Chapter 6 Floods and Coastal Storms

6.1 Risk Assessment

6.1.1 Description of Hazards

Requirement §201.6(c)(2)(i): The risk assessment shall include a description of the type location and extent of all natural hazards that can affect the jurisdiction.

Flooding and coastal storms present similar risks and are usually related types of hazards in Santa Cruz County. Coastal storms can cause increases in tidal elevations (called storm surge), wind speed, coastal erosion, and debris flows, as well as flooding. During a flood, excess water from rainfall or storm surge accumulates and overflows the channels of creeks and rivers onto the banks and adjacent floodplains and inundates beaches. Floodplains are lowlands adjacent to rivers, lakes and oceans that are subject to recurring floods. Several factors determine the severity of floods, including rainfall intensity and duration, creek and storm drain system capacity, and the infiltration rate of the ground.

A flood occurs when a waterway receives a discharge greater than its conveyance capacity. Floods may result from intense rainfall, localized drainage problems, tsunamis or failure of flood control or water supply structures such as levees, dams, or reservoirs. Floodwaters can carry large objects downstream with a force strong enough to destroy stationary structures such as homes and bridges and break utility lines. Floodwaters also saturate materials and earth resulting in the instability, collapse, and destruction of structures as well as the loss of human life.

Floods usually occur in relation to precipitation. Flood severity is determined by the quantity and rate at which water enters the waterway, increasing volume and velocity of water flow. The rate of surface runoff, the major component to flood severity, is influenced by the topography of the region as well as the extent to which ground soil allows for infiltration in addition to the percent of impervious surfaces. It is important to note that a stream can crest long after the precipitation has stopped.

As storms arrive onto land from the Pacific and rise over the mountains and ridges that border the eastern boundaries of the County, the air associated with those storms cools and that cooling results in large amounts of precipitation also known as the orographic effect. The topography provides fairly steep and well-defined watershed areas to funnel the falling rain into runoff tributaries. Periods of very heavy rainfall are common throughout fall and winter months and the two rivers in the County, along with several creeks and streams, can rise to flood stage in a short period of time. Settlement and habitation in the County, from the historic Ohlone/Awaswas indigenous communities through the founding of the Santa Cruz Mission in 1791, and subsequent logging communities throughout the 1800s, tended to acknowledge the floodplain areas of the rivers and streams, building on the higher ground. However, as the population grew, particularly in the middle 1900's, low lying areas near virtually every waterway were encroached upon for housing, business, or agricultural development.

Climatologists point out that the period between 1920 and 1970, the years of most significant growth in Santa Cruz County, was a "dry cycle" for most of central California. Only one or two instances of serious

winter weather in the 1950's highlighted the consequence of development in low-lying areas. Over time, land that had previously been avoided was developed for both commercial and residential use in the floodplains of the San Lorenzo and Pajaro Rivers, Soquel, and Aptos Creeks, and along the beaches.

As a consequence, substantial portions of the City of Santa Cruz and the City of Watsonville have been flooded, houses and businesses in the San Lorenzo Valley have been damaged or destroyed by floodwaters, and there have been losses along Soquel Creek, Aptos Creek, and in beach areas on multiple occasions over the past half-century.

Most of the known floodplains in the United States have been mapped by FEMA, which administers the National Flood Insurance Program (NFIP). Information about floodplains in Santa Cruz County can be found in FEMA's most recent Flood Insurance Study (FIS) and on the Flood Insurance Rate Maps (FIRM). A small-scale version of all the FIRM panels for the County is shown in Figure 12.

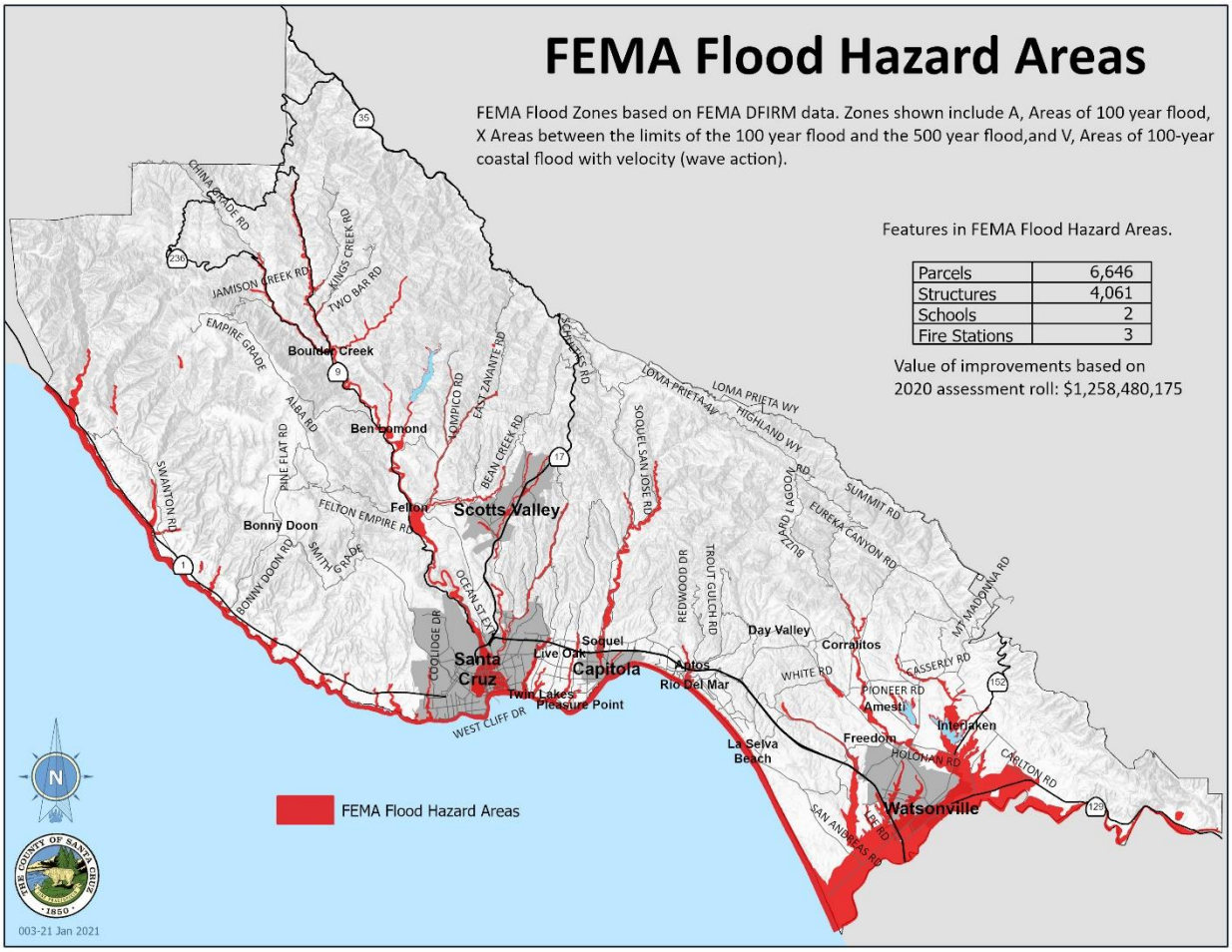


Figure 12 Generalized FEMA flood hazard area in Santa Cruz County

Within Santa Cruz County there are numerous areas subject to flooding due to rivers, creeks, or coastal storms. The two main rivers in the County that are subject to flooding are the Pajaro River and the San Lorenzo River. The Pajaro River and its floodplain runs through agricultural lands within the Pajaro Valley and, downstream, through downtown Watsonville. The San Lorenzo River runs through the

heavily populated San Lorenzo Valley and into downtown Santa Cruz, where a 2002 levee project has significantly reduced the flood risk for downtown residents, merchants, and landowners.

Other major creeks in Santa Cruz County adjacent to rural and urban development that are subject to flooding include Aptos Creek, Trout Creek, Valencia Creek, Salsipuedes Creek, Corralitos Creek, Soquel Creek, and their tributaries. The steepness of many of these creek canyons and the surrounding mountain areas contribute to the speed that flood water can accumulate and move resulting in relatively short warning times, increasing the hazard for those at risk. There are also many smaller creeks and tributaries throughout the County that are subject to flooding. Most of these are tributaries to the major creeks and rivers noted above.

Areas of low-density development characterize the creeks along the North Coast of Santa Cruz County. Flooding of developed areas from storm surges is unlikely in this area since development has occurred mainly on cliffs and inland of the coastal flood areas. While flooding is still a risk in these areas, there are no occurrences of repetitive loss from flooding along the North Coast.

Coastal flooding along the heavily developed Monterey Bay coastline of Santa Cruz County may occur with the simultaneous occurrence of large waves and storm swells during the winter. Storm centers from the southwest direction produce the type of storm pattern most commonly responsible for the majority of severe coastline flooding. The strong winds combined with high tides that create storm surges are usually accompanied by heavy rains. When storms occur simultaneously with high tides, flood conditions, particularly flooding at the mouth of the Pajaro River and Aptos Creek, are exacerbated.

