Assessment, 2021; USGS, 2020

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- Government Facilities
- Pump Stations
- Public Schools (K-12)
- Private Schools (K-12)
- Transmission Lines

Hazardous Waste Sites

- Groundwater Surface Flooding
- 6.6ft Sea Level Rise

Groundwater depth below surface

- 0 - 3.3 feet (Very Shallow)
- 3.3 - 6.6 feet (Shallow)

## Severe Weather

Severe weather poses a significant threat to Pacifica, disrupting daily life, compromising safety, and affecting infrastructure and ecosystems. Severe weather is usually caused by intense storm systems, although strong winds can occur without a storm. The types of dangers posed by severe weather vary widely and may include injury or death, damage to buildings and structures, fallen trees, roads blocked by debris, and fires sparked by lightning. Severe weather often produces high winds and lightning that can damage structures and cause power outages. Lightning from these storms can ignite wildfires and structure fires that can cause damage to buildings and endanger people. Objects such as vehicles, unprotected structures like bus stops or carports, fences, telephone poles, or trees can also be struck directly by lightning, which can cause an explosion or fire. The most common severe weather events that have historically impacted Pacifica are heavy rains (usually a result of atmospheric rivers), thunderstorms, and windstorms.

While average annual rainfall may increase only slightly in Pacifica, climate change is expected to cause an increase in the number of years with intense levels of precipitation. Heavy rainfall can increase the frequency and severity of other hazards, including flooding and landslides.

Public Safety Power Shutoff (PSPS) events are used as a preventive strategy to reduce wildfire risk during severe weather, especially during high winds and dry conditions. Utility companies like the Pacific Gas and Electric Company (PG&E) may shut off power lines during severe weather to prevent them from sparking fires causing power outages that may last for extended periods. Without power, communication networks may be disrupted, making it harder for residents to receive emergency notifications and for first responders to coordinate effectively. People who depend on medical devices, such as oxygen concentrators or ventilators, are at greater risk during power outages, as are those who need electricity for climate control to keep indoor temperatures safe. The loss of power to communications and other critical infrastructure disrupts access to goods and services.

*Lightning off the coast of Pacifica. Photo provided by San Mateo County staff.*

## Wildfire

Wildfires pose a growing threat to Pacifica. The City's Mediterranean climate, steep topography, and diverse plant communities create ideal conditions for wildfire development. Historically, the fire season in the Bay Area extended from early summer through late fall of each year during the hotter, drier months, although it is increasingly a hazard that can occur year-round due to higher temperatures, lower moisture content in air and plant matter, accumulation of vegetation, and high winds. Rising temperatures and prolonged droughts dry out vegetation, creating abundant fuel for fires. Pest outbreaks, such as Sudden Oak Death and bark beetles, leave behind weakened and dead trees that serve as additional fuel, while extreme heat, reduced occurrence of fog, and erratic wind conditions make wildfires more unpredictable and harder to control.

*Firefighter in San Mateo County. Photo provided by San Mateo County staff.*

The online PREP Map Viewer, illustrates the fire hazard severity zones in the surrounding unincorporated county lands designated as High and Very High Fire Hazard Severity Zones. The Wildland-Urban Interface, where human development, such as homes and residential development, and undeveloped wildland vegetation meet faces the highest risk of burning. The areas of eastern and southern Pacifica where the parks and open space meet residential neighborhoods on the hillsides are most at risk.

According to the Western Fire Chiefs Association, human activities are the leading cause of wildfires, and increased development near these wildland areas has amplified the likelihood and risk of wildfire events.[20] Wildfires not only destroy homes and infrastructure but can also displace entire communities and degrade critical wildlife habitats. The economic consequences are significant, ranging from property damage and fire suppression costs to long-term business disruptions. Moreover, the loss of natural spaces impacts recreation, tourism, and local biodiversity. Historically, wildfires have not burned in or near Pacifica; however, increased temperatures and prolonged droughts due to climate change may increase the potential for wildfires in the parks and open space areas of the eastern and southern portion of the city.

# Key Findings

This section presents the key findings of the Vulnerability Assessment for Pacifica, highlighting the people and community features that were identified as priority vulnerabilities. Priority vulnerabilities are the people, buildings, infrastructure, economic drivers, ecosystems and natural resources, and key services that should be considered the City's priorities in adaptation and resilience planning. Identifying a population or a community asset as a priority vulnerability reflects the severity of climate change impacts and level of harm, but also considers other factors such as the size of the population, current and historic injustices and discrimination, the role that the asset plays in maintaining community-wide well-being, and the potential of the population or asset to be impacted by compounding or cascading effects of interacting hazards.

**Priority Vulnerabilities**

In addition to the severity of impacts from climate change and related hazards, other factors that affect whether a population or asset is considered a priority vulnerability include:

- Size of the population or the importance of the asset.
- Equity considerations and history of marginalization.
- Role in supporting community well-being.
- Community values and concerns.
- Ability to resist and recover from hazards.
- Potential for cascading and compounding impacts.

Overall, the hazards that pose the greatest risk to Pacifica are landslides and debris flows, severe weather, flooding, and wildfire. Landslides and debris flows are of particular concern because they can cut off roadways, isolating areas of the city from the surrounding region and preventing visitors from traveling to the city for recreation and tourism. Climate change is expected to affect everyone and all locations in Pacifica to some degree. However, some populations and other community assets are likely to be disproportionately affected, and it is these groups and assets that the Vulnerability Assessment identifies. This section does not describe all impacts from climate change and associated hazards. Rather, it identifies the populations and assets who the project team found priority vulnerabilities for the greatest number of hazards, based on the results of the Vulnerability Assessment. Other populations and assets not listed here may still face significant harm from climate change.

