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Central Coast Hydrologic Region

Central Coast Hydrologic Region Summary

This section is under development.

Current State of the Region

Setting

The Central Coast Hydrologic Region extends from southern San Mateo County in the north to Santa Barbara County in the south (Figure CC-1 Central Coast Hydrologic Region). The region includes all of Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara counties, most of San Benito, and parts of San Mateo, Santa Clara, Ventura, and Kern counties. Geographically, the vegetation and topography of the Central Coast is highly variable and includes redwood forests, foggy coastal terraces, chaparral-covered hills, green cultivated valley floors, stands of oak, warm and cool vineyards, and semi-arid grasslands. The climate and microclimates of the region are unique and foster both ecological and agricultural diversity.

PLACEHOLDER Figure CC-1 Central Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

Among all of California's hydrologic regions, the Central Coast is the most reliant on groundwater for its water supply (Figure CC-2.)

PLACEHOLDER Figure CC-2 Agricultural and Urban Demand Supplied by Groundwater. From DWR Bulletin 118 – California's Groundwater (2003)

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Groundwater supplies are locally supplemented by stream diversions, timed releases from regional reservoirs, and some imported surface water. Factors that affect water availability in the region include precipitation, groundwater recharge capacity, groundwater quality degradation, groundwater pumping management styles or practices, surface water and reservoir storage capacity, as well as the annually variable SWP and CVP water deliveries.

The Central Coast Hydrologic Region receives very little snow, and floodwaters originate primarily from rainstorms in winter and spring. Streams draining the mountains of the Central Coast are subject to short, intense floods, causing frequent flood damage in agricultural and urban areas. Most streams produce slow-rise floods, but the steep mountainous terrain can produce flash floods that are intense and of short duration. Extended precipitation may produce debris flows, particularly after a season of hillside fire damage, and the steepness of the streams can increase the sediment size to boulder proportions. In urban areas, excessive stormwater runoff can result in shallow flooding, especially in coastal communities where storm surges may coincide with high tides. Tsunamis, though rare, also pose a threat to the low-

lying coastal areas. Structural failure of the region's dams, levees, and other water-related infrastructure also provides the potential for flooding.

Flooding is a significant issue in the Central Coast Hydrologic Region, and exposure to a 500-year flood event threatens one in three residents, more than $40 billion dollars of assets (crops, buildings, and public infrastructure), and over 310 sensitive species. In Monterey County, more than 50 percent of the population is exposed to 500-year flood event. In the Central Coast region, local flood-related projects totaling $280 million have been proposed, including major projects on the Carmel River, Pajaro River, Salinas River, Soap Lake, and Llagas Creek.

Flood damage has been observed in the Central Coast Hydrologic Region since at least 1861. For a list of floods in this hydrologic region, refer to the California Flood Future Report Attachment C: Flood History of California Technical Memorandum.

Watersheds

The Central Coast Hydrologic Region is divided here into the Northern and Southern Planning Areas. These Planning Areas are geographic collections of individual and shared watersheds with the Monterey-San Luis Obispo county line serving as the boundary between the two Planning Areas. All rivers within the Central Coast region drain into the Pacific Ocean. Following are summary descriptions of each Planning Area.

Northern Planning Area Watersheds

The Northern Planning Area contains all of Santa Cruz and Monterey counties, most of San Benito County, the southern part of Santa Clara County, and a small part of southern San Mateo County. The main rivers in the region are the San Lorenzo, Pajaro, Salinas, San Benito, Carmel, San Antonio, and Nacimiento. Coastal watersheds west of the northern Santa Lucia Range include the Little Sur and Big Sur rivers and numerous coastal streams, some of which are perennial.

The San Lorenzo River originates at the crests of the Santa Cruz and Ben Lomond Mountain ranges and enters the Pacific Ocean at Santa Cruz. The upper areas are heavily forested, and criss-crossed with many old logging roads that now serve rural residences. The Pajaro River begins in southern Santa Clara County and is joined by Pacheco Creek, the San Benito River, and Tres Piños Creek. The Pajaro River watershed spans four counties, covering over 1,300 square miles. The river enters Monterey Bay and the Pacific Ocean west of Watsonville. The Pajaro River watershed is one of the Central Coast regions largest and is well known for its productive agricultural soils and powerful flooding characteristics.

The largest watershed in the region is the Salinas River watershed, covering 4,600 square miles, draining more than 40 percent of the Central Coast region. The Salinas River originates in the La Panza Mountains of San Luis Obispo County and flows northward through the Salinas Valley to Monterey Bay, a length of approximately 170 miles. Major tributaries to the Lower Salinas River watershed are the Nacimiento, San Antonio, and Arroyo Seco rivers, all of which originate west of the Salinas River in the Santa Lucia Range. Other tributaries are the Estrella River and San Lorenzo Creek, which begin east of the Salinas River in the Cholame Hills and Gabilan Range, joining the river at King City. Agriculture dominates the bottomlands of this watershed.

The Carmel River watershed begins on the western slopes of the Sierra de Salinas range, covering about

200,000 acres of Monterey County. Numerous creeks join the Carmel River, which flows through Carmel Valley to the Carmel River lagoon and into the Monterey Bay National Marine Sanctuary at Carmel Bay. The Carmel Valley has a mixture of urban areas, rural residential, agriculture, rangeland and recreational areas. The upper reaches of the Carmel River, above the Los Padres Dam, flow through the Los Padres National Forest.

The Santa Lucia watersheds originate in Los Padres National Forest, on the steep northwestern slopes of the Santa Lucia Mountains in Monterey County, characterized by many small coastal streams that flow directly to the ocean.

Southern Planning Area Watersheds

The Southern Planning Area contains all of San Luis Obispo and Santa Barbara counties, as well as a portion of northwest Ventura and a few square miles of Kern counties. The principal watersheds are the Upper Salinas, the Santa Maria—which includes the Huasana, Cuyama, and Sisquoc rivers—the San Luis Obispo, San Antonio, Santa Ynez, Carrizo Plain, and the Santa Barbara Channel Islands. As in the Northern Planning Area, coastal watersheds here are mostly short and steep.