Flood hazard areas identified on the Flood Insurance Rate Map are identified as Special Flood Hazard Areas (SFHA). The FIS and FIRMs for Santa Cruz County were updated by FEMA in 2017. SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. SFHAs are labeled as Zone A, Zone AO, Zone AH, Zone AE, Zone A99, Zone AR, Zone V, and Zone VE. See Table 15 for an explanation of these zones. Moderate flood hazard areas, labeled Zone X (shaded), are the areas between the limits of the base flood and the 0.2- percent-annual-chance (or 500-year) flood. The areas of minimal flood hazard, which are the areas outside the SFHA and higher than the elevation of the 0.2-percent-annual-chance flood, are labeled Zone C or Zone X (unshaded).

Flood Zone	Definition
A	Areas subject to inundation by the 1-percent-annual-chance flood event. Base Flood Elevations or flood depths not determined.
AE	Areas subject to inundation by the 1-percent-annual chance flood event. Base Flood Elevations determined.
AH	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between one and three feet. Base Flood Elevations determined.
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths determined.

AR	Areas that result from the decertification of a previously accredited flood protection system that is determined to be in the process of being restored to provide base flood protection
A99	Areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately be protected upon completion of an under- construction Federal flood protection system. These are areas of special flood hazard where enough progress has been made on the construction of a protection system, such as dikes, dams, and levees, to consider it complete for insurance rating purposes.
V	Areas along coasts subject to inundation by the 1-percent-annual-chance flood event with additional hazards associated with storm-induced waves. Base Flood Elevations not determined.
VE	Areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. Base Flood Elevations determined.
X (Shaded on FIRM)	Areas of 0.2-percent-annual-chance flood; areas of 1-percent-annual- chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1- percent-annual-chance flood.
X (not shaded on FIRM)	Areas determined to be outside the 0.2-percent-annual-chance flood.

Table 15 FEMA Special Flood Hazard Area zones and definitions

6.1.2 Previous Occurrences

Requirement §201.6(c)(2)(i): The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Flooding in Santa Cruz County has occurred in each of the primary drainages and will continue to do so in the future given the right set of meteorological conditions. Previous occurrences are well documented for all primary drainages. The known occurrences are detailed below.

Summary of Historical Floods in Santa Cruz County

Major storms and associated flooding are known to have occurred during March 1899, December 1937, February 1940, November 1950, January 1952, December 1955, April 1958, January 1963, January 1967, January 1973, and January 1982. The December 1955 and January 1982 storms were the most severe in recent times. Below is a summary of the historic flooding for the major rivers, creeks, and beaches in Santa Cruz County. The historical information cited below comes from studies and reports completed by the United States Army Corps of Engineers (USACE) and the Federal Emergency Management Agency (FEMA) Flood Insurance Studies (FIS).

<u>Aptos, Trout, and Valencia Creeks</u>

Aptos Creek drainage basin is of small size and limited flood problems. It includes the drainage areas of Valencia Creek, Trout Creek, Bridge Creek and Mangles Gulch. Floods are known to have occurred in 1955, 1963 and 1982, however little information is available prior to 1955.

During the four-day period ending December 22, 1955, heavy rains fell over the basin causing Aptos and Valencia Creeks to slightly exceed bank full stages at several points in the lower basin. Agricultural damage was primarily due to scour and erosion of first shelf lowlands planted to pasture, a few orchard crops, and idle croplands. The peak flow was measured at 3,500 cfs and approximately 140 acres were inundated, of which 20 acres were cropland. Non-cropland damages were generally very minor, consisting of eroded private roads and washed-out culverts. County roads and bridges experienced relatively heavy damages at the Valencia Road crossing. The bridge on Aptos Creek just below the confluence of Aptos and Valencia Creeks sustained a washout of cribbing endangering the bridge structure. Four homes along Moosehead Drive, downstream from the village of Aptos, experienced flooding. The Southern Pacific Railroad sustained minor damage due to undermining of the roadbed at Aptos, which resulted in a seven-day interruption of rail service. The local telephone company sustained minor damages to the undermining of facilities in the floodplain (USACE, Floodplain Information, Aptos, Trout, and Valencia Creeks, 1973).

The January 1982 flood had a peak flow of 3,950 cfs and corresponded to a 40-year recurrence interval based upon stream gauge data in Aptos Creek. Heavy damage occurred from this storm. At least seven homes along Moosehead and Spreckels Drive between Highway 1 and the Spreckels Drive Bridge suffered major damage. Further downstream damage resulted to major portions of two streets paralleling Aptos Creek.

Pajaro River, Salsipuedes Creek, and Corralitos Creek

During December 21 through 24, 1955, and April 2 through 4, 1958, the Pajaro Valley experienced flooding. These floods are the two largest on record for the Pajaro River. The associated discharges for these events were 24,000 cfs and 23,500 cfs, respectively, at the Chittenden gauge (USACE, 1963). The estimated recurrence intervals for floods of these magnitudes are 27 years and 26 years, respectively. In comparison, the estimated discharge at Chittenden for a 100-year flood is 43,000 cfs. (FEMA FIS 2006).

In the December 1955 flood, the Pajaro River was maintained within the levees in the Watsonville area, but the levees were breached 2.1 miles upstream of the confluence with Salsipuedes Creek (USACE, 1963). Although no lives were lost, 972 people were evacuated, and $1.12 million damage incurred. Included in these costs were monies spent to repair levees damaged by erosion. Additional levee repairs were required because of the April 1958 flood; however, no other significant damage resulted (USACE, 1963). Significant flooding along Corralitos and Salsipuedes Creeks also occurred in December 1955 and April 1958. Peak discharges for Corralitos Creek at Green Valley Road have been estimated from high-water elevations (USACE, 1956). The estimated discharges for the 1955 and 1958 floods are 3,620 cfs and 2,680 cfs, which correspond to recurrence intervals of 12 and 7 years, respectively. The overflow of Corralitos Creek upstream of the leveed section on Salsipuedes Creek flooded 29 blocks within the City of Watsonville during the December 1955 flood (USACE, 1963).

The Pajaro Valley experienced only minor damage from the January 1982 flood. (FEMA FIS, 2006). In 1995, a major flood event breached the Pajaro River levees and the Town of Pajaro was flooded.

San Lorenzo River

The San Lorenzo River basin is the largest drainage basin contained entirely within the County. Few records exist of flooding in the San Lorenzo Basin (outside of the City limits) prior to 1940. However damaging storms are known to have occurred in 1940, 1955, 1958, and 1982.

In January 1862, within the City limits, land was consumed and buildings along the riverbanks were destroyed.

January 1890 saw the largest river level recorded to this date.

In January 1895, a storm caused flooding of basement, yards, and lots in the City of Santa Cruz.

In March 1907, floodwaters were higher than previous floods. February 1940 and 1941, saw continued episodes of flooding.

December 1955 was the highest historic flood along the San Lorenzo River and had a peak discharge of 30,400 cfs, which equates to approximately a 30-year recurrence interval. The most intensive rainfall fell during a four-day period from December 21-24. In the central part of the basin, known as the Ben Lomond area, the San Lorenzo River exceeded bank full stage. Local reports indicate previous maximum stages of record were exceeded along Kings, Boulder, Two Bar, and Zayante Creeks in the upper basin. Overflows occurred from the headwaters to the mouth, resulting in the maximum flood of record. The heavy rains and overflows loosened and scoured out large trees and floated them downstream where they became lodged at channel points of constriction, impounding flow, causing extremely severe local flooding. The numerous log jams and other channel obstructions diverted the high velocity flows, causing the streams to change from the normal alignment, undercut and scour out numerous bridges, road fills, channel dams and private developments. It is estimated that at least 388 acres were flooded. Seven people (5 within the Santa Cruz City limits, 2 outside) lost their lives as a result of the flood. It is estimated that 390 people outside the City limits were displaced by the floodwaters. Numerous houses, roads, parks, and commercial properties were damaged or destroyed in the Boulder Creek, Ben Lomond, Felton, and Paradise Park areas. (USACE, 1973)

The April 1958 flood was minor in comparison to the 1955 flood, but still saw erosion, creek bank failures and damage and loss of houses.

The magnitude of the January 1982 flood was similar to the December 1955 flood and had a peak discharge of 19,700 cfs. Damage upstream of the City of Santa Cruz was extensive. The damage was most extensive in the area between the upstream limits of Felton and in the areas of Paradise Park, Gold Gulch and Felton Grove. In the Felton Grove area, floodwaters in the overbanks reached 3 to 7 feet and inundated 50 homes and cabins. An additional 60-70 homes were flooded between Felton and Ben Lomond. It is estimated that the 1982 flood had a recurrence interval along the San Lorenzo River of approximately 30 years. (FEMA FIS, 2006).