## Low-Resourced Households

**Most Vulnerable To:**


Air quality and smoke


Drought


Extreme heat


Human health hazards


Flooding


Landslides and Debris Flows


Sea Level Rise


Severe Weather


Wildfire

Climate change in Pacifica exacerbates vulnerabilities for low-resourced households, including those in poverty and low-resourced people of color, particularly due to increased risks from air quality and smoke, wildfires, extreme heat, human health hazards, landslides, flooding, drought, and severe weather. Low-resourced households typically lack sufficient resources to invest in home repairs and weatherization improvements, energy-efficient appliances, healthcare, and other means to prepare for and recover from hazardous events. Households in poverty are more likely to lack health insurance and be unable to afford to see a physician.[21] Evacuation concerns are significant for these households, as they may lack access to reliable transportation or the financial means to leave during emergencies, making it difficult to comply with evacuation orders or receive emergency notifications due to language barriers.[22]

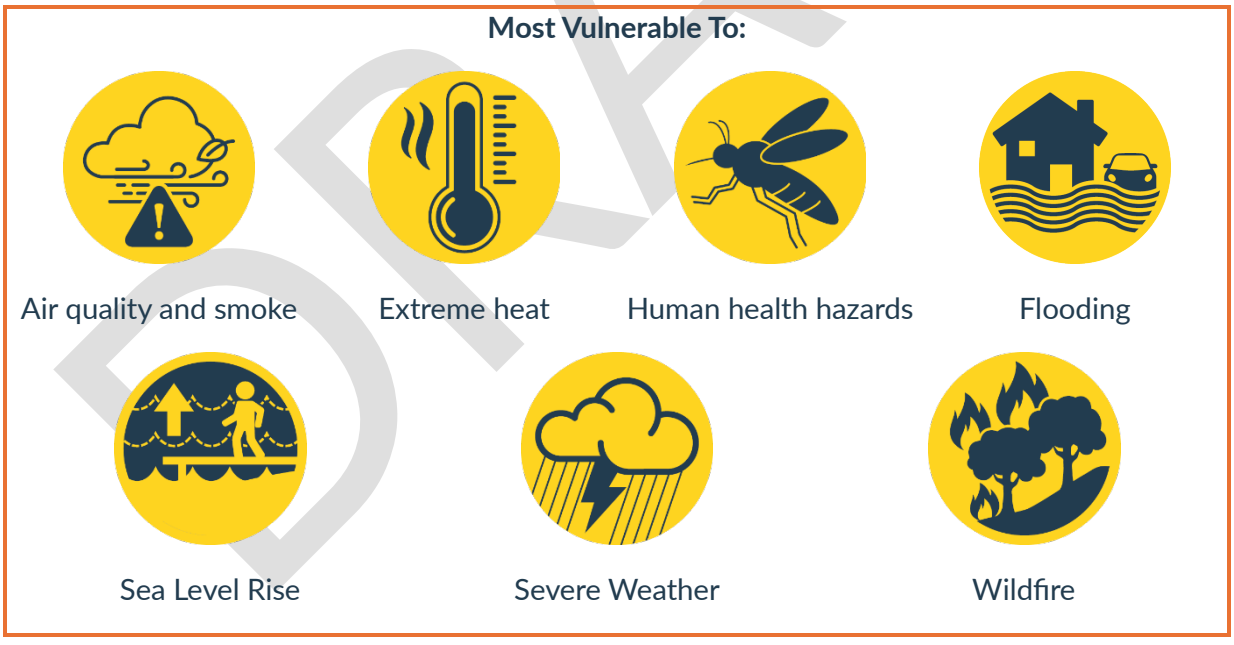
**Pacifica Resource Center**

The Pacifica Resource Center is a community-focused organization dedicated to providing essential services to residents in need. This organization provides food assistance, housing support, emergency financial assistance for utilities, and education resources for low-resourced households. Their mission is to alleviate poverty and promote self-sufficiency among the Pacifica community.

Wildfires create hazardous air quality and individuals with limited financial means often cannot afford to install air filters or seek healthcare for respiratory issues. Low-resourced people of color may have fewer options for safe evacuation during a wildfire or prior to a flooding or landslide event due to financial constraints and reduced access to transportation.[23] Extreme heat events also disproportionately affect low-resourced households, as they often live in poorly insulated homes, and many homes in Pacifica do not have air conditioning due to historically cool temperatures.[24]

Drought poses additional challenges, as these households struggle to afford rising water costs,[25] or reduce water through water conservation measures due to income constraints. Additionally, people of color and lower-income households often live in flood-prone areas or housing that could be damaged by landslides. When flooding or landslides occur, many of these households cannot afford repairs or insurance to replace lost property, which further entrenches them into poverty. Severe weather compounds these challenges by exposing lower-income and marginalized communities to harm from high winds, heavy rain, and thunderstorms. With fewer resources to make structural upgrades or address mold and mildew issues, these households often experience worsened living conditions. According to the Asian Pacifica Environmental Network, in the aftermath of a disaster, institutional barriers and economic challenges hinder recovery from such events, with fewer support services available to these households.[26]

## Persons with Chronic Illnesses and Disabilities




Approximately 8 percent of residents in Pacifica report having a disability.[27] This group is particularly vulnerable due to their increased sensitivity to health impacts and limited mobility. Wildfire smoke and poor air quality can exacerbate respiratory conditions such as asthma and chronic bronchitis. Extreme heat poses a serious threat by worsening conditions like diabetes, cardiovascular disease, and respiratory ailments.[28] Many people with chronic illnesses take

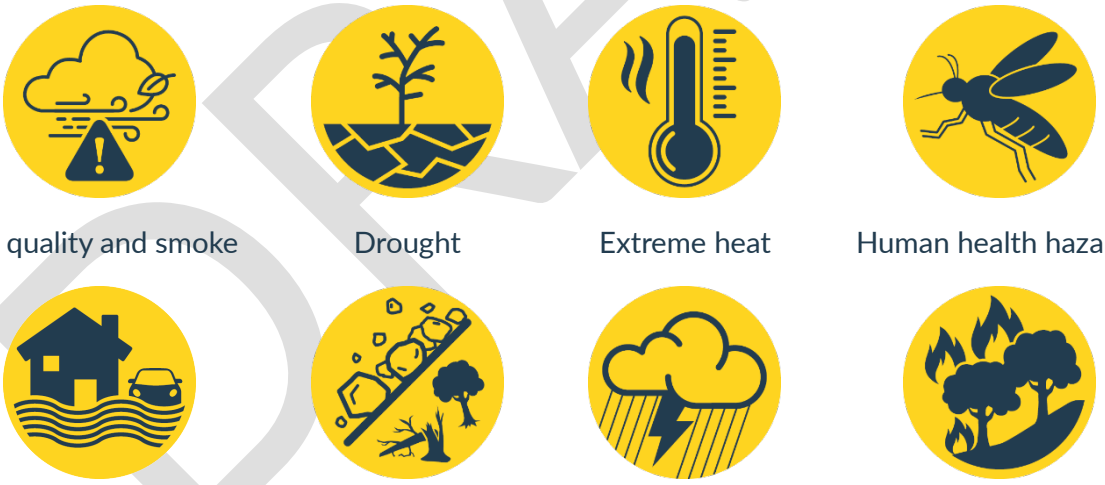
medications that hinder the body's ability to regulate temperature, making them more susceptible to heat-related illnesses. Persons with chronic health problems may have weaker immune systems due to pre-existing conditions that make it more difficult to fight off new illnesses from mold and mildew growth in homes or vector-borne illnesses.[29]