The Upper Salinas River originates in the La Panza Mountains of southern San Luis Obispo County and flows northward, joined by several creeks and the Estrella River before crossing over into the Northern Planning Area. The Morro Bay watershed and estuary, south of Big Sur, covers about 48,450 acres, and is one of the last relatively unaltered coastal wetlands along the central and southern California coast.

The Santa Maria, San Antonio, and Santa Ynez watersheds drain to the Pacific Ocean through rivers that originate 10 or more miles inland to the east.The Santa Maria River watershed covers 1,880 square miles, making it the second largest watershed in the Central Coast hydrologic region. The broad, flat Santa Maria valley is protected from flooding by levees and a series of flood control channels and basins. The Santa Ynez River watershed in Santa Barbara County includes Lake Cachuma, the Santa Ynez River and other smaller tributaries within the area.

The San Luis Obispo watershed consists of coastal streams that originate in the hills and mountains southeast of the Santa Lucia Range. The Carrizo Plain, just west of the San Luis Obispo-Kern county line, is a large semi-enclosed alkali ephemeral lake basin traversed by the San Andreas Fault. The Santa Barbara Channel Islands watersheds drain to the Pacific Ocean through streams and minor drainages on each of the islands.

Additional descriptions of these watersheds and the water quality discussion can be found in the Water Quality section.

Groundwater Aquifers

This section is under development.

Ecosystems

Within the Central Coast region, the varied and often unique flora and fauna are supported by ecosystems that reflect the local geology, hydrology, and climate. Distinct ecological sections are represented in the region: the Central California Coast, the Central California Coast Range, and the Southern California

Coast, of which only Santa Barbara County is a part. Each of these ecological sections has ecosystems that support diverse, sometimes specialized, assemblages of plants and animals. The Central Coast is home to numerous threatened and endangered wildlife (Box CC-1) (Table CC-1) and plant species (Table CC-2.)

PLACEHOLDER Box CC-1 Explanation of Federal- and State-listed Plant and Wildlife Ranking/Determinations

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

PLACEHOLDER Table CC-1 Critical Wildlife Species List for the Central Coast

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

PLACEHOLDER Table CC-2 Critical Plant Species List for the Central Coast

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Watersheds in the Northern Planning Area are variable in habitat, climate, and geology. The Santa Cruz Mountains bioregion supports redwood and Douglas fir forests, Coast live oak, chaparral and manzanita shrub lands, coyote brush, and native California grasses. Unique to the area are plant communities such as sand hills and sand parklands. The northern Santa Cruz County planning region includes the southernmost range for coho salmon, and contains three of the five streams where these fish occur south of San Francisco. Santa Cruz County watersheds also support populations of steelhead trout and the California red-legged frog.

The ecological subsection of Watsonville Plain-Salinas Valley contains the Pajaro and Salinas rivers, and the Elkhorn Slough. The landscape is predominantly alluvial plain, covered with stream-derived, rich soils. Woodlands contain Valley and Coast live oak, and riparian areas have scattered stands of cottonwood and willow. Elkhorn Slough harbors one of the largest tracts of tidal salt marsh in California. This ecological area provides much-needed habitat for hundreds of species of plants and animals, including more than 340 species of birds. More than 7,000 acres of protected lands are in the Elkhorn Slough watershed. Moss Landing Wildlife Area is in Monterey County adjacent to Elkhorn Slough. There are 728 acres of salt ponds and salt marsh just north of Monterey. This is part of the largest unaltered salt marsh along the California coast.

The Salinas River watershed's riparian habitat occurs along narrow strands along the banks of the Salinas River but rarely exists as extensive, mature stands. Over time, the riparian habitat has been reduced and fragmented by agricultural conversion, urban development, grazing, and flood control activities. Tributaries to the Salinas River provide natural habitat for steelhead trout.

The Santa Lucia Range contains canyons populated by Douglas fir, redwood, oaks and mixed conifers, California sagebrush, chaparral, and manzanita shrubs.

Watersheds in the Southern Planning Area in San Luis Obispo and Santa Barbara counties support a wide

variety of landscapes populated by coastal chaparral, Valley, Coast live, and Blue oaks, mixed conifers, willows, sycamores, manzanita, and grasslands. Semiarid mountains, serpentine habitats, grasslands, juniper and oak woodlands provide habitat and migration corridors for a wide variety of native species.

The Carrizo Plain, east of the Cuyama River and the Caliente Range, contains 250,000 acres of native California grasslands—the largest single native grassland remaining in California. The plain's ecosystem supports the largest concentration of endangered animal species in California.

Santa Barbara County is located at a point of transition between the Southern California and Northern California ecozones and is characterized by rare plant assemblages. More than 1,400 plant and animal species are found in the county. Several salt marshes occur in Santa Barbara County and provide habitat for a number of estuarine invertebrates and fish, migratory birds, and rare and endangered animal species.

Flood

Slow-rise flooding is the overwhelmingly predominant type of flood in the Central Coast Hydrologic Region. Debris flows occur in most major storms, particularly when forest fires of the previous season have damaged vegetation. Tsunamis are infrequent but have been known to cause major devastation. Flash floods and coastal flooding also cause damage at times, and stormwater and structure failures occasionally occur. Flood damage has been observed in the Central Coast Hydrologic Region since at least 1861.

The region was included in a statewide inundation identified as "The Great Flood" in 1861-1862. During the Great Flood, the narrow coastal plains in Santa Barbara County were flooded. In San Luis Obispo County, many creeks overflowed, including Villa, Cayucos, Morro, Little Morro, Chorro, Los Osos, and San Simeon creeks. Up to 4 feet of floodwater was sustained in downtown San Luis Obispo, and widespread flooding damaged 142 homes, 110 businesses, 16 bridges, 1,800 acres of agricultural land, and many schools, parks, and other public properties, as well as utility and rail lines.