<u>Soquel Creek</u>

Storms of flood-producing magnitude occurred during March 1899, December 1937, February 1940, January 1943, November 1950, January 1952, December 1955, April 1958, October 1962, January 1963, January 1967, and January 1982. The December 1955 storm is the most severe storm of recent times, its seventy-two-hour rainfall interval was equivalent to about 35 percent of the normal annual rainfall.

During the flood of 1955, a major logjam occurred at the Soquel Avenue Bridge, causing a severe backwater condition. In Soquel, eight city blocks were inundated displacing 359 persons (USACE, 1956). Just upstream of the confluence with Hinkley Creek, floodwaters in the overbanks reached depths of five to six feet. The peak flow for Soquel Creek at the Soquel gauge indicated a peak flow of 15,800 cfs, which is a recurrence interval of 70 years (FEMA Flood Insurance Study March 2, 2006).

During the 1982 flood, the Soquel Creek basin experienced major flooding in the vicinity of the Soquel Avenue Bridge. A massive logjam diverted flow down the main street of the town of Soquel. The floodwaters rose rapidly along Soquel Creek and caused major damage to two mobile home parks adjacent to the stream. The estimated peak flow was 9,700 cfs, which equates to an estimated recurrence interval of approximately 16 years.

Beach / Coastal Flooding

Flooding along the Pacific coast of Santa Cruz is typically associated with the simultaneous occurrence of high tides, large waves, and storm swells during the winter. Significant storms, with associated damage, strike the Monterey Bay communities with regular frequency. As a result, ocean front development has not been compatible with the natural instability of the shoreline and intense winter weather conditions. (FEMA FIS, March 2, 2006).

The most severe storms on record to hit the California coast occurred in 1978 and 1983 when high water levels were accompanied by very large storm waves (FEMA FIS, 2006).

In 1978, a series of storms emanated from a more southerly direction, than normal. Consequently, some of the more protected beaches were damaged. Jetties and breakwater barriers were overtopped, and in some cases, undermined. Direct wave damage occurred to many beachfront homes and seawalls, especially in the more populated beachfront areas such as at Seacliff Beach and Rio Del Mar Beach. (FEMA FIS, 2006).

In 1983 a similar storm hit the Santa Cruz Coast. During this storm, a new 3,500-foot seawall was destroyed and in Seacliff Beach 19 of 21 homes were significantly damaged when the existing riprap protection was overtopped. (FEMA FIS, 2006).

The Pajaro Dunes area of the County that is fronted by dunes has also been subject to severe damage to structures as well as rapid beach retreat in 1968, 1969, 1978 and also in 1983. (FEMA FIS, 2006).

No major flooding events on local rivers, creek, or beaches has occurred since the previous LHMP was adopted.

Significant storms and associated damage from flooding strike the Monterey Bay communities with a frequency of one large storm every three to four years. A 100-year flood has a one percent probability of occurring in any given year and while considered to be a severe flood, it still has a reasonable possibility of regular occurrence. For the purposes of the protection of property, life and safety, floods of other magnitudes and occurrence intervals should also be considered in mitigation efforts.

Floods are gauged by their cresting elevation, the area of inundation or damages and either the size of the event or the probability of occurrence. The size and depth of the floodplain area is computed using mathematical models of precipitation, slope, runoff, soil type and cross-section. Flood depths are

calculated at intervals along a stream or channel corridor and then mapped and interpolated between sections. This results in the floodplain map.

The probability of occurrence is expressed in a percentage of the chance of a flood of a specific extent occurring in any given year. The most widely adopted design and regulatory standard for floods in the United States is the 1-percent annual chance flood, and this is the standard formally adopted by FEMA. The 1-percent annual flood is also commonly referred to as the "100-year flood," leading to the misconception that it should occur only once every 100 years. In fact, a 100-year flood may occur in any year, regardless of the time that has passed since the last one. It is the probability that smaller floods occur more often than larger floods that compels the percentage.

Flood Occurrence Intervals	Percent Chance of Occurrence Annually
10 years	10.0%
50 years	2.0%
100 years	1.0%
500 years	0.2%

Table 16 Flood probability terms

A recent study conducted by the U.S. Geological Survey projects that climate change will cause a shift in peak precipitation from January to February, with less precipitation occurring in the fall (November-December) and spring (March-April) by 2100. The U.S. Geological Survey (USGS) also concluded that while the amount of annual precipitation is not expected to substantially change as a result of climate change, precipitation will be concentrated in mid-winter[4]. As a result, flood occurrence intervals are expected to shift with the "10-year" event occurring more frequently, for example. flooding is a growing threat that deserves careful attention as one of the more hazardous impacts of climate change.

The flood hazard maps prepared by FEMA do not account for future sea level rise. In 2017 The Central Coast Wetlands Group conducted a study of future sea level rise impacts along the Santa Cruz County coast. The report titled Coastal Climate Change Vulnerability Report was funded through a grant from the Ocean Protection Council through the Local Coastal Program Sea Level Rise Adaptation Grant Program. This grant program is focused on updating Local Coastal Programs (LCPs), and other plans authorized under the Coastal Act such as Port Master Plans, Long Range Development Plans and Public Works Plans (other Coastal Act authorized plans) to address sea-level rise and climate change impacts, recognizing them as fundamental planning documents for the California coast.

The project was intended to achieve key objectives to further regional planning for the inevitable impacts associated with sea-level rise (SLR):

1. Identify what critical coastal infrastructure will be compromised due to SLR and estimate when those risks may occur; and
2. Define appropriate response strategies for these risks and discuss with regional partners the programmatic and policy options that can be adopted for LCP updates.

[4] Flint, L.E., and Flint, A.L., 2012. Simulation of Climate Change in San Francisco Bay Basins, California: Case Studies in the Russian River Valley and Santa Cruz Mountains: U.S. Geological Survey Scientific Investigations Report 2012-5132, 55 p.

The project incorporated the most complete inventory of coastline revetment and seawalls for the Monterey Bay with coastal hazard GIS layers developed by Phil Williams and Associates and ESA Consulting to account for current protections from current and future coastal hazards. The project evaluated the impacts of sea level rise on municipal infrastructure, private properties, and natural resources. The project also evaluated relevant state policies and adaptation response alternatives ranging from "grey to green" for integration into municipal planning documents. The project also fostered regional discussions regarding inclusion of appropriate adaptation strategies into Local Coastal Program and other planning documents.

The study evaluated how various sea level rise scenarios would impact both coastal flooding and coastal erosion. Two examples of the results of the study for coastal flooding of particularly vulnerable locations along the coast are shown in the following two maps. Figure 13 depicts the results of the study at Corcoran and Moran Lakes assuming increasing amounts of sea level rise (from 10 centimeters to 159 centimeters) by the year 2100. Figure 14 is a similar depiction of the hazard at Pajaro Dunes by the year 2030 with 10 centimeters of sea level rise.