Some people with chronic illnesses or disabilities rely on medical devices that may fail during power outages and further compound risks. Mobility challenges can prevent access to medical services or hamper evacuation efforts. Flooding presents additional challenges for individuals with chronic health issues, as they may be more vulnerable to health problems from mold and mildew exposure, and critical medications or medical devices could be lost or damaged. Sea level rise and coastal flooding are slower moving but also pose serious risks, especially for individuals with disabilities who may struggle to prepare for such events. Up to 8 percent of the population in Pacifica is vulnerable to sea level rise and have a disability.

Support from local organizations like the Center for Independence for Individuals with Disabilities is vital in helping these individuals prepare for and recover from disasters, providing resources such as emergency kits and backup power options. However, the unique vulnerabilities of these populations demand greater coordination and preparedness to ensure their safety in a changing climate.

## Older Adults

**Most Vulnerable To:**



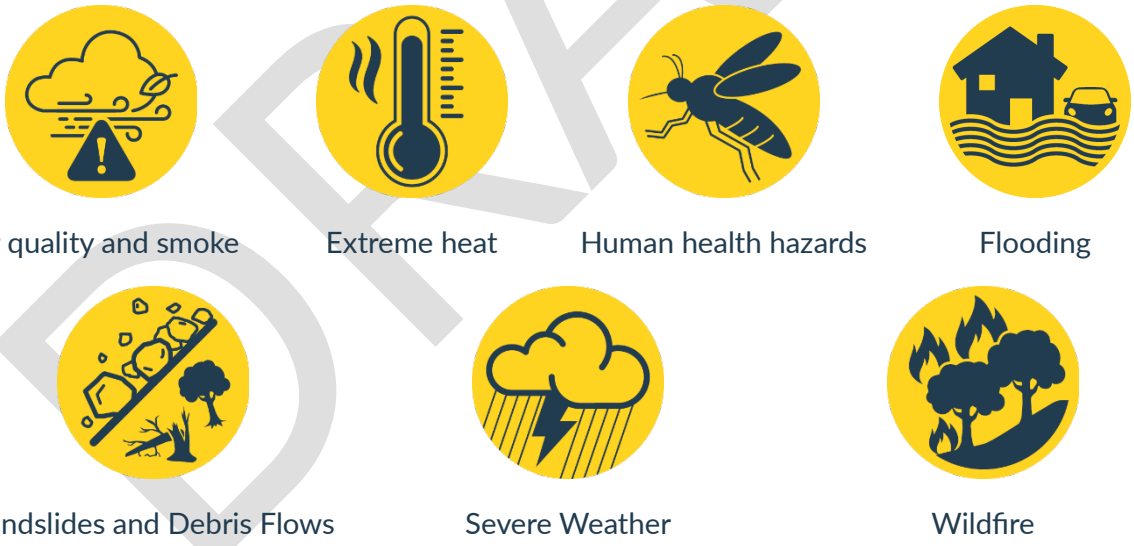

Over 19 percent of the population in Pacifica are older adults 65 years and older.[30] Older adults face a distinct set of vulnerabilities during emergencies, and it is essential to understand these challenges to protect this population effectively. Many older adults experience reduced mobility, impaired vision, and hearing loss, making it more difficult for them to prepare their homes for hazardous conditions or evacuate quickly during wildfire, landslide, severe weather, or flooding

events. For instance, attempting to evacuate during or prior to a severe storm while dealing with mobility impairments or vision issues significantly increases their risk of harm. Conditions common in older adults, such as heart disease, diabetes, and respiratory issues can be significantly worsened during crises, particularly when exposed to wildfire smoke, vector-borne illnesses, or extreme heat.[31]

Economic and social factors compound these risks, as older adults on average have lower incomes than middle-aged adults, and older adults in Pacifica are more likely to receive far less income than surrounding cities. This limits their ability to invest in necessary disaster preparedness measures, such as purchasing emergency supplies, conducting vegetation management for wildfires, or retrofitting their homes with water-efficient appliances; ultimately increasing their vulnerability to hazard events. Some older adults are also unable to drive, leaving them dependent on external assistance if they need to evacuate. The digital divide is another key factor, given that some older adults may be less familiar with digital technology, making it difficult for them to receive timely alerts and critical information through smartphone alerts, social media, or text messaging. The relationship of physical limitations, chronic health issues, economic constraints, and limited access to information can converge to place their lives at considerable risk.