In 1937, Llagas Creek overflowed and damaged the Gilroy-Morgan Hill-San Martin area. There was regional inundation in February and March of 1938, and damages totaled $1.2 million. The December 1955 flood inundated 14,400 acres in the northern portion of the Central Coastal Hydrologic Region and caused $16 million in damage. In March and April of 1958, the Pajaro River severely eroded its levees, and the Carmel River flooded adjacent lands near State Highway 1. In December 1966 through January 1967, in the Salinas Valley, the Salinas River overflowed and damaged farmlands, industry, and to a lesser extent public facilities, businesses, homes, and its own banks. One life was lost, about 32,000 acres of agricultural lands were flooded, and USACE estimated $6.1 million in damages, approximately $1.1 million of which were in Santa Barbara County.

In January and February of 1969, a series of Pacific storms brought widespread damage to central and southern California. In the Central Coast Hydrologic Region, damage was most severe in the Salinas River and Santa Ynez River basins and in the Carpinteria-Montecito area. In January, both sides of the Salinas River flooded from San Ardo to Spreckels, destroying roads and bridges, flooding sewage treatment plants, and eroding farmland. The Carmel River overflowed and washed out a local bridge. In San Luis Obispo, businesses were damaged heavily when San Luis Obispo Creek became clogged with debris and overflowed. The Santa Maria River flooded lowlands west of Santa Maria. There was heavy damage at Lompoc, Solvang, and Vandenberg Air Force Base when the Santa Ynez River overflowed.

Santa Monica, Franklin, and San Ysidro Creeks overflowed, causing heavy sedimentation and flood damage in Montecito and Carpinteria. Santa Ynez River flooding damaged Lompoc and Solvang extensively and inundated 4,000 acres of farmland.

In January-February of 1978, damage to homes and infrastructure occurred in San Luis Obispo County, notably in Corbit Canyon, where 20 homes were damaged, and on Arroyo Grande Creek. Damage also occurred on Pismo, Suey, Tar Spring, Prefumo, and Davenport creeks. In Santa Barbara County, erosion and deposition damaged channels and farmland along the Santa Maria River and other streams of the region. A flash flood washed away nine buildings, damaged infrastructure, and left debris deposits in Hidden Springs. Damage to roads, bridges, and farmland was extensive along the Cuyama River. In Santa Barbara County, San Antonio Creek damaged floodworks at Los Alamos and farmland elsewhere. Agricultural areas, parks, and infrastructure were damaged by flooding from the Santa Ynez River, notably at Lompoc. Landslides blocked Mission Creek causing an overflow that damaged Santa Barbara streets and an apartment building. Further damage occurred on San Ysidro, Romero, San Pedro, Atascadero, Tecolotito, Carneros, Gobernador, and Santa Monica creeks and Arroyo Paredo.

In January 1982, mudslides in the San Lorenzo basin destroyed 39 homes and damaged nearly 400 more, particularly in Felton, Ben Lomond, Brookdale, Lompico, and Boulder Creek. The San Lorenzo River washed out a bridge in Santa Cruz, damaging three main telephone cables, and a tributary ruptured a 24-inch water main serving the city. Local streams overflowed in Soquel and Aptos, damaging homes, businesses, and infrastructure. The Pajaro River inundated part of Watsonville and adjacent agricultural land. The Salinas River flooded residences along U.S. Highway 101 north of Salinas. In the Gilroy area, Llagas Creek breached levees of 10 sewage percolation ponds, and mudslides and washouts closed U.S. Highway 101 and State Highways 129 and 152. A list of major flood events in the Central Coast Hydrologic Region is the California's Flood Future Report Attachment C: Flood History of California Technical Memorandum.

Climate

The Central Coast region has a temperate Mediterranean climate characterized by mild, wet winters and warm, dry summers. West of the Coast Range, the climate is dominated by the Pacific Ocean, characterized by small daily and seasonal temperature changes, and high relative humidity. As distance from the ocean increases, the maritime influence decreases, resulting in a more continental type of climate that generates warmer summers, colder winters, greater daily and seasonal temperature ranges, and lower relative humidity. For example, on a summer day, the maritime influence on climate can be felt by traveling from Cambria to Shandon.

Microclimates are prevalent throughout the region, where the local topography and geography creates pockets of climate that are distinct from the surrounding area. Microclimates are beneficial, if not crucial, to the region's agriculture and viticulture, providing both warm and cool environments for a broad spectrum of specialty crops such as wine grapes, fruits, nuts, and vegetables. The vineyard-growing areas throughout the region generally have summers that are long and cool due to the influence of the ocean. High-quality wine grapes thrive in this environment with moderate climate all summer, foggy mornings, bright sunshine through the afternoon, and very windy afternoons and early evenings.

Between 2008 and 2012, the average annual precipitation—usually rain—in the region ranged from about 11 to 36 inches. Most of the rain occurs between late November and mid-April, with the mountain areas

receiving more rainfall than the valley floors.

Demographics

Population

The Central Coast Hydrologic Region had a population of 1.53 million people in the 2010 census. The three largest cities are Salinas, Santa Maria, and Santa Barbara. The region had a growth rate of 2.59 percent between 2006 and 2010 (39,587 people). In 2012, the Central Coast Hydrologic Region had an estimated 1.53 million people (Table CC-3). The population of the Central Coast is projected to increase by about 20% by 2050 (Table CC-4).

PLACEHOLDER Table CC-3 Population Estimates for the Central Coast from 2000 to 2010.

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

PLACEHOLDER Table CC-4 Population Estimates and Decadal Projections for the Central Coast

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Tribal Communities

Tribes with historic or cultural ties to the Central Coast region are primarily different bands of the Chumash, Esselen, Ohlone, and Coastanoan (previously referred to collectively as the Mission Indians). These bands include the following: Amah Mutsun Tribal Band, Amah Mutsun Band of Ohlone/Coastanoan, Coastal Band of Chumash, Coastanoan Ohlone Rumsen-Mutsen, Indian Canyon Mutsun Band of Costanoan, Northern Chumash Tribal Council, Ohlone/Coastanoan-Esselen Nation, Ohlone Tribe, and the Salinan Tribe (of Monterey, San Luis Obispo, and San Benito Counties).