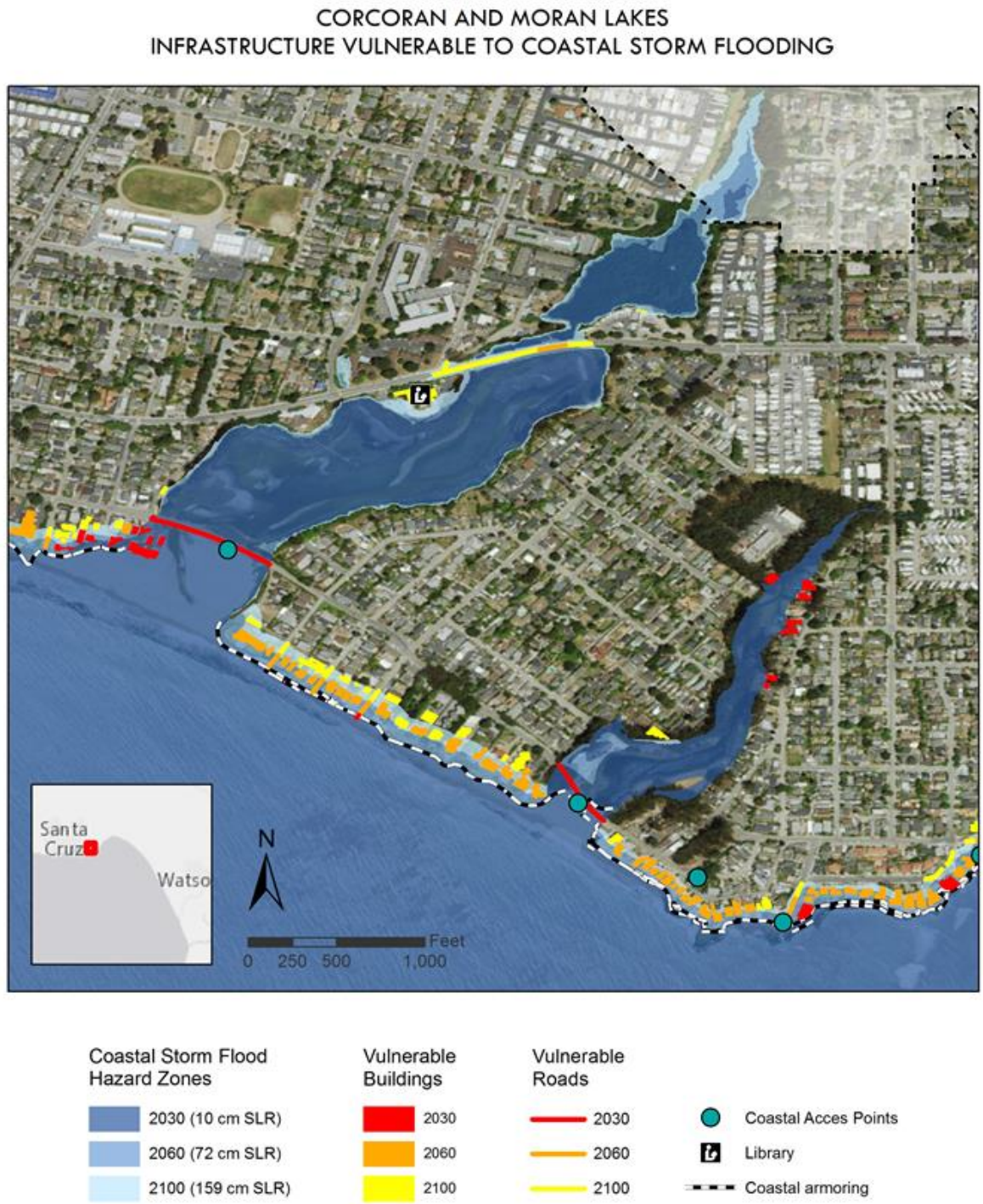


Figure 13 Infrastructure vulnerable to coastal storm flooding with sea level rise

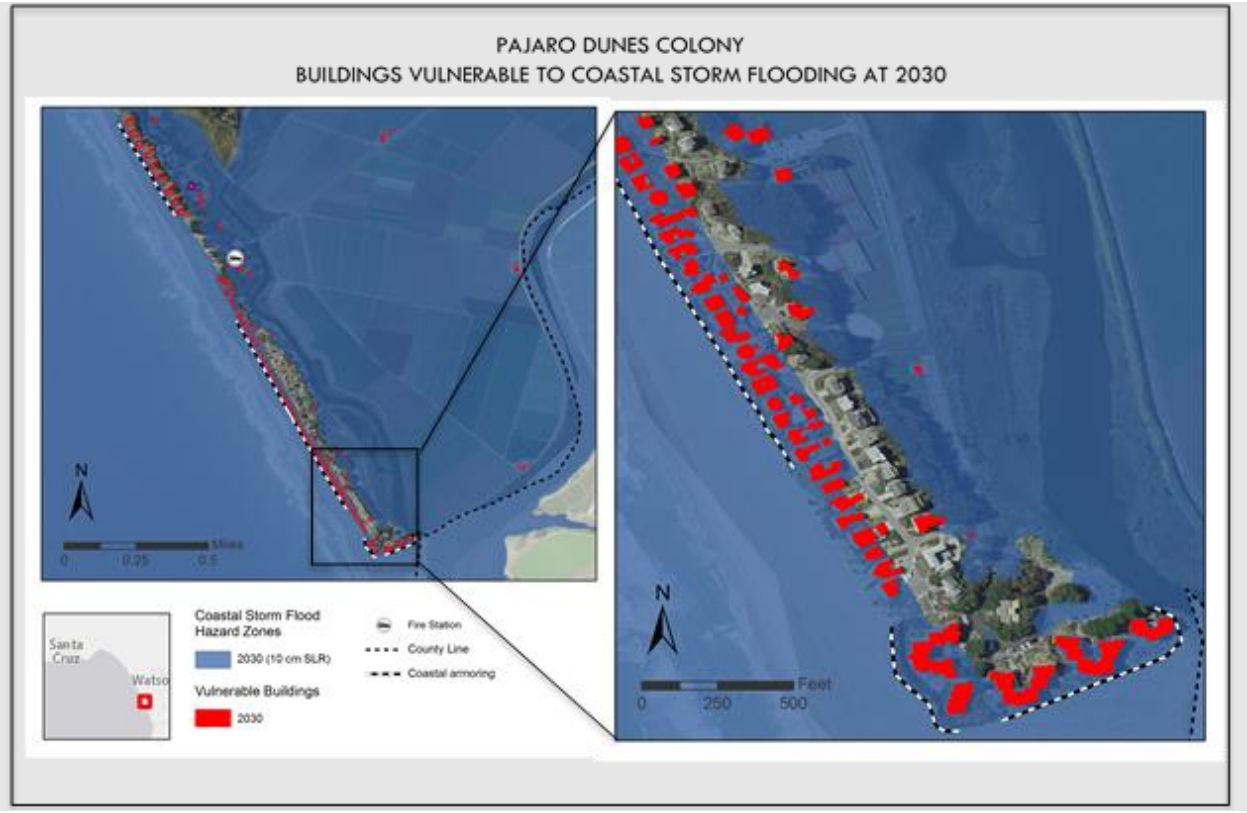


Figure 144 Pajaro Dunes vulnerability to coastal storm flooding with sea level rise

6.1.3 Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Overall Summary of Flood Vulnerability

Riverine flooding is a risk for many parts of the communities of Boulder Creek, Ben Lomond, Brookdale, Felton, Zayante, Paradise Park, unincorporated Santa Cruz, unincorporated Scotts Valley, Live Oak, Soquel, Rio Del Mar, Aptos, and unincorporated Watsonville. Coastal flooding is a risk for many homes along Live Oak, Aptos, Seascape, and unincorporated Watsonville beaches. Many homes, apartments, hotels, shops, and critical facilities have been built in these areas to accommodate resident and tourist needs. Properly protecting these structures from flooding is essential to preventing loss of human life and protecting the local economy.

Based on the 100-year flood plain (FEMA Zone A and VE), there are over 4,000 structures located in a flood hazard are in the County. Of that total, 83% are residential buildings (3,363), 6% are commercial buildings (246), 5% are agricultural buildings (208), and 1% each are government (58), industrial (45) and institutional buildings (45). Miscellaneous and utility-related buildings represent 3% (96). The institutional buildings in the floodplain include 2 schools and 3 fire stations.

Summary of Flood Protection Measures and Future Vulnerability

Flood protection measures implemented in the unincorporated areas of Santa Cruz County have included nonstructural and structural measures. The nonstructural measures include floodplain zoning ordinances that regulate building within the floodplain as well as protection of riparian areas that further limits impacts of flooding on structures. Structural measures implemented in the County have been limited primarily to the Pajaro Valley.

Although dozens of houses in the flood prone areas of the County have been elevated above the 100-year flood or wave run-up elevation over the past several decades, areas previously inundated by flooding will continue to do so in the future, with potentially substantial impacts to property, lives, and infrastructure.

Flows in excess of approximately 10,000 cfs caused flooding on the lower Pajaro River before completion of the Federal levee project (USACE, 1963). After the floods of 1938 and 1941, the USACE designed levees for the Pajaro River and Salsipuedes Creek.

Levees were completed along the Pajaro River by the USACE in 1949. Levees along the north bank begin just upstream of the mouth at the Pacific Ocean and continue to approximately River Mile 11.8 (Murphy Road); levees along the south bank begin just upstream of the mouth and continue to River Mile 10.6. The levees increased the capacity of the Pajaro River to 22,000 cfs downstream of Salsipuedes Creek, equivalent to a 25-year flood. In the same year, levee construction on Salsipuedes Creek from the confluence with the Pajaro River to River mile 2.5 on the west bank to River Mile 1.7 on the east bank was also completed (USACE, 1963). The addition of the levees increased the capacity of Salsipuedes Creek to 10,000 cfs (USACE, 1963).

In 1963, the USACE performed additional studies and recommended that the levees along the Pajaro River and along Salsipuedes and Corralitos Creeks be modified to provide additional protection (USACE, 1963). Construction was authorized in the Flood Control Act of 1966 and the project proceeded to the advanced stages of design, but local support in Watsonville was withdrawn and the project was placed in a deferred status (USACE, 1978; and USACE, 1974).

However, in recent years, studies on the Pajaro River levees have indicated that they may fail under a roughly 8-year event (approximate flow of 18,000 cfs). The County of Santa Cruz and the U.S. Army Corps of Engineers are currently working together to come up with a solution to enhance the levees and increase the level of flood protection. See Figure 15 for Pajaro River Flood Risk map.

The Santa Cruz County Flood Control and Water Conservation District (District) was established to provide funding for implementing proposed Army Corps of Engineers (Corps) flood control projects on the Pajaro River, Salsipuedes Creek, and Corralitos Creek. District staff coordinates with the Corps to ensure local needs are addressed; provides assistance to the Corps in project evaluation, as necessary, administrative, and engineering drainage services; and is responsible for the replacement, upgrade, and maintenance of drainage and flood control facilities in the levee system. The District provides administration and coordination of the Corps Pajaro River Flood Risk Reduction Project, and staff for the County's participation in the Pajaro River Watershed Flood Prevention Authority. The District staff is working to identify funding for the long-awaited levee reconstruction project. In the meantime, the

recently completed Pajaro River Bench Excavation Project has provided some additional flood conveyance capacity.