## Unhoused Persons

**Most Vulnerable To:**



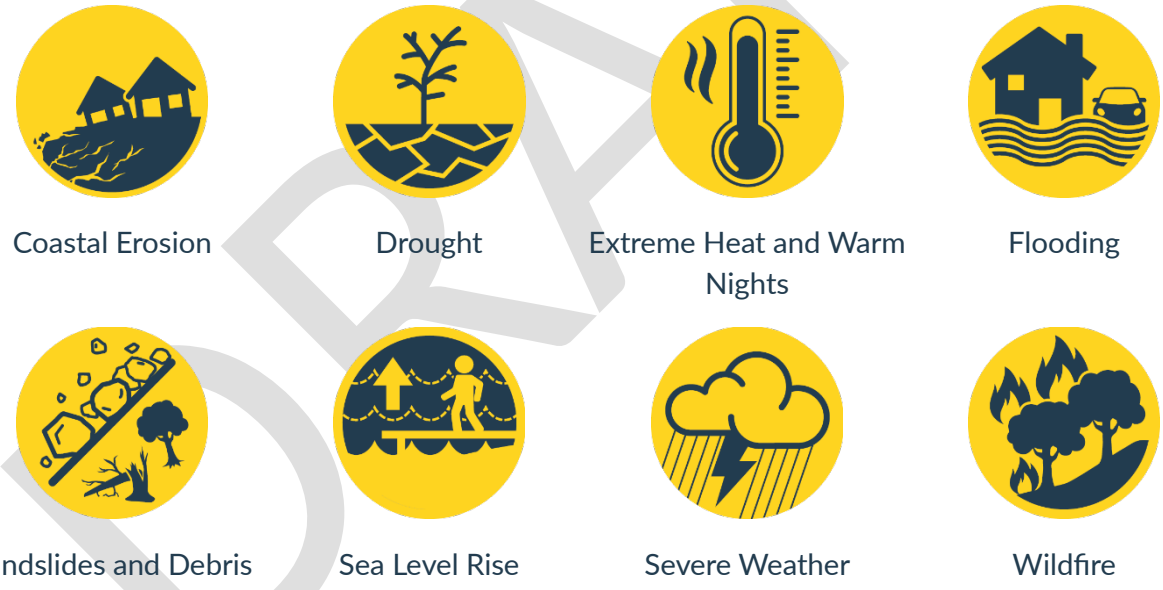

As stated in the Community Profile section, the most recent San Mateo County Homeless Count and Survey identified 180 unhoused persons in Pacifica, which is approximately 16 percent of all unhoused persons counted in San Mateo County, despite being home to only about 5 percent of the county's total population. Because of unstable shelter and lack of resources, climate change increases the exposure of unhoused individuals to hazards like poor air quality, extreme heat,

vector-borne illnesses, floods, severe weather, and wildfire. Poor air quality from wildfire smoke worsens respiratory health, and although social services provide some support, they often fail to meet demand during disasters. Without reliable shelter and often on medication that impairs temperature regulation, individuals experiencing homelessness also face higher risks from extreme heat, facing dehydration from lack of water, as well as respiratory issues and heat stroke.[32]

Unhoused persons are more likely to reside in flood-prone areas, such as riparian areas or near drains and culverts, where direct exposure causes injury and loss of belongings. Some unhoused individuals can seek local shelters, but many encounter barriers like limited transportation, preventing them from preparing for or responding to severe storms, wildfires, and floods. Landslides and severe weather further harm unhoused individuals and families, damaging or destroying temporary shelters and exposing them to illness from colder nighttime temperatures. With few communication options, many unhoused individuals miss critical evacuation warnings during wildfires and severe weather, leaving them unable to find refuge in time.

## Utility Infrastructure and Services

**Most Vulnerable To:**




Residents, visitors, and workers rely on energy, communication, water, and wastewater infrastructure and services to work, play, stay connected, and remain healthy and safe. Energy delivery and communication infrastructure and services are highly vulnerable to hazards that could undermine their foundations or cause damage to the power lines, including coastal erosion, flooding, landslides, severe weather, and wildfire. Infrastructure in Pacifica has limited redundancy, especially in the southern portion of the city, meaning that if a piece of infrastructure fails, there are less likely to be other facilities or parts of the infrastructure network that can provide services instead.

Landslides, wildfire, and severe weather can damage power lines and disrupt natural gas supplies. Fallen infrastructure may damage roads and buildings, posing risks to people and potentially requiring road closures. Damaged infrastructure can spark wildfires and therefore PG&E conducts PSPS events in Pacifica approximately every other year during severe weather, de-energizing the electricity lines for hours or days.[33] This can harm those who rely on energy infrastructure to power life-supporting devices, refrigerate medications, and run businesses. Extreme heat also causes more demand for electricity (usually to run air conditioning units), causing further stress on the power lines that may lead to brownouts and blackouts. A power or communication outage could affect emergency medical response and emergency resource services, impacting the health and well-being of residents and visitors in Pacifica.

Pacifica's water and wastewater services are also vulnerable to multiple climate change hazards. The city relies heavily on water from the Hetch Hetchy system, which is subject to drought conditions in the Sierra Nevada. Reduced precipitation can decrease water availability for essential community needs and make wastewater more concentrated, requiring additional treatment and energy. Water restrictions during droughts may limit water availability to residents and businesses, and chronic drought can also impact groundwater supplies.

Flooding poses a major risk to water infrastructure, particularly pump stations in areas like Sharp Park, West Fairway Park, and Mori Point. Flooding, erosion, and sea level rise threaten these pump stations, and saltwater intrusion can interfere with biological treatment processes. Excessive stormwater can overwhelm wastewater treatment systems, potentially causing backups and contaminating local water bodies with raw sewage. The Calera Creek Water Recycling Plant, vital for wastewater service, faces landslide risks in its high-hazard location. Landslides or severe flooding could disrupt the sewer system for weeks or months, affecting community health and well-being. Additionally, miles of pipeline and several stormwater pump stations are vulnerable to damage from sea level rise, which can increase the presence of saltwater in the system and lead to corrosion.

## Transportation Infrastructure and Services

**Most Vulnerable To:**


Coastal Erosion


Flooding


Landslides and Debris Flows


Sea Level Rise


Severe Weather


Wildfire

Highway 1 links each of the neighborhoods, recreation, and commercial areas of Pacifica, and therefore the community relies on this route to remain open and accessible for community members to travel to other areas of San Mateo County and for visitors to travel to the community. If Highway 1 becomes damaged or impassable, southern Pacifica could become isolated from goods and services in other regions of San Mateo County. Sections of Highway 1 and Beach Boulevard, such as along Pacifica State Beach and near the Pacifica Municipal Pier are already exposed to high tides, threatening the stability of the roadways from coastal erosion during periods of storm surge and heavy wave action.

Local roads, such as Sharp Park Road and Linda Mar Boulevard, are at risk from climate change. Flooding from heavy rains or debris from a landslide may block the roads or erode away the road base, subsequently disrupting mobility. .Landslides are more likely to occur in the eastern and southern portions of the city where roads traverse hilly terrain. Flooding of transportation facilities occurs where the creek meets the ocean and the floodplain spreads out. Wildfires pose additional risks to transportation infrastructure, threatening to block or damage highways and local roads in the eastern and southern portions of the city. These hazards can also compromise emergency evacuations, especially if bridges fail or roadways become impassable during an emergency.

Extreme heat, flooding, and erosion create dangerous road conditions, damage traffic signals, and prevent access to goods and services in other areas of San Mateo County. Maintenance and retrofitting of transportation infrastructure is essential to preventing isolation of Pacifica and ensuring access to vital goods, but this can be expensive as severe storms become more frequent and intense. *Connect the Coastside*, a community-based transportation plan focused on coastal

residents and visitors, aims to improve bike and pedestrian facilities to enhance overall accessibility, though ongoing maintenance remains critical to the resilience of this infrastructure.