Currently, tribal landholdings in this region include the Indian Canyon community and the Santa Ynez Reservation, owned by the Santa Ynez Band of Chumash Indians and composed of less than 140 acres in Santa Barbara County. A resort casino was added to the reservation in 2004 and is a major source of tourism to the Santa Ynez Valley area.

The Santa Ynez Chumash Tribe is working with several federal, State, and local agencies and non-profit organizations to ensure the success of their Environmental Office programs. Another priority for the Santa Ynez Chumash Tribe is establishing or restoring federal recognition for all Central Coast tribes.

The Santa Ynez Environmental Office conducts riparian habitat assessments, biological assessments, surface and ground water quality monitoring, identifying potential pollution sources, identifying and removing invasive plant species, and developing a Water Quality Control Plan, a Fish, Wildlife, and Habitat Management Plan, and an Integrated Weed Management Plan. They are working with the Chumash Cultural Department to host a workshop at the annual Camp Kalawa Shaq that shares the importance of natural resource protection with children.

Disadvantaged Communities

Like the rest of California, many small agricultural communities in the Central Coast are considered disadvantaged communities (DAC) (Table CC-5). These are communities where the Median Household

Income (MHI) is less than 80% of the Statewide MHI, which for 2006-2010 is $60,883. Therefore, a DAC MHI is less than $48,706.

For the Central Coast, many disadvantaged communities are population centers for Spanish-speaking workers associated with seasonal and year-round labor-intensive agricultural production. According to a 2006 study, the regions of California with the highest percentage of population living in poverty were the San Joaquin Valley and Central Coast- two regions that rely heavily on agricultural production and farm labor.

PLACEHOLDER Table CC-5 Disadvantaged Communities within the Central Coast

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Land Use Patterns

The varied topography of the Central Coast region and its distance from California's major population centers results in a landscape that is primarily pastoral and agricultural. Major economic activities include tourism, agriculture and agriculture-related processing, universities and education, government and service-sector employment.

Federal lands in the region total more than 2 million acres and include Los Padres National Forest, Pinnacles National Park, Channel Islands National Park, Carrizo Plain National Monument, Monterey Bay National Marine Sanctuary, Fort Ord National Monument, Guadalupe-Nipomo Dunes National Wildlife Refuge, and the Salinas River National Wildlife Refuge. Military installations include Vandenberg Air Force Base, Fort Liggett, Camp Roberts, Camp San Luis Obispo, and Presidio of Monterey. State facilities include University of California at Santa Cruz, California Polytechnic State University San Luis Obispo, California State University Monterey, and nearly 60 parks, beaches, and monuments. The region's economy benefits greatly from its parks, beaches, and forests, which draw millions of visitors each year.

Agriculture is the backbone of the Central Coast, contributing around $6.3 billion in gross agricultural production value to the regional economy in 2011, not including wine production. The climate, microclimates, and rich soils allow for specialty food and nursery crops as well as range pasture and dry-farmed grain. Between 2005 and 2009, the annual average acreage of all crops was about 661,000 acres, and the average acreage of irrigated crops was approximately 447,000 acres (DWR, Land and Water Use estimates). Top crops for the Central Coast region include strawberries, lettuce, and wine grapes, yet each county in the region produces a wide variety of produce and products.

PLACEHOLDER Figure CC-3 Central Coast Strawberry Production

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

PLACEHOLDER Figure CC-4 Central Coast Total Vegetables and Row Crops

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

PLACEHOLDER Figure CC-5 Central Coast Total Fruit and Nuts

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PLACEHOLDER Figure CC-6 Central Coast Total Nursery

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

PLACEHOLDER Figure CC-7 Central Coast Total Livestock

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

PLACEHOLDER Figure CC-8 Central Coast Acres of Wine Grapes over Time

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

The conversion of farmland to non-agricultural use in the Central Coast region varied from county to county, and resulted in a net loss of about 5,591 acres of farmland, from 2008 to 2010. Farmland includes *Prime Farmland*, *Farmland of Statewide Importance*, *Unique Farmland*, *Farmland of Local Importance*, and *Grazing*. Data from http://www.conservation.ca.gov/dlrp/fmmp/Pages/Index.aspx.

Northern Planning Area

Northern Santa Cruz County is dominated by residential land use, including rural and mountain residential zoning, timber production, open space, agriculture, and a mix of commercial and special districts. The lower portions of the watersheds, close to Monterey Bay, are more urbanized with residential, commercial, and light industrial land use. Upper watershed land use consists predominantly of rural residential, timber production, open space, some mining, and limited agriculture. On the northern coastline, the coastal terraces are used for agriculture and grazing. Santa Cruz County is economically dependent upon tourism, recreation, and the UC Santa Cruz campus. Agriculture is the county's second largest industry, with a gross production value of $566 million in 2011.

Southern Santa Cruz County, including Watsonville Sloughs, is a productive agricultural district yielding strawberries, raspberries, landscape plants, flowers, and vegetables. Coastal agriculture includes brussel sprouts, strawberries, lettuce, and other specialty crops.

Monterey County has the highest density areas of urban development, clustered near Monterey Bay. Along the Salinas River are several urban and residential centers, including the City of Salinas. The gross agricultural production value of Monterey County in 2011 was $3.85 billion. The predominant land use in the Salinas Valley is agriculture and rangeland, with discrete areas of urban development in the cities and towns along the Salinas River. Near Seaside, more than 1,300 acres of the former military installation Fort Ord have been redeveloped into California State University, Monterey Bay.

The Monterey Peninsula and its surrounding areas are composed of a wide range of land uses that serve residential, commercial, industrial, recreational, and open space uses. Urban development is concentrated

primarily in the coastal cities. Outside of the cities, low- to rural-density residential areas dominate. Land use in the 255-square mile Carmel River watershed includes wilderness, viticulture, grazing, recreation (golf courses and park areas), and sparse residential, suburban, commercial, and light industrial. Very little of the watershed is in traditional agricultural use. Resource conservation represents another important land use throughout the region, with parts of the planning area including the Ventana Wilderness and Los Padres National Forest.