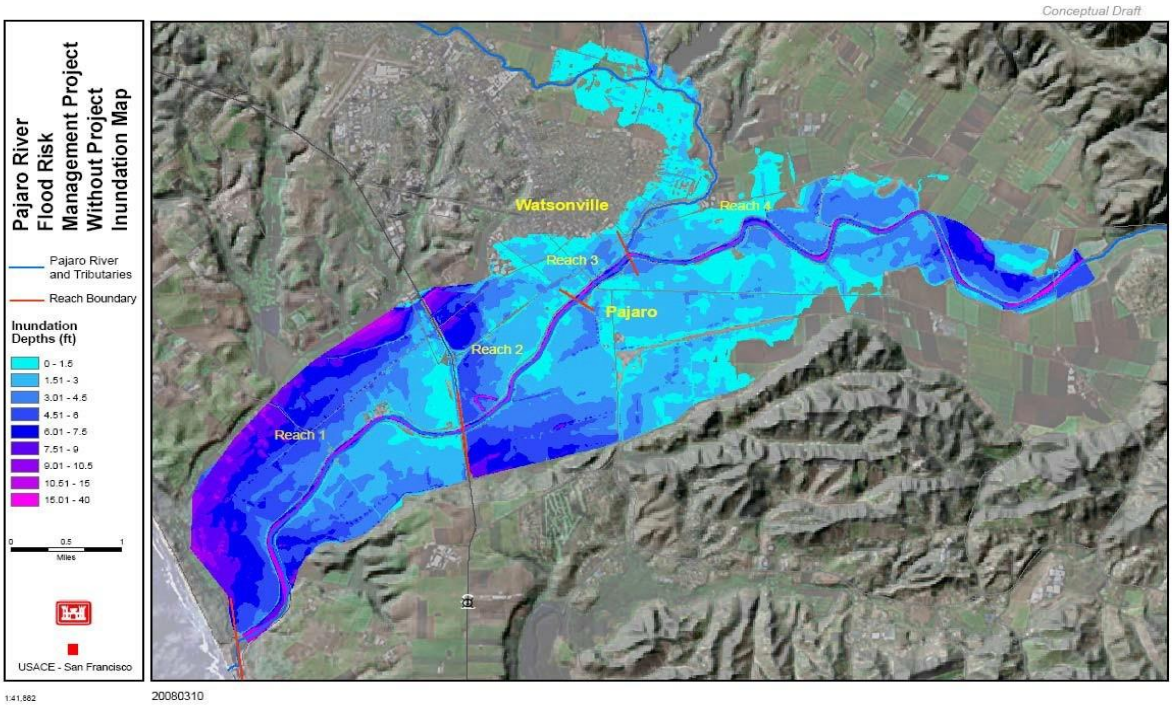


Figure 15 Pajaro River flood risk map

No major flood control projects have been constructed in the Aptos Creek, Soquel Creek, or the Santa Cruz County portion of the San Lorenzo River basins. Local interests have provided non- continuous bank protection constructed of various materials including concrete, timber, and riprap. A multiple-purpose reservoir on Soquel Creek, approximately 5 miles upstream from Monterey Bay, was found to be economically justified, but has not been implemented. A major flood control project, which includes levees and channel improvements, was constructed on the San Lorenzo River. These improvements, however, are located within the Santa Cruz City limits and not in the unincorporated portion of the county.

Residents and municipalities of northern Monterey Bay have spent hundreds of thousands of dollars on flood protection measures to prevent coastal flood damage. Permanent structures such as seawalls, boulder-sized riprap, timber, and concrete bulkheads have been installed. Of the 9.5 miles of urbanized northern Monterey Bay coastline, over half is protected by seawalls or riprap. Severe storms in January of 1983 overtopped many of the structures. Protection varied by site. At Seacliff State Beach, repeated storms have destroyed reconstruction efforts, while at New Brighton State Beach, damage was minor. At Seacliff State Beach in January 1983, high waves associated with high tides overtopped a rock rubble mound to cause major damage to 19 of 21 homes.

After the major flood in December 1955, a flood-control project was constructed by the USACE to provide protection against a flow of 53,000 cfs at the mouth of the San Lorenzo River. The flood-control project included improvements on the San Lorenzo River as well as Branciforte Creek. On the San

Lorenzo River, the project extended from the Southern Pacific Railroad (SPRR) bridge near the mouth to the city's concrete weir diversion works. Between the SPRR bridge and the State Highway 1 bridge, the project included levees, channel improvements, and bank protections; upstream of State Highway 1, only channel improvements were made. The modified channel was wider with a lower invert than the natural channel. Channel improvements were designed to provide 3 feet of freeboard and to carry 53,000 cfs downstream of the confluence with Branciforte Creek and 46,800 cfs between the confluence and the State Highway 1 bridge. On Branciforte Creek, a rectangular concrete channel was constructed and extended upstream 1 mile from the confluence with the San Lorenzo River at the Soquel Avenue bridge.

Nonstructural measures employed by the City of Santa Cruz include a logjam removal procedure and flood plain zoning ordinances. The zoning ordinances regulate development in the flood plain areas of the city.

Impact of Hazards

Flooding in the various river basins impact public health and safety, critical facilities, and infrastructure, as well as the community's economy.

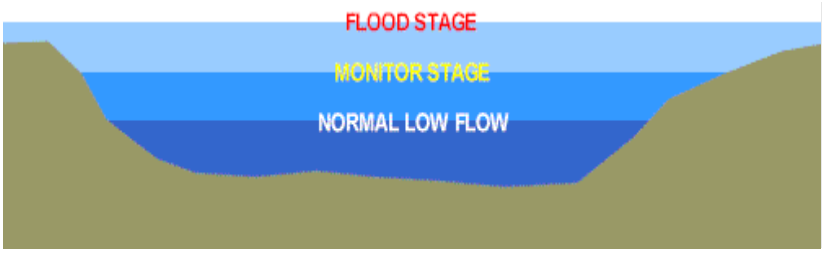
When floods hit the community, as shown by past history, public health, and safety issues (including loss of life and property as well as the overall health of the community) can be widespread. Recognition of these hazards has led the County of Santa Cruz to work with FEMA, in recent years, to assist property owners in funding elevation of homes above the base flood elevation (Felton Grove) and to develop a plan to improve levee safety (Pajaro River). Additionally, the County of Santa Cruz has improved rain and stream gauging in the San Lorenzo River, Soquel Creek, Corralitos Creek and Pajaro River watersheds. The improved gauging includes real-time monitoring of rainfall and stream levels that are monitored 24 hours a day during storm event. See Watershed Flood Monitoring Table 17, for monitoring information for various rivers and streams.

This monitoring is coordinated with the County Public Works Department, the County Emergency Operations Center, the National Weather Service in Monterey, NOAA, and the USGS. In the Pajaro River watershed, monitoring coordination also includes the Santa Clara Water District, and the counties of San Benito and Monterey. Close coordination has allowed an alert system to be developed through the use of a reverse 911 system. This system may not save fixed structures, but it can save lives. Coordination with other agencies has also helped to time releases from reservoirs (Santa Clara Water District), so that releases do not coincide with peak flows. Following is a table of Santa Cruz County Stream / River Flood Stages that has been developed to assist flood control staff in their monitoring of flooding.

Stream & Location	Datum = 0	Today's Levels	Flood Watch Stage	Flood Monitor Stage	Initial Overflow Areas	Flood Warning Stage
San Lorenzo R. Big Trees, Felton	227.0' NGVD		10.0'	14.0'	Felton Grove, Gold Gulch, and Paradise Park	18.0'
Soquel Creek Bridge St.	21.4' NGVD		8.0'	11.5'	Heart of Soquel, Old Mill Mobile Home Park, Areas west of Porter St.	14.5'
Corralitos Cr Green Valley Rd.	89.4' NGVD		9.0'	9.0'	Orchard Park Subdivision, College Rd. Flood Watch & Monitor Stages at the same level due to fast rising water	11.5'
Salsipuedes Cr Hwy 129			25.0'	32.0'	2.4-mi down-stream from Corralitos Cr., Orchard Park, College Rd (Drew Lake) Top of levee at 37.5'	34.5'
Pajaro River @ Chittenden	81.9' NGVD		23.0'	25.0'	Area along channel extending 2.5-miles upstream from confluence of Pajaro R. & Salsipuedes Cr. Top of levee at 34.5'	32.0'
Pajaro River @ Main St	0' NGVD		23.0'	27.5'		31.0'
LARC (computer voice msg - stream levels) SLR @ Big Trees: 335-9365						

Table 17 Santa Cruz County stream/river flood stages

Non-leveed Streams

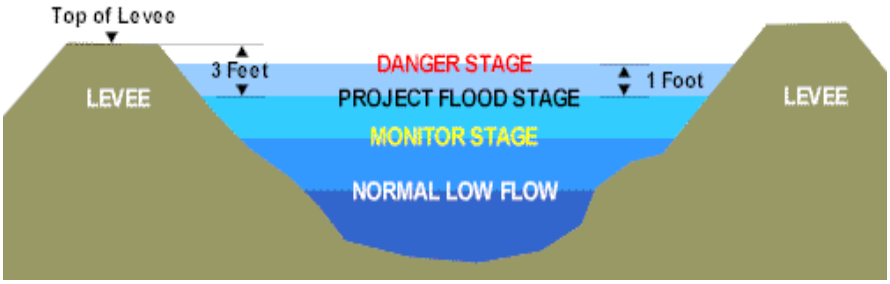


Flood Watch Stage: The Stage at which current or developing conditions pose a threat of flooding but it is NOT certain or imminent.