## Homes

**Most Vulnerable To:**


Homes in Pacifica, including those that serve as short-term rentals, are increasingly vulnerable to climate change hazards, and the loss of homes in this region could have devastating consequences for residents, as housing is essential to the community's stability. Damage to short-term rentals could harm the local economy, as visitors may be deterred from traveling to the area due to fewer lodging facilities. As bluffs and shorelines erode, homes situated along the coast face significant risks of collapse or structural failure, with little that can be done to reverse the damage once erosion progresses. While revetments and seawalls already exist to slow bluff erosion, these measures may not provide long-term protection for homes.

Flooding from heavy rainfall and sea level rise poses another serious threat to homes, potentially rendering them uninhabitable due to water damage, mold, and mildew growth. Within just 24 hours of flooding, mold can start to grow on damp surfaces, damaging building materials such as drywall and insulation. Coastal flooding can cause structural damage, including foundation cracks and buckling floors, and can compromise essential appliances like heating and ventilation systems and water heaters. Landslides, which deform the ground surface, and severe weather events, including high winds and heavy rainfall, further increase the risks to homes, particularly those that are older or poorly maintained.

Wildfires present a dual threat for homes in eastern and southern Pacifica, directly damaging homes from flames and exacerbating risks through post-fire landslides and debris flows. The combined impact of these climate change hazards endangers not only individual homes but also the broader health and safety of the Pacifica community.

## Outdoor Recreation

**Most Vulnerable To:**


Air quality and smoke


Coastal Erosion


Drought


Human health hazards


Flooding


Landslides and Debris Flows


Sea Level Rise


Severe Weather


Wildfire

The outdoor recreation industry, supported by parks and recreation infrastructure and beaches in both the coastal and inland areas of Pacifica, face multiple vulnerabilities due to climate change. Worsening air quality, particularly during summer from regional wildfires, may reduce the number of visitors as people are discouraged from outdoor activities. On the other hand, higher temperatures inland will likely increase visitors to Pacifica due to cooler coastal temperatures. Those who visit may need protective gear to minimize smoke exposure and vector-borne illnesses, impacting enjoyment and reducing demand for recreational services, which are vital to the local economy. Drought and water restrictions may limit landscape maintenance, making parks less appealing and affecting water-based amenities like showers and fountains. While smaller parks may benefit from water-efficiency measures, scaling these to larger sites, like golf courses, remains a challenge, increasing operational costs and reducing available services.

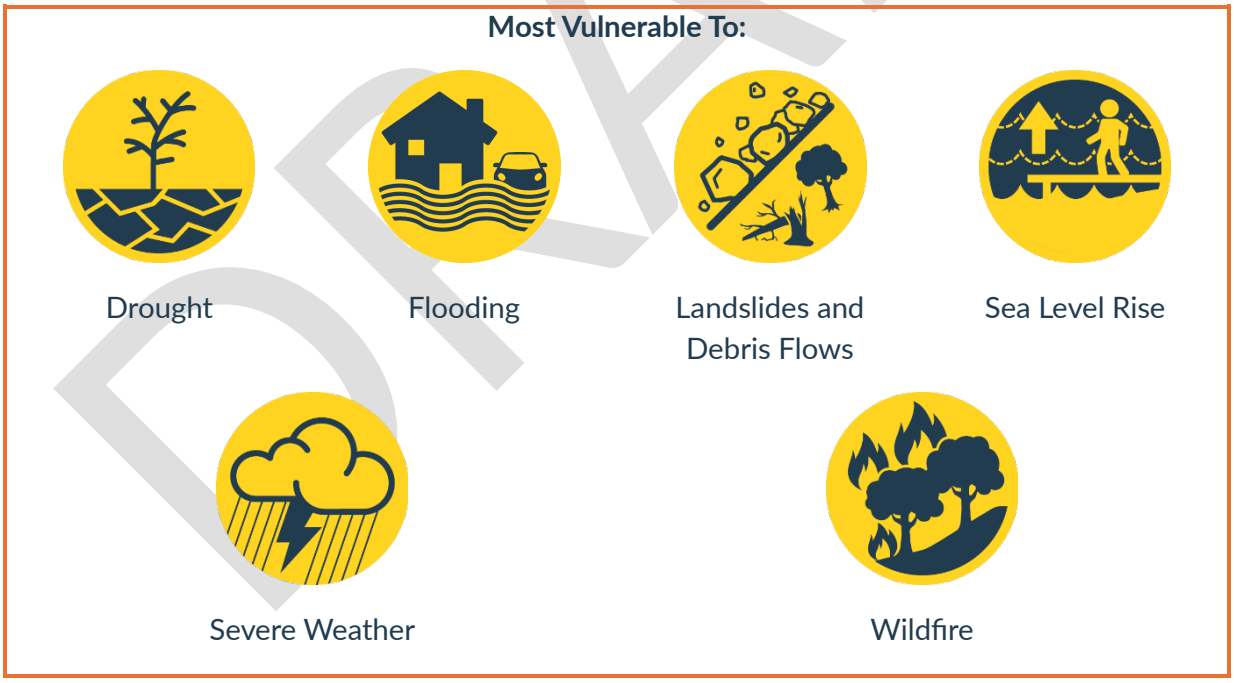
Erosion and landslide risks pose direct threats to Pacifica's recreational sites, particularly along eroding bluffs and coastal trails. The following parks and recreation sites are in high landslide susceptibility areas or coastal erosion hazard areas: Sweeny Ridge Reserve, Frontierland Park, San Pedro Valley County Park, Sharp Park, Fairmont Park, and Grace McCarthy Vista Point. Coastal

erosion can cause dangerous conditions, block trails like the California Coastal Trail, restrict access to beaches, and limit evacuation routes as damage to Highway 1 and Beach Boulevard is likely (as described in the Transportation Infrastructure and Services section). Although protective structures could reduce some erosion impacts, these can be costly, and damage to popular sites could disrupt local tourism and reduce economic benefits.