Santa Clara and San Benito county land use includes agricultural, rural residential, and urban. In San Benito County, the gross agricultural production value of 2011 was $263 million, and for 2010, the gross agricultural production value of Santa Clara County was $266 million.

As of 2011, the Northern Planning Area currently devotes more than 47,300 acres to growing wine grapes.

Southern Planning Area

The southern Central Coast is primarily pastoral and agricultural with scattered population clusters developed on coastal terraces and interior lowlands and valleys. Agriculture in the region has grown significantly in the last several years, thanks largely to vineyard expansions. As of 2012, about 58,000 active vineyard acres support about 280 wineries in the Southern Planning Area.

Agriculture comprises two-thirds of the land use in San Luis Obispo County with the majority of this acreage used for livestock grazing. The gross value of agricultural production in 2011 was $736 million Active vineyards cover about 38,000 acres of the county; other land uses include rural lands, open space, and residential, commercial, and urban uses.

Major land use in Santa Barbara County includes agricultural preserves (land zoned for 100-acre or greater lot size) or other agriculturally zoned land. Less than 3 percent of the county is within incorporated cities, and 2 percent is within unincorporated urban areas. The value of agricultural production in 2011 was $1.2 billion. As of 2012, the county has more than 20,000 active vineyard acres, generating more than $100 million annually in wine grapes. Oil production continues offshore, but onshore production continues to decline.

Regional Resource Management Conditions

Water in the Environment

The California Department of Fish and Wildlife has identified the following water-related needs for the Central Coast Hydrologic Region:

- Restoration projects that facilitate the improvement of aquatic habitat, including deep and shallow open water;
- Acquisition of conservation easements on lands;
- Protect or restore fish habitat through the improvement of fish passage conditions, gravel augmentation, hydrology, fish screens, min/max flow, etc…;
- Restoration of floodplain process, including hydrodynamic process, to benefit listed species;
- Development, collection and publication of instream flow data, including recommended instream flow levels and minimum instream flow requirements;
- Prevent or reduce negative impacts from invasive non-native species including those associated

with water supply and conveyance projects such as quagga and zebra mussels, egeria densa, water hyacinth, and others;

- Improvements in the coordination, management and implementation of groundwater management;
- Development, collection and publication of instream flow data, including recommended instream flow levels and minimum instream flow requirements;
- Restoration or modification to allow for a more natural regime of hydrology and hydraulics;
- Restoration projects that facilitate the increase of populations and improvement of habitat for salmon, especially Coho;
- Restoration of riparian habitat, including conservation of riparian corridors;
- Restoration of upland plant communities;
- Water quality improvements (sediment, oxygen saturation, pollution, temperature, etc…) to support healthy ecosystems;
- Improvements in coordination, management and implementation of watersheds;
- And, restoration projects that will improve upon existing wetlands, or create new wetlands in appropriate areas

Northern Planning Area

Santa Cruz

The amount of water for the environment in the Santa Cruz IRWM region is determined by water rights, diversions, and recent studies completed to support the recovery of coho salmon and steelhead trout.

The San Lorenzo River is the largest surface water supply for the Santa Cruz region. The San Lorenzo River Watershed Management Plan, adopted in 1979, established minimum streamflow requirements for salmonid migration, spawning, and rearing. More recently, the City of Santa Cruz Water Department began negotiations with the California Department of Fish and Wildlife and the National Marine Fisheries Service to develop a habitat conservation plan (HCP) to minimize adverse impacts to aquatic habitat from its water supply facilities operations. The HCP contains in-stream flow targets for the City's diversion points, for five different hydrologic year types.

In-stream flow requirements for Soquel Creek (to sustain fish) maintain 15 cfs or the natural flow from December 1 to June 1, and 4 cfs or the natural flow from June 1 to December 1.

The National Oceanic and Atmospheric Administration (NOAA) Fisheries Service recently released the Central California Coast Coho Salmon Recovery Plan, which recommends that recovery efforts in Santa Cruz focus first on Scott and San Vicente Creeks by improving flow conditions.

Pajaro River Watershed

The water for the environment in the Pajaro River Watershed is determined by water rights in the region and the requirement to maintain sufficient flows to support marine fisheries. The Pajaro River drains into the Monterey Bay Marine Sanctuary and adequate flows are necessary to maintain the health of fisheries. Recently two projects have been implemented in the region to support environmental water needs. The South County Resources Management Program and the Corrralitos Creek Surface Fisheries Enhancement Project aim to maintain sufficient water flows to support fish populations.

Greater Monterey

The creeks and streams of the Greater Monterey IRWM region once provided plentiful habitat to abundant riparian and estuarine wildlife, but land use practices and water diversions over the last century have led to a decrease in both the quantity and quality of environmental water.

Within the Greater Monterey County IRWM region, critical habitat has been designated for South-Central California Coast steelhead along the entire Big Sur coast and within the Salinas River basin, which includes the Salinas River, the Salinas River Lagoon, Gabilan Creek, Arroyo Seco River, Nacimiento River, the San Antonio River, and their tributaries.

Along the Big Sur coast in Monterey County, major steelhead watersheds include Big Sur River, Little Sur River, and Big Creek. There are some diversions along these rivers to supply drinking water for nearby homes and resorts, but no major dams or reservoirs. The California Department of Fish and Wildlife (CDFW) developed Streamflow Recommendations for rivers and streams throughout the state, and the Big Sur River was assigned a high priority for future in-stream flow studies.