Flood Monitor Stage: The Stage at which initial action must be taken by concerned interests (livestock warning, removal of equipment from lowest overflow areas, or simply general surveillance of the situation). This level may produce overbank flows sufficient to cause minor flooding of low-lying lands and local roads.

Flood Warning Stage: The Stage at which overbank flows are of sufficient magnitude to cause considerable inundation of land and roads and/or threat of significant hazard to life and property.

Leveed Streams



Flood Monitor Stage: The Stage at which patrol of flood control project levees by the responsible levee maintaining agency becomes mandatory, or the Stage at which flow occurs into bypass areas from project overflow weirs.

Project Flood Stage: The Stage at which the flow in a flood control project is at maximum design capacity (U.S. Corps of Engineers "Project Flood Plain"). At this level there is a minimum freeboard of 3 feet to the top of levees.

Danger Stage: The Stage at which the flow in a flood control project is greater than maximum design capacity and where there is extreme danger with threat of significant hazard to life and property in the event of levee failure. This is generally 1 foot above project flood stage.

Requirement §201.6(c)(2)(ii): The Plan shall address NFIP insured structures within the jurisdictions that have been repetitively damaged by floods.

FEMA records indicate a total of 77 repetitive loss properties in Santa Cruz County containing a total of 94 structures. These are NFIP-insured structures that have had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978. Flood insurance claim payments on these properties alone total over $3.4 million dollars. Repetitive loss properties are concentrated in the San Lorenzo River corridor and the Aptos beach area. Santa Cruz County is classified as a Category C Repetitive Loss Community under the Community Rating System (CRS). Category C Communities are those with more than 10 repetitive loss properties. By 2012, and as a result of the 2010 LHMP, the County has worked to mitigate the flood hazard on 18 of these properties primarily through elevation of the structures. Currently, there are 59 repetitive loss properties that have not been mitigated.

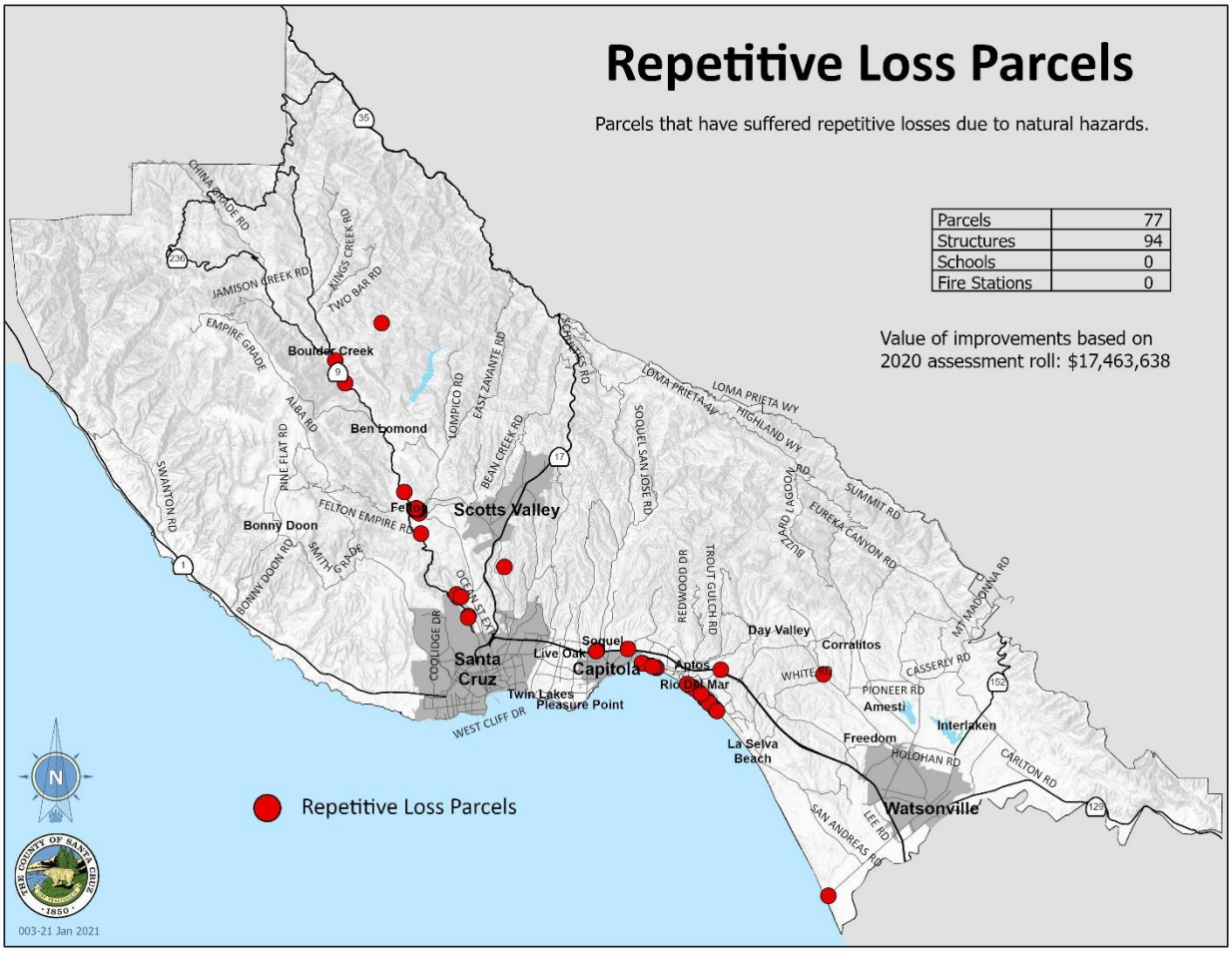


Figure 16 Repetitive loss properties in Santa Cruz County

6.1.4 Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas.

Table 18 identifies the number of parcels that intersect the flood plain. All of the structures on those parcels have been included as potential losses in that table. However, a more detailed analysis, recently completed for the FEMA Biennial Report, assessed whether specific habitable structures on those parcels were located within the floodplain. This data shows that there are over 2,000 1–4-unit residential structures and over 200 other habitable structures in the flood hazard areas of Santa Cruz County. Approximately 16,000 permanent year-round Santa Cruz County residents live in flood hazard areas.

6.1.5 Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.

Potential Dollar Loss to Vulnerable Structures

More than 6,600 parcels lie within the flood zone areas with the majority of these parcels categorized as residential. Within the residential areas, there are over 3,300 structures. The population in the flood zone is approximately 16,182. The potential loss in residential areas alone tops $ 1 billion. When all types of land use are considered, the potential loss is nearly $ 1.26 billion.

Land Use	Parcels	Structures	Total Assessed Value 2020
Agricultural	333	208	$37,258,624
Commercial	227	246	$83,568,431
Government	257	58	$0
Industrial	42	45	$26,548,326
Institutional	80	45	$43,267,619
Miscellaneous	276	80	$19,398,018
Residential	5,394	3,363	$1,048,044,563
Utilities	37	16	$394,594
Total	**6,646**	**4,061**	**$1,258,480,175**
Population	14,726		
Population is based on the number of residential parcels x 2.73 (See Table 3)			

Table 18 Flood potential loss inventory

Methodology Used to Prepare Estimate

Valuations of parcels within a hazard area are based on improvement values only as collected by appraisers with the Santa Cruz County Assessor's Office. They do not reflect sale value or replacement value. If a parcel intersected a hazard, the entire improvement value of that parcel was used.

Census population blocks were reduced to center points. If a hazard intersected a center point, that population was counted.

Since FEMA flood data is mapped on the federal level, the data is somewhat coarse in horizontal accuracy. The data is a rough estimate of expected flood elevations and loss areas.

Estimating flood losses is an established process. If a "100 year" flood occurred in our county, meaning that the flood has a 1% chance of occurring in any given year, it would impact over 4,000 structures to various degrees. This was determined by intersecting the county's database of structures with the FEMA-developed maps of the 100-year floodplain. Structures within the floodplain vary in construction, size, and materials, ranging from single- family homes to multi-family to commercial.