Pacifica's coastal and inland recreation sites are also vulnerable to sea level rise, especially Pacifica State Beach, which faces risks from wave action and storm surge. Sea level rise could shrink beach space and impact visitor-serving facilities such as the Linda Mar Shopping Center, threatening visitor convenience and safety. Long-term flooding may necessitate adaptation measures such as beach nourishment and sand retention, though these strategies could be expensive and require ongoing intervention.

Severe weather events, including floods and landslides, could damage recreational sites and limit accessibility, while wildfires present a growing risk. Large parts of Pacifica's parks in the eastern and southern portions of the city are in wildfire-prone areas. Wildfire damage to park facilities, landscapes, and road access could lead to significant repair costs, delays in service, and expose visitors and workers to hazards. With parks managed by different entities, coordinating climate resilience efforts poses an added challenge.

## Riparian Habitats



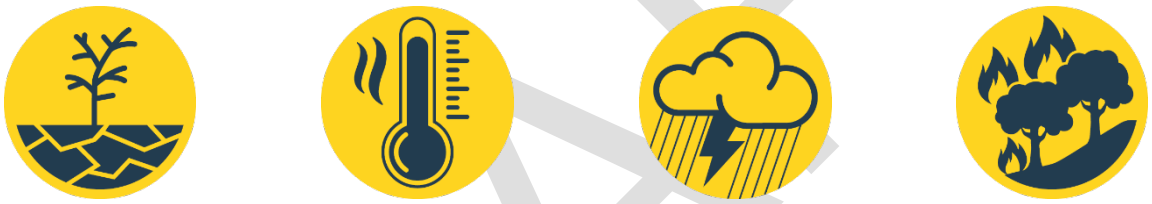

Riparian habitat is the ecosystem in Pacifica that is most vulnerable to the effects of climate change. Droughts can dry up smaller streams, reduce streamflow, increase temperatures, and cause algal blooms and erosion, which disrupts the habitats that plants and animals rely on.[34] Erosion along stream banks increases during droughts due to dying vegetation that holds the stream banks together, reducing the ability of the ecosystem to recover and ultimately reducing

their ability to absorb floodwaters. Rising temperatures and extreme heat days speed up the drying of riparian zones, particularly affecting heat-sensitive species and hindering plant growth and reproduction. Successive hot years can shrink these areas, intensifying competition among species that depend on these habitats.

Floods and landslides also pose risks, bringing debris into riparian areas, degrading soil and water quality. Increased stormwater flows can also damage these fragile ecosystems. Additionally, sea level rise can introduce saltwater into riparian systems as saltwater moves farther inland, endangering freshwater-dependent plant species. Severe storms may uproot trees, disrupt water flow, and lower water quality due to soil and contaminant runoff. Together, these climate-related changes present ongoing and interconnected challenges for Pacifica's riparian habitats, which provide essential ecosystem services by absorbing stormwater and reducing the speed of water flowing through these systems.

## Other Priority Vulnerabilities

**Most Vulnerable To:**




Although the following populations and assets are not identified as priority vulnerabilities for as many hazards as discussed previously, they are still significant and are important to Pacifica and represent critical concerns to community members. It is essential that this report recognize these other priority vulnerabilities for the purpose of community planning and risk assessment efforts. Addressing these vulnerabilities proactively can help to mitigate their impacts and support the community's overall resilience.

## Woodlands

Woodlands in Pacifica are vulnerable to climate change due to the combined effects of drought, higher temperatures, and increased wildfire risks. Drought conditions exacerbate vulnerabilities, leading to tree die-offs, crown defoliation, and increased susceptibility to ecosystem pests and diseases.[35] These infestations not only harm tree health but also increase the availability of fuel for wildfires. Sudden Oak Death spreads rapidly during severe wind events, and damaged oak woodlands may increase the risk of wildfires, destabilize slopes leading to landslides, and decrease the absorption of stormwater leading to increased flooding in Pacifica. Healthy woodlands play a crucial role in supporting the City's outdoor recreation industry, as well as reducing the impacts of flooding and extreme heat. However, damaged or poorly maintained woodland areas can amplify wildfire risks, posing a threat to the city.

## Emergency Services

**Most Vulnerable To:**

Extreme Heat and Warm Nights

Human Health Hazards

Flooding

Landslides and Debris Flows

Severe Weather

Wildfire

Emergency services in Pacifica face significant vulnerabilities due to climate change hazards, particularly in relation to disruptions in critical transportation routes. Highway 1, the primary route connecting Pacifica to the surrounding region, runs through flooding and landslide-prone areas and is susceptible to damage during severe storms. These events could block or delay emergency response efforts, with few alternative routes offering the same capacity. Rebuilding or relocating Highway 1 is possible in some areas, but costly and time-consuming, requiring coordination with multiple agencies.

Extreme heat events are expected to increase demand for emergency services, particularly for medical assistance. Heat-related power outages could delay emergency response, and if large portions of the population are affected by heat-related health issues, local medical facilities—already limited—may become overwhelmed. Shortages in medical supplies, equipment, and healthcare personnel could occur, especially if supply chains are disrupted. Flooding, landslides, and severe storms may also increase the demand for emergency services, while simultaneously damaging transportation, communication, and energy infrastructure, complicating response efforts. In extreme cases, multiple hazards—such as landslides coinciding with floods or wildfires—could compound the challenges for emergency responders.

## Next Steps

The Vulnerability Assessment is a key technical study that can support future planning efforts in Pacifica. This assessment helps community members, agency staff, and decision-makers understand how climate change hazards may impact local conditions and identify priority areas for adaptation and resilience. While its findings can inform updates to a General Plan Safety Element, they may also be used for other planning efforts, such as a Safety Element Update, Climate Action Plan, or other resilience-focused initiatives.

# Glossary

**Adaptation:** Making changes in response to current or future conditions (such as the increased frequency and intensity of climate-related hazards), usually to reduce harm and to take advantage of new opportunities. [36, 37]

**Adaptive Capacity:** The combination of the strengths, attributes, and resources available to an individual, community, society, or organization that can be used to prepare for and undertake actions to reduce adverse impacts, moderate harm, or exploit beneficial opportunities. [38]

**Cascading or Compounding Effects:** Extreme events that link together hazards over days, weeks, or months, resulting in multiplied effects that cause secondary and sometimes tertiary damage, exceeding the damage of the initial hazard event.

**Climate Change:** A change in the state of the climate that can be identified by changes in the mean, and/or the variability, of its properties, and that persists for an extended period, typically decades or longer.