In general, the environmental water needs for the Greater Monterey County IRWM planning region need quantification, especially for the following areas:

1. Rivers and streams that provide habitat, or potential habitat, for steelhead and other special status aquatic species. Critical habitat has been designated for South-Central California Coast steelhead along the entire Big Sur coast, including Big Sur River, Little Sur River, San Carpoforo and Arroyo de la Cruz Creeks, and within the Salinas River basin, which includes the Salinas River, the Salinas River Lagoon, Gabilan Creek, Arroyo Seco River, Nacimiento River, the San Antonio River, and their tributaries.
2. Significant wetlands and estuaries such as Elkhorn Slough and Tembladero Slough; and
3. Protected coastal waters such as the federally protected Monterey Bay National Marine Sanctuary (MBNMS), which encompasses four Critical Coastal Areas (CCA), two Areas of Special Biological Significance (ASBS), and five Marine Protected Areas (MPA). Protected areas include: Elkhorn Slough (CCA and MPA), Moro Cojo Estuary (MPA), Old Salinas River Estuary (CCA), Salinas River (CCA), Julia Pfeiffer Burns Underwater Park (CCA and ASBS), Point Lobos (MPA), Point Sur (MPA), Big Creek (MPA), and the ocean area surrounding the mouth of Salmon Creek (ASBS). Notably, one of the main environmental water uses in the region is for the 366-acre Salinas River National Wildlife Refuge, where the Salinas River empties into Monterey Bay.

Environmental water needs will become more critical as the region's ecosystems become more vulnerable to the impacts associated with climate change.

Efforts to maintain water for the environment include the Monterey County Water Resources Agency's water releases from the San Antonio and Nacimiento reservoirs in routine, seasonal conservation releases to maintain flows on the Salinas River and recharge the river basin. Annual instream flow requirements for the Nacimiento River below the Nacimiento Dam are 18,099 acre-feet. In addition, segments of the Big Sur River are part of the national Wild and Scenic River system, and the North Fork and South Fork segments have unimpaired runoff from their headwaters to their confluence at the boundary of the Ventana Wilderness in Los Padres National Forest in Monterey County.

Monterey Peninsula, Carmel Bay, and South Monterey Bay

Environmental water use within the Monterey Peninsula, Carmel Bay, and South Monterey Bay IRWM Region centers on the Carmel River and its tributaries. The Carmel River, below the San Clemente Dam and Reservoir, has an annual minimum instream flow of 3,620 acre-feet. This year, however, the removal of San Clemente Dam has begun and complete removal is scheduled to be finished by the end of 2015. The removal of the dam will aid in restoration of the lower Carmel River, which will include providing renewed unimpaired access to 25 miles of spawning and rearing habitat for the threatened South-Central California Coast steelhead.

Southern Planning Area

San Luis Obispo

The San Luis Obispo IRWM region is organized into 16 Water Planning Areas (WPAs.) For this region, the federally protected species South-Central California Coast steelhead (Oncorhynchus mykiss) was used as the primary indicator species to develop regional Environmental Water Demands, as shown in the table below:

PLACEHOLDER Table CC-6 Environmental Water Demands, San Luis Obispo IRWM

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A Habitat Conservation Plan for the upper watershed of the Arroyo Grande Creek calls for modified stream releases from Lopez Reservoir into the creek, with the intention of partially restoring and enhancing the habitat of steelhead trout and red-legged frogs.

Santa Barbara Countywide

Segments of the Sisquoc River (mostly within the San Rafael Wilderness) are designated as part of the national Wild and Scenic River system, which results in unimpaired runoff along a 33-mile stretch. Populations of fish exist in the upper reaches of the River.

Cachuma Reservoir, on the Santa Ynez River, is the main water supply for southern Santa Barbara County. Operations procedures endeavor to accommodate fish within the Santa Ynez River, and include surcharge of Cachuma Reservoir for a fish “pool” with specific protocol for releases, ramping, and water temperature to support fish.

In addition, ephemeral creeks along the south coast experience periods of continuous flow to the ocean.

Water Supplies

In California, both water supply and land-use planning are local responsibilities of utilities and city and county governments. Given its limited desire for and access to imported water, local groundwater and surface water provides most of the Central Coast supply. The Central Coast does import a small amount of water from the Central Valley Project and the State Water Project. See Figure CC-9 for an overview of the flow of water in the region.

PLACEHOLDER Figure CC-9 Central Coast Regional Inflows and Outflows in 2010

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the end of the chapter.]

Northern Planning Area

Santa Cruz

For the Santa Cruz area, streams and groundwater provide all of the supply for agricultural users, residential, municipal, and industrial. In 2010, the Santa Cruz Region used approximately 35,000 AF. Seventy-eight percent of this supply was groundwater, 21% came from surface water and less than 2% came from recycled wastewater. This volume has steadily decreased since 2000 when usage was 10% higher even though there are currently 8% more water connections.

The City of Santa Cruz uses the north coast sources first, because that water is of the highest quality. Should north coast water not be available (due to flow or other restrictions), the City diverts and treats the San Lorenzo River for delivery. If the San Lorenzo River is too turbid or does not have adequate flow, the City utilizes water stored in Loch Lomond or pulls small amounts of water from the Live Oak wells. Generally, water stored in Loch Lomond is seen as drought insurance, so the City does not utilize that source unless necessary. Similarly, the San Lorenzo Valley Water District utilizes its surface diversions for supply when sufficient water is available, and then uses their wells when there is not sufficient surface supply.

The volume of water used throughout the year is highly variable by season with only 12% of the overall Santa Cruz County water use occurring during the winter months (January through March) and 40% of during the summer months (July through September). The seasonal water use for agriculture is even more pronounced, using 6% of its water during the winter and 49% during the summer. Urban and residential seasonal water use is about 18% during the winter and 32% during the summer.

PLACEHOLDER Table CC-7 Santa Cruz Regional Water Supply Production by Water District within IRWM Boundary

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- The City of Santa Cruz Water Department (SCWD) obtains surface water from the San Lorenzo River watershed, with surface diversions from the San Lorenzo River, Liddell Spring, Laguna Creek, Reggiardo Creek, Majors Creek, Loch Lomond reservoir, and groundwater from the Live Oak wells.
- The average annual flow volume for the San Lorenzo is approximately 95,000 AF, and the Loch Lomond reservoir, built in 1960, has a capacity of about 8,600 AF.
- Soquel Creek Water District is entirely dependent on groundwater from two aquifers: Purisima Formation (62%) and the Aromas Formation (38%).
- San Lorenzo Valley Water District supplies are obtained from the Santa Margarita and Lompico Sandstone aquifers as well as surface water from springs and tributaries to the San Lorenzo River.
- Central Water District relies on groundwater from the Aromas and Purisima aquifers for supply.
- Davenport County Sanitation District relies on surface water diverted from Mill Creek and San

Vicente Creek for supply.