The 2017 Santa Cruz County Coastal Climate Change Vulnerability Report provides similar estimates for coastal flood hazard areas subject to future sea level rise. Regarding the areas of Rio Del Mar and Pajaro Dunes, for example, coastal access, parking and 80 commercial and residential buildings are vulnerable to wave damage and coastal flooding by 2030 (10 cm of sea level rise) within the low-lying sections of Rio del Mar. More than 130 buildings within the Pajaro Dunes Colony (many comprised of multiple residences) are also vulnerable to flooding during winter storms.

By 2060 more than 800 additional buildings are at risk of impact from a predicted 2.4 ft. rise in sea levels as coastal protective structures begin to fail. If current structures are replaced, it is estimated that 500 of the vulnerable buildings would be protected, 400 of which are private residence. By 2100, more than 1,800 residential properties within the unincorporated county are vulnerable to coastal climate change hazards.

6.1.6 Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Santa Cruz County has a number of compact urban communities as well as extensive areas of agricultural land and forested hillsides. A number of rural villages and towns are located throughout the County. As mandated by the 1978 Growth Management Ordinance, most new development has occurred within or adjacent to the urban services line (i.e., the boundary point for such infrastructure as water and sewage service). As with most communities, increased housing costs have resulted in the need to provide higher density housing. In Santa Cruz County, all development of this type occurs where urban services are available. Other development is mostly infill or reuse development, and development of existing rural residential properties.

Growth Management policies prevent development from occurring where hazards are present and, in most cases, require substantial setbacks from these hazards.

No changes in these development regulations or patterns occurred that would affect the County's overall vulnerability since the previous plan was adopted in 2016. As stated above, growth management

policies prevent new development from occurring where hazards are present. Development on existing lots of record is required to avoid hazards and incorporate appropriate setbacks, structural elevation, floodproofing, and other requirements to mitigate potential impacts from flood hazards. Since the last LHMP in 2016, there has been twelve new residential structures and one commercial structure built on existing lots of record in flood hazard areas in the County. The Environmental Planning Section of the Planning Department, staffed by Resource Planners, one of which is the designated floodplain manager, specialize in reviewing each application for new residential and commercial structures to ensure that new development does not occur in hazard zones and that development on existing lots of record avoid, minimize, and mitigate potential impacts from identified flood hazards. These policies and procedures implement the mitigation strategy described below.

6.2 Mitigation Strategy

Requirement §201.6(c)(3): The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

Programs Currently in Effect

The County participates in the National Flood Insurance Program (NFIP) regulating development in the floodplain according to NFIP standards. The County has adopted a floodplain management ordinance that incorporates the FEMA model ordinance and includes stricter local requirements. The County's floodplain management ordinance and other activities and programs implemented locally by the Planning Department have qualified us to participate in the NFIP and the Community Rating System, which has reduced flood risk and incrementally reduced flood insurance rates for all residences in Santa Cruz County. The County entered the NFIP program following the publication of the original NFIP insurance rate maps for Santa Cruz County in 1984. The County has continuously participated in the program and plans to continue to comply with NFIP requirements.

The County of Santa Cruz currently addresses land use within the floodplain in the General Plan as well as actively enforcing related building, zoning, and resource planning codes, and other land use regulations concerning development within the 100-year floodplain. The 2019 California Building Code has several new enforceable provisions for development in flood hazard areas, which are incorporated into County building and resource planning codes.

The County participates in a number of ongoing mitigation actions to avoid or reduce the threats of flood. Actions include:

- The County is the lead agency in an early warning flood forecasting system for evacuation of areas susceptible to flooding.
- Continual improvements to the early warning system are being planned and implemented, especially as they relate to the Upper Pajaro watershed, the San Lorenzo watershed and in the severely burned areas of recent fires.
- Regulations on development and alteration of flood plains, stream channels and protective barriers that accommodate overflow are in place.

- Developing improvement plans for the Pajaro River Levee system in collaboration with the Army Corps of Engineers to meet 100-year storm event capacity.
- Encouragement of property owners, potential buyers and residents living in floodplains and coastal inundation areas to participate in the National Flood Insurance Program (NFIP).
- Rehabilitation of remote culverts and storm drainage systems to reduce flooding caused by inadequate storm drainage.

Additionally, annual flood control maintenance on the Pajaro River is performed by the Public Works Department. This work is required by the U.S. Army Corps of Engineers and consists primarily of managing in-stream riparian vegetation to encourage geomorphic form and function. The vegetation management plan is identified in the Final EIR for the Pajaro River and Salsipuedes and Corralitos Creeks and requires vegetated buffer zones to be generally maintained at 10-feet at the toe of the levees and 5-feet along the wetted edge of the river. The vegetation management is required in order for winter flows not to exceed the design capacity of the Pajaro River levees.

Future Plans

The County has taken the necessary steps to apply for and be accepted into the Community Rating System (CRS). The CRS is a voluntary incentive program that is part of the National Flood Insurance Program (NFIP). The program recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements (FEMA 2002). As a result, flood insurance premium rates have been discounted to reflect the reduced flood risk resulting from community actions meeting the following three goals of the CRS:

- Reduce flood losses
- Facilitate accurate insurance rating
- Promote awareness of flood insurance

For communities participating in the CRS, flood insurance premium rates are discounted in increments of 5 percent, with the lowest class communities receiving the highest discount. For example, a Class One community would receive a 45 percent premium discount, and a Class Nine community would receive a 5 percent discount. A Class Eight community, which is the current designation for Santa Cruz County, receives a 10% discount. The CRS classes for local communities are based on 18 creditable activities organized under the following four categories:

- Public Information
- Mapping and Regulations
- Flood Damage Reduction
- Flood Preparedness

Currently, approximately 1,000 communities nationwide receive flood insurance premium discounts based on implementation of local mitigation, outreach, and educational activities that go well beyond minimum NFIP requirements.

Assigning Priority to Mitigation Actions

Priority levels have been assigned to each of the mitigation actions. Highest priority has been given to those actions that are relatively inexpensive to implement, are required as part of other programs (e.g. NFIP), and/or will reduce the costs of flood damage to the County and the costs of flood insurance to the public.

Project Feasibility

It should be noted that there are many items that are infeasible at this time due to current County budget cuts and recent and possible future layoffs. These items include installing gauges on Aptos and Valencia Creeks, and expansion of drainage system monitoring. In addition to limited funding for implementing these programs, there is very little staff time to devote to applying for financial assistance. As the economic climate improves, these programs can be integrated into future iterations of this report.

An assessment of this mitigation strategy as part of this 5-year plan update indicates the strategy is effective for reducing potential losses identified in the risk assessment. The current flooding risk has not changed since the previous plan was adopted. No adjustments are needed to address a change in circumstances. There have been no major flooding events during the five-year update period.

6.2.1 Mitigation Goals

Requirement §201.6(c)(3)(i): The hazard mitigation strategy shall include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

The County of Santa Cruz has developed several flood hazard mitigation goals to create a more flood-resistant community.

Flood Goals

Flood 1 - Avoid or reduce the potential for life loss, property, and economic damage from flooding.

Flood 2 - Enhance emergency management tools.

Flood 3 - Protect critical facilities, schools, and utilities from flooding.

Flood 4 - Promote public awareness of flood hazards, mitigation measures and flood insurance.

Flood 5 - Preserve open space in the flood hazard area.

6.2.2 Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

Flood hazard mitigation strategies include the following actions. The alpha-numeric identifiers after each action are further described in Chapter 15 Mitigation Strategy.

- Continue to enforce flood plain management regulations on all permit applications. (A-2)
- Continue to participate in the Community Rating system to improve floodplain management. (A-3)
- Review and revise California Environmental quality Act (CEQA) Initial Study checklist to ensure storm water runoff is fully mitigated. (B-2)
- Update and revise the Geologic Hazards Ordinance. (B-5)
- Pursue elevation of structures to raise them above the 100-year flood level. (B-6)
- Continue to enforce requirements for on-site retention of storm water runoff from impervious surfaces where feasible for all new development in the Groundwater Recharge Zone and the Water Supply Watershed Zone and throughout Santa Cruz County. (B-7)
- Evaluate the effectiveness of current policies and ordinances designed to limit storm water runoff and recommend revisions to improve the effectiveness of these policies. (B-8)
- Evaluate the effectiveness of current drainage plan requirements. (B-9)
- Implement the "Stormwater Facilities Master Plan" for Flood control Districts 5. (B-10)
- Continue to inspect and maintain drainage system infrastructure. (B-11)
- Develop public education materials on flood protection and mitigation by working collaboratively with community groups, non- governmental organizations, and the local media. (B-12)
- Regulate development in flood zones to optimize preservation of open space through the application of the Geologic Hazards Ordinance and Open Space Preservation policies. (B-13)
- Limit development and monitor conditions of development and grading permits near natural channels and wetlands to prevent sedimentation. (B14)
- Implement the Pajaro River Flood Risk Management Project to reduce the probability and consequences of flooding in the City of Watsonville, the Town of Pajaro, and surrounding agricultural lands. (B-20 New)

Implementation and Evaluation

As part of the County's participation in the CRS program, a Flood Mitigation Planning Committee has been created and consists of the Floodplain Manager and key Planning Department, Office of Emergency Services, and Department of Public Works staff members. The County convenes regular meetings of the Committee to assess and evaluate progress on the goals and action items in the Plan. Additionally, the Committee works with responsible agencies to promote the goals and action items in their annual budgets and work programs. The Committee prepares an Annual Evaluation Report and distributes the report to the Board of Supervisors, the Community Rating System Coordinator for inclusion in the annual Community Rating System Report, the local news media, and the public.