**Community Asset:** A valued feature of a community that may be harmed by climate change. Community assets may include buildings, infrastructure, community services, ecosystems, and economic drivers.

**Exposure:** The presence of people; infrastructure; natural systems; and economic, cultural, and social resources in areas that are subject to harm. [39]

**Goal:** An ideal future end state related to public health, safety, or general welfare.

**Hazard:** An event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, damage to the environment, interruption of business, or other types of harm or loss. [40]

**Impact:** The effects (especially the negative effects) of a hazard or other conditions associated with climate change.

**Policy:** A specific statement that guides decision making, indicating a commitment of the local legislative body to a particular course of action.

**Program:** An action, procedure, program, or technique that carries out a General Plan policy.

**Resilience:** The capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and change from a disruptive experience. Community resilience is the ability of communities to withstand, recover, and to learn from past disasters to strengthen future response and recovery efforts.

**Risk:** The potential for damage or loss created by the interaction of hazards with assets such as buildings, infrastructure, or natural and cultural resources.

**Vulnerability:** The degree to which natural, built, and human systems are susceptible to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt. [41]

**Vulnerability Assessment:** An analysis of how a changing climate may harm a community and which elements—people, buildings and structures, resources, and other assets—are most vulnerable to its effects based on an assessment of exposure, sensitivity, potential impact(s), and the community's adaptive capacity.

# Appendix A: Methods

The Vulnerability Assessment considers the threats from all relevant natural *hazards*, which are events or physical conditions that have the potential to cause harm or loss and will emphasize changes to hazard frequency and severity due to climate change. When Pacifica updates its Safety Element, the update will address natural and human-caused hazards, such as seismic hazards and hazardous materials. However, these hazards are not included in the Vulnerability Assessment, as climate change does not substantially change their frequency or severity. The Vulnerability Assessment also assesses *populations* and *assets* facing potential harm from the hazards. This includes the risk of physical damage to buildings and infrastructure, social vulnerability of persons likely to be disproportionately harmed by hazards, potential disruption to the city's economic engines, and loss of important services.

The Vulnerability Assessment is based on accurate and up-to-date information, including the Cal-Adapt database, the *California Adaptation Planning Guide* (2020), and the *San Mateo County Multijurisdictional Local Hazard Mitigation Plan* (2021). As outlined in the *California Adaptation Planning Guide*, the Vulnerability Assessment follows a four-step process:

1. **Identify Exposure.** In a Vulnerability Assessment, *exposure* is the presence of people, infrastructure, natural systems, and resources (economic, cultural, and social) in areas subject to harm. A *hazard*, in this context also called a climate change hazard, is an event or physical condition that has the potential to cause types of harm or loss. This step includes confirming applicable hazards in the county, describing historical hazards, describing how hazards are expected to change, and mapping the hazard-prone areas. The creation and review of this memo is part of this step of the Vulnerability Assessment.
2. **Analyze Sensitivity and Potential Impacts**. *Sensitivity* is the level to which changing climate conditions affect a population or community, species, natural system, government, asset, or resource. Potential *impacts* are the effects of a climate change hazard, the combination of exposure to the hazard and sensitivity of the population or asset to it. For example, suppose an increase in extreme heat events is the hazard. In that case, the greater risk of heat-related illness in susceptible persons is the exposure, and the sensitivity is the degree of the impact from the exposure. Each population and asset in Pacifica is likely to experience different impacts. The project team will assess the sensitivities and potential impacts to each population or asset from each applicable climate change hazard.
3. **Evaluate Adaptive Capacity.** *Adaptive capacity* is the ability of people and assets to adjust to potential damage from climate change hazards, to take advantage of existing resources and opportunities such as funding or tools, and to respond to the impacts of climate change. The project team will assess the adaptive capacity of each population and asset for each applicable identified hazard. The City is already implementing several measures to increase adaptive capacity, including the Municipal Code requirements and Capital Improvement Program.

4. **Conduct Vulnerability Scoring**. *Vulnerability* is defined as the combination of impact and adaptive capacity as affected by the level of exposure to changing climate conditions. Following the process in the *California Adaptation Planning Guide*, the project team will score impact and adaptive capacity for each population and asset affected by each hazard on a scale of low, medium, and high, which informs determination of the priority vulnerabilities among the populations and assets in Pacifica.

# Appendix B: Populations and Assets

## Populations

1. Children and youth (under 18).
2. Cost-burdened/low-income/overcrowded households: Cost-burdened households are those paying 30 percent or more of their income towards housing expenses. The State identifies $149,100 as the low-income threshold for a household of four people in San Mateo County in 2023.[42] Overcrowded households include housing units that have more than one person per room (excluding bathrooms and kitchens). Approximately 4 percent of homes in Pacifica are overcrowded.[43]
3. Households in poverty: Households with an income below the federal poverty line, which is $31,200 for a household of four.[44]Approximately 5 percent of Pacifica residents earn incomes at or below the poverty line.[45]
4. Immigrant communities/linguistically isolated persons: Communities consisting of foreign-born populations, including immigrants, refugees, and undocumented persons. Linguistically isolated persons include households without a member who is fluent in English. Spanish, Chinese, and Tagalog are the primary languages in Pacifica among households that are not fluent in English.[46]
5. Low-resourced people of color: Persons identifying as a member of a racial and/or ethnic group and facing limited access to resources, such as financial, social, healthcare, or educational assistance.[47,48]
6. Outdoor workers: Workers in agriculture, landscaping, construction, outdoor recreation, etc.
7. Persons experiencing homelessness: The San Mateo County 2022 One Day Homeless Count reported 161 total persons experiencing homelessness (all unsheltered) in the City of Pacifica.[49]
8. Persons living on single-access roads (roads with only a single entry or exit point): Single-access and road-constricted neighborhoods are throughout the city, including near Frontierland Park, in Vallemar, and along Rockaway Beach Avenue.
9. Persons with chronic illnesses and/or disabilities: Approximately 9 percent of Pacifica's population has some form of disability.[50]
10. Persons without a high school degree: Approximately 7 percent of Pacifica's adult population has not obtained a high school degree or equivalent.[51]
11. Persons without access to lifelines: Persons without reliable access to a car, transit, or communication system. Approximately 3 percent of Pacifica households do not have access to a personal vehicle.[52] Approximately 4 percent of Pacifica households do not have an internet subscription.[53]
12. Renters: Approximately 32 percent of Pacifica housing units are renter-occupied.[54]
13. Residents of mobile homes: Residents of mobile homes, including Pacific Skies Estate.
14. Seniors (65+): Seniors constitute 19 percent of Pacifica's population.[55] Approximately 10 percent of Pacifica households are made up of seniors living alone.[56]
15. University students.