- Lompico County Water District supply is obtained from the Santa Margarita and Monterey aquifers as well as Lompico Creek.
- Small drinking water systems rely mostly upon groundwater.

There are two major groundwater basins recognized in the Santa Cruz IRWM region - the Santa Margarita and Soquel-Aptos. The Santa Margarita Basin, in the San Lorenzo River watershed, is a sequence of Tertiary-age sandstone, siltstone, and shale. A 2006 groundwater model calculates a sustainable yield of about 3,320 AFY for the basin. Although current pumping rates are less than the modeled sustainable yield, groundwater levels still appear to be declining in the Scotts Valley area sub-basins. The Soquel -Aptos Basin consists of the Purisima Formation, a Tertiary sandstone, and the Aromas Formation, a younger unconsolidated sandstone. The Purisima extends at depth beneath the Pajaro Valley, and the overlying Aromas serves as the main water-bearing aquifer in the Pajaro Valley. Sustainable yield of the Purisima is estimated to be less than 5,700 AFY, while groundwater production over the past 5-years is estimated by the Santa Cruz County Water Resources to have averaged about 5,900 AFY.

Because the Purisima and Aromas Formations extend offshore beneath Monterey Bay, the aquifers are in hydrologic connection with the Pacific Ocean. Consequently, overdraft of the basin has the potential to pull seawater into the aquifer beneath the inland areas. Groundwater levels are currently below the elevations determined to be necessary to prevent seawater intrusion. The Soquel Creek Water District has determined that it needs to reduce pumping by 1500 AFY for 20 years in order for groundwater levels to recover to safe levels in the Soquel-Aptos basin.

Ben Lomond Mountain provides a limited source of groundwater, and the Summit Area has limited groundwater as well, with many homes relying on trucked water for supply during dry parts of the year.

Water supply reliability for both agriculture and municipal use is a concern in the Watsonville area. Due to seawater intrusion, some coastal wells have become too brackish for domestic or agricultural use. Groundwater is the primary source of agricultural water supply, supplemented by recycled water and surface water that has been captured and recharged to the groundwater basin.

Pajaro River Watershed

The Pajaro River Watershed is reliant on groundwater supplies. It's supplies are affected by a number of issues such as seawater intrusion and overdraft. The quality and quantity of groundwater supplies varies throughout the region. In the region about 90% of water demand comes from agriculture, which also affects groundwater quality due to run-off.

Portions of San Benito and Santa Clara Counties in the region rely on imported water from the Central Valley Project from the San Luis Reservoir, groundwater, recycled water, and local surface water. Both Santa Clara Valley Water District and San Benito County Water District have conjunctive use programs. Uvas and Hernandez reservoirs are important for conjunctive use operations in Santa Clara and San Benito counties, respectively.

Greater Monterey

Groundwater is the main source of water for most of the Greater Monterey County IRWM planning

region; however, residents along the Big Sur coast depend entirely on surface water and shallow wells for their water supply, and residents near Greenfield in the Salinas Valley have a diversion from the Arroyo Seco River. The Greater Monterey County IRWM region receives no imported water.

The largest groundwater basin in the planning region is the Salinas Valley Groundwater Basin. The basin is located entirely within Monterey County and consists of one large hydrologic unit comprised of five subareas: Upper Valley, Arroyo Seco, Forebay, Pressure, and East Side. These subareas have different hydrogeologic and recharge characteristics but do not contain barriers to horizontal flow. The Upper Valley, Arroyo Seco and Forebay subareas are unconfined and in direct hydraulic connection with the Salinas River.

Groundwater recharge in the Salinas Valley is principally from the Salinas River, Arroyo Seco, other tributaries to the Salinas River, and from deep percolation of rainfall. Both natural runoff and conservation releases from Nacimiento and San Antonio Reservoirs contribute to the flow in the Salinas River. It is estimated that stream recharge accounts for approximately half of the total basin recharge. Deep percolation of applied irrigation water is the second largest component of the groundwater budget.

Other groundwater basins in the Greater Monterey County IRWM region include a portion of the Pajaro Valley Groundwater Basin in the north and Lockwood Valley, Cholame Valley, and Peach Tree Valley basins in the south. As well, approximately one quarter of the Paso Robles Groundwater Basin lies within the Greater Monterey County IRWM region, with the remainder residing in the San Luis Obispo IRWM region.

Monterey Peninsula, Carmel Bay, South Monterey Bay

For part of coastal Monterey, nearly all of the water supply comes from the Carmel River and groundwater in the Carmel Valley aquifer, which underlies the alluvial portion of the Carmel River downstream of the San Clemente Dam, and groundwater in the coastal subareas of the Seaside Groundwater Basins. About 70 to 80 percent of the surface runoff in the Carmel River watershed is from rainfall within the Los Padres National Forest and Ventana Wilderness.

Hydrological investigations have shown that the Seaside Groundwater Basin can sustainably yield about 3,000 acre-feet of water annually, before being degraded by seawater intrusion. However, between 1995 and 2006, California American (Cal-Am) Water Company, the major water supplier in the Monterey area, pumped on average 4,000 acre-feet per year from the coastal area of the Seaside Basin and 700 acre-feet per year from the Laguna Seca area. Adjudication of the basin in 2006 called for reductions in pumping from the Seaside Basin, likely at a rate of 10% reduction (520 AF) every three years until year 2021. In 2009, the State Water Resources Control Board, Division of Water Rights issued a Cease and Desist Order to Cal-Am, , to reduce its water diversion from the Carmel River by 70% by 2017. Due to these significant water supply reductions, a significant portion of Cal-Am's water supply for the Monterey Peninsula must be replaced with water from new sources (Monterey Peninsula Water Management District, 2011).