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. Continuing efforts to address flood hazards has been a very high priority for Planning Department staff. Accomplishments include updating how we define substantial damage/substantial improvement in flood plain management to reflect current structure valuation, and participation in the Community Rating System to improve flood plain management and reduce insurance costs. The Planning Department has updated the Safety Element of the General Plan, the Geologic Hazards Ordinance, and the Flood Plain Ordinance. These updates are in effect outside of the Coastal Zone and are awaiting certification by the California Coastal Commission prior to being in effect in the Coastal Zone. The Planning Department continues to review development applications for emergency use and critical structures, and all other structures, for compliance with the California building code and the Geologic Hazards Ordinance regarding flood hazards. Planning staff has developed public education materials and mailed to properties within flood hazard areas. An explanation of how the previous mitigation plan has been implemented over the last five years is included in Appendix L. The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. There are no recommended changes to the mitigation actions for earthquake hazards, and the actions will continue to be implemented on an ongoing basis through existing regulatory mechanisms and funding and staff resources.

2021 Progress Report

The integration of the plan into existing planning mechanisms and the implementation of mitigation actions demonstrate progress in risk reduction. An explanation of how the mitigation plan for flood hazards has been implemented over the last five years is included in Appendix L and described below for each Mitigation Action related to flood hazard reduction.

- The County participates in the National Flood Insurance Program and has a flood plain management ordinance administered by a floodplain manager. All permit applications potentially impacted by flood hazards are reviewed by the floodplain manager. Notably, the issue of substantial improvement of existing building has been addressed. The “Flood Zones – Substantial Improvements” interpretation became effective February 10, 2010. The interpretation effectively increased the substantial improvement dollar value per square foot from $107 to $212.17 for most single-family dwellings and $318.25 for single family dwellings in the coastal high hazard area. The “Flood Zones –Substantial Improvements” interpretation was subsequently superseded by the new Substantial Improvement / Damage Review forms created in March 2013. These forms have simplified the permit requirements for applicants and reduced application review time for staff. (A-2)
- Planning Department staff completed the application for participation in the CRS Program during the 2011-2012 fiscal year. The County of Santa Cruz was accepted into the program as a Class 8 Community effective October 1, 2012. Staff has maintained this rating since the effective date. The Class 8 rating qualifies homeowners for a 10% reduction in flood insurance premiums. (A-3)
- The Initial Study Checklist used by County staff has been updated to ensure that storm water runoff is fully considered and mitigated to the extent possible. Ongoing updates will take place, as necessary. (B-2)
- Funding was obtained and the Geologic Hazards Ordinance was amended in 2020. The completed Geologic Hazards Ordinance update is awaiting certification by the California Coastal

Commission. The update of the ordinance was coordinated with an update of the Safety Element of the General Plan and other implementing ordinances. (B-5)

- Per the Geologic Hazards Ordinance, the Planning Department continues to evaluate incoming building and development permit applications for structures in flood hazard areas to determine if the work will meet or exceed the threshold for a substantial improvement. Structures for which substantial improvements are proposed are required to be elevated. For those projects that do not exceed substantial improvement, the applicant is advised of the benefits of elevation of the structure. During the reporting period, the Planning Department has issued 10 permits for elevated structures and received 8 elevation certificates for newly elevated structures. Applicants continue to keep the size of renovation projects below the substantial improvement threshold in order to avoid the elevation requirement. (B-6)
- Public Works Stormwater Management staff continues to require on site mitigations to control runoff volume and rates from new or redeveloped impervious areas where feasible throughout Santa Cruz County. (B-7)
- On March 6, 2012, the Board of Supervisors adopted Ordinance No. 5117 adding Chapter 7.79 Runoff and Pollution Control to the Santa Cruz County Code. The adoption of the ordinance was supplemented by changes to the County Design Criteria on the same day (B-8)
- As part of developing the 2012 Ordinance, requirements for both new and redeveloped sites have been generated to minimize impervious area impacts to flooding and water quality. Stormwater mitigation requirements apply to new and redevelopment type of projects. Work is needed to develop quantifiable criteria for minimizing impervious areas required by both the Design Criteria and the General Plan (B-9)
- The Master Plan for Zones 5 and 6, the most urbanized areas of the county, was completed in August 2013. The Master Plan identified recommended improvements that Public Works and the Flood Control Districts will consider in prioritizing the drainage improvements within these zones. Zone 5 is in the process of updating the Zone Drainage Master Plan to assess the condition and capacity of the larger conveyances within the Zone, to estimate the cost of comprehensive maintenance and CIP program. The goal of this update is also to seek sustainable funding source to maintain and upgrade the drainage facilities within the zone. Also, one of the tasks in the Zone 5 Master Plan update will be about “limited” modeling for climate change and sea level rise. One iteration of climate change impacts will be modeled on the CIP pipe and creek models. The climate change iteration will include tidal boundary change due to sea level rise and increased runoff due to precipitation change. (B-10)
- The Department of Public Works continued to inspect and maintain drainage system infrastructure. Approximately 3000 junction structures, 2262 minor culverts, and 160 bridges and major culverts are maintained. From 2014 through present the Public Works Department has replaced approximately 116 culverts. Public Works continues to struggle to maintain the County’s existing drainage infrastructure due to the continued shortfall of State and Federal funds and declining gas tax revenues. The lack of available funding affects our staffing levels and our ability to perform necessary maintenance and repairs. (B-11)
- Distribution of a flood hazard brochure is required as a condition of participation within the CRS Program. The brochure is sent out annually to properties within flood hazard areas. The brochure is also provided annually to real estate offices, mortgage companies, and insurance providers within the County. The flood hazard brochure gets sent to over 4700 addresses every year. This requires significant staff resources to print, fold and tape the brochures. In 2017, the County was required to update the CRS program to conform to the guidelines in the revised CRS

Coordinator's Manual. The brochure at that time was replaced with a postcard that directs the property owner or resident to an online resource with the required information. (B-12)

- The existing Geologic Hazards Ordinance and Riparian Corridor and Wetland Protection Ordinance have been effective at preserving open space for most development. The Planning Department continues to improve on understanding the relationship between the two and enforcing them cohesively. The new Flood Hazard Ordinance has been adopted based on the State model ordinance and will further optimize preservation of open space through clarification of the existing ordinance. Revisions to the Riparian Corridor and Wetland Protection Ordinance have been postponed due to limited staff resources. (B-13)
- The Riparian Protection ordinance prohibits development within riparian corridors and buffers. The Planning Department actively works with developers to reduce the need for Riparian Exceptions when they can be avoided. In addition, the new Runoff and Pollution Control ordinance authorizes Public Works staff to inspect stormwater mitigation practices for development projects once every five years (or more often if necessary). (B-14)

The worksheets in Appendix L also describe how the current mitigation strategy, including the goals and hazard mitigation actions, will be implemented over the next five years. There are no recommended changes to the mitigation actions for flood hazards, or the priorities of the mitigation actions. The actions will continue to be implemented on an ongoing basis through existing regulatory mechanisms and funding availability.

Requirement §201.6(c)(3)(ii): The Plan shall address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate.

The Planning Department continues to review all permit applications, including over-the-counter applications, within the Special Flood Hazard Area (SFHA) for compliance with NFIP and County floodplain management regulations for new and substantially improved structures. The construction value for permits issued within the SFHA are recorded and tracked for cumulative improvements within a 5-year period. Since the adoption of the most recent LHMP in 2016 the Planning Department has reviewed approximately 330 permits within the SFHA.

The County of Santa Cruz was accepted into the Community Rating System (CRS) program as a Class 8 Community effective October 1, 2012. The County continues to participate in the program. A 5-year Cycle Visit was held on November 15, 2017 to review the County floodplain management program under the 2017 CRS Coordinator Manual. Results were returned to the County in July 2018. Staff has maintained a Class 8 rating even under migration from scoring using the 2007 CRS Coordinators Manual to the 2017 Manual. A Class 8 rating qualifies homeowners for a 10% reduction in flood insurance premiums. The 2019 CRS Annual Recertification was accepted on September 13, 2019.