16. Unemployed persons: Pacifica's civilian labor force unemployment rate is approximately 4 percent.[57]

## Infrastructure

1. Energy and communication infrastructure:
    - Transmission Lines: Pacific Gas and Electric Company (PG&E).
    - Natural gas pipelines and structures: PG&E.
    - Cell towers, radio sites, fiber-optic lines, and internet lines.
2. Flood control and stormwater infrastructure.
3. Vehicle fuel stations:
    - Electric vehicle charging stations: Five public charging stations.58
    - Gas stations
4. Hazardous materials sites: 40 cleanup sites (five open) identified via the State Water Control Board's GeoTracker database;[59] five toxic substance sites (one open) identified via the State Department of Toxic Substance Control's EnviroStor database. [60]
5. Transportation infrastructure:
    - Highways: Highway 1.
    - Major roads: Palmetto Avenue, Monterey Road, Hickey Boulevard, Manor Drive, Sharp Park Road.
    - Bridges: Eight bridges.
    - Transit facilities: Stops and other facilities provided by SamTrans.
    - Airports: San Francisco International Airport (SFO).
6. Parks and related recreational facilities:
    - Beaches: Pacifica State Beach, Linda Mar Beach, Rockaway Beach, Sharp Park Beach, Esplanade Beach.
    - Regional Parks: Golden Gate National Recreation Area, Sharp Park, San Pedro Valley County Park, McNee Ranch State Park.
    - District Parks: Frontierland Park.
    - Neighborhood Parks: Fairmont Park, Fairmont West Park, Fairway Park, Imperial Park, Oddstad Park, Sanchez Park.
    - Pocket Parks: Brighton Mini-Park, Connemara Mini-Park, Cypress Mini-Park, Edgemar Park, Horizon Mini-Park, Monterey Mini-Park, Palmetto Mini-Park, Pomo Park, Portola Mini-Park, Skyridge Park, Timber Hill Mini-Park.
    - Special Facilities: Grace McCarthy Vista Point, Pacifica Skate Park, Rockaway Beach Promenade, Sharp Park Promenade and Pier, Brink Pool, Pacifica Municipal Pier, Beach Boulevard Promenade.
    - Trails: Coastal Trail, Milagra Ridge, Mori Point, San Pedro Valley Park, Sweeney Ridge, Pedro Point Headlands Trail, Devil's Slide Trail.
7. Water and wastewater infrastructure: Wastewater treatment plant, lift stations, sewer mains and lateral pipes, water pipes and storage reservoirs, Calera Creek Water Recycling Plant.

## Buildings

1. Commercial and retail centers: Brentwood Shopping Center, Fairmont Shopping Center, Park Mall Shopping Center, Linda Mar Shopping Center, Rockaway Beach Plaza, Vallemar Shopping Center, Eureka Square, Palmetto Avenue Shopping Center, and Pacific Manor.
2. Government and community facilities: City Hall and Municipal Services Building, Pacifica City Hall, Pacifica Council Chambers, Pacifica Sharp Park Library, Pacifica Sanchez Library.
3. Medical and care facilities: Doctor's offices.
4. Homes and residential structures: Multifamily and single-family residences.
5. Public safety buildings: Pacifica Fire Department Stations No. 71 and No. 72, Police Department.
6. Schools:
    - Elementary Schools: Alma Heights Christian Academy, Cabrillo School, Good Shephard School, Montessori School of Linda Mar, Ocean Shore School, Ortega School, Sunset Ridge Elementary, Vallemar School, Linda Mar Educational Center/Home School Program.
    - Middle Schools: Alma Heights Christian Academy, Cabrillo School, Ingrid B. Lacy Middle School, Ocean Shore School, Vallemar School.
    - High Schools: Alma Heights Christian Academy, Oceana High School, Terra Nova High School.

## Economic Drivers

1. Major employers: Ace Hardware, City of Pacifica, Jefferson High School, Lucky, North Coast County Water District, Oceana Market, Pacifica School District, Recology of the Coast, Rite Aid, Ross Dress for Less, and Safeway.
2. Commercial and retail centers.
3. Outdoor recreation.
4. Regional economic activities.

## Ecosystems and Natural Resources

1. Beaches.
2. Grassland and prairie habitats. Non-native annual grasslands are composed of a dense to sparse cover of annual grasses and are typically occupied by numerous species of annual forbs. Grasslands and coastal prairies occur at Milagra Ridge, Sweeney Ridge, Cattle Ridge, Mori Point, Aramai Point, San Pedro Valley Park, the San Pedro Mountain hills, and the Pedro Point Headlands.
3. Groundwater: San Pedro Valley Groundwater Basin.
4. Riparian habitats along Milagra Creek, Sanchez Creek, Calera Creek, Rockaway Creek, San Pedro Creek, and San Mateo Creek.
5. Scrub habitats, including Coastal Bluff Scrub, Northern Coastal Scrub, and Willow Riparian Scrub.

6. Wetlands: Lands within the coastal zone that may be covered periodically or permanently with shallow water. Wetlands in Pacifica are found along riparian areas, drainages, along the coast, and as fresh and brackish water marshes.
7. Woodlands, including Coastal Mixed Hardwood Oak/Oak Woodland, Eucalyptus, Monterey Cypress, and Riparian Mixed Hardwood.

## Key Services

1. Education services: Pacifica School District, Jefferson Union High School District, private schools, and childcare.
2. Emergency services: Pacifica Emergency Preparedness and Safety Commission, North County Fire Authority, San Mateo County Sheriff's Office, San Mateo County Department of Emergency Management, San Mateo Operational Area Emergency Services Council, Pacifica Police Department.
3. Energy delivery and communication services: Peninsula Clean Energy, PG&E, radio, television, cellular and landline phone, and internet.
4. Government administration and community services.
5. Public transit access: SamTrans, San Mateo County Transit District, San Mateo County Transportation Authority.
6. Solid waste removal: Recology of the Coast.
7. Water and wastewater: North Coast County Water District, Pacifica Sewer Collection System Division.

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