Several regional projects are under consideration for the replacement water supply project: groundwater replenishment project for the Seaside groundwater basin; regional desal facility; and small strormwater capture and reuse for Pacific Grove.

Southern Planning Area

Water supplies for the area include groundwater, surface water, imported State Water Project water via the Coastal Branch Aqueduct, and recycled water. The State Water Project can deliver up to 70,500 acre-feet per year into San Luis Obispo and Santa Barbara counties. Water supplies also are enhanced by conjunctive use of surface and groundwater supplies, as well as cloud seeding.

Groundwater is an important source of water supply to the region; 28 groundwater basins underlie the southern part the Central Coast region. Groundwater beneath large extensive alluvial valleys—such as the Salinas, Paso Robles, and Santa Maria valleys—occurs in thick and sometimes confined aquifers. In contrast, groundwater underlying smaller valleys—such as Huasna Valley inland and the San Simeon, Cayucos, and Morro valleys along the coast—occurs in thinner, unconfined aquifers.

USBR projects in the area include the Santa Maria Project and the Cachuma Project. The Santa Maria Project constructed Twitchell Dam and Reservoir in by 1958 for water conservation and flood control. Twitchell Reservoir stores floodwaters of the Cuyama River, which are released as needed to recharge the groundwater basins in the Santa Maria Valley; this prevents salt water intrusion and also provides full and supplemental irrigation water to approximately 35,000 acres of cropland. The objective of the project is to release regulated water from storage as quickly as it can be percolated into the Santa Maria Valley ground-water basin.

The Cachuma Project, constructed by 1956, consists of dams, reservoirs, tunnels and conveyances. Bradbury Dam stores floodwaters of the Santa Ynez River which are eventually routed to croplands and municipal users of Goleta, Montecito, Summerland, Carpinteria, and the city of Santa Barbara.

Whale Rock Reservoir, owned by the Whale Rock Commission, and the USACE's Santa Margarita Lake both provide water to the city of San Luis Obispo and surrounding communities.

Lake Nacimiento, a reservoir built by the Monterey County Water Authority in San Luis Obispo County, was completed in 1961 and has provided water supplies for agriculture in Monterey County, mitigation of salt water intrusion in the lower Salinas Valley, and urban demands in San Luis Obispo County. San Luis Obispo County, since 1959, has an annual entitlement of 17,500 AF of water from Lake Nacimiento.

Conjunctive use of surface water and groundwater is a long-standing practice in the region. San Luis Obispo County obtains nearly 80 percent of its water from groundwater supplies and about 20 percent from reservoirs and other sources.

The Santa Ynez River Basin is the largest drainage system wholly located in Santa Barbara County, draining about 40 percent of the mainland part of the county. It is the primary source of water for about two-thirds of Santa Barbara County residents. Three dams have been constructed on the river to store and divert water to the south county (Cachuma, Gibraltar, and Jameson).

Surface water supplies are an important part of the regional water supply. Lake Cachuma on the Santa Ynez River and Gibraltar Reservoir provide the majority of the south coast's water supply annually. Twitchell Reservoir on the Cuyama River is important to both the water supply and the flood protection of the Santa Maria Valley; the reservoir supplies recharge to the Santa Maria Groundwater Basin.

San Luis Obispo

The City of Morro Bay operates the only desalination plant in the SLO region. In the past, Morro Bay has used the salt water reverse osmosis (SWRO) treatment plant to treat water from saltwater wells and to remove nitrates from fresh water wells. Recently, two 450 gallons per minute (gpm) brackish water reverse osmosis (BWRO) treatment trains were installed, enabling the facility to treat both fresh water and salt water wells simultaneously. The SWRO plant is designed to produce approximately 645 AFY of potable water from seawater. The BWRO system capacity is about 581 AF of Morro Basin groundwater extracted by permit. Operation and maintenance costs are estimated to be about $1,700 per AF, but with possible installation of energy recovery equipment, costs would drop to $1,100 -$1,300 per AF range.

Recycled Water

The City of San Luis Obispo currently delivers 135 AFY to nearby golf courses, schools and commercial establishments, with expectations of increasing recycled water deliveries to 1,000 AFY. The City must also maintain discharge to San Luis Obispo Creek, and this flow amounts to approximately 1,800 AFY. Other water recycling projects in the County include:

- Nipomo CSD (Black Lake WWTP, Southland WWTP)
- California Men's Colony (Dairy Creek Golf Course)
- Templeton CSD (Meadowbrook WWTP/recharge Salinas River underflow)
- City of Atascadero WRF (Chalk Mountain Golf Course)
- Rural Water Company (Cypress Ridge Golf Course)
- Woodlands MWC (Monarch Dunes Golf Course)

Santa Barbara

Water supplies include groundwater, surface water in reservoirs, and imported State Water Project. The City of Santa Barbara also constructed a desalination plant which may be utilized at some time in the future, but remains in "moth balled" state. Other sources include recycled water, cloud seeding, and an aggressive local and regional water conservation program. Table CC-8 shows the different water sources for the seventeen water service districts in Santa Barbara County.

PLACEHOLDER Table CC-8 Santa Barbara Countywide IRWM Water Supplies

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Water Uses

There are about 1.53 million people in the Central Coast region and groundwater accounts for approximately 83 percent of the water supply used for agricultural, industrial, and municipal (urban) purposes and nearly 100 percent for rural domestic purposes (DWR, 2003). In the Salinas Valley, groundwater accounts for nearly 100% of the potable supply.

Drinking Water

In the Central Coast region there are an estimated 400 community drinking water systems and over 80%

are small (serving less than 3,300 people) and most serve less than 500 people. Small water systems face unique financial and operational challenges in providing safe drinking water. Given their small customer base, many small water systems cannot develop or access the technical, managerial and financial resources needed to comply with new and existing regulations. These water systems may be geographically isolated, and their staff often lack the time or expertise to make needed infrastructure repairs, install or operate treatments, or develop comprehensive source water protection plans, financial plans or asset management plans (EPA 2012).

In contrast, less than 20% of the region's 400 community drinking water systems are medium and large water systems, and deliver drinking water to over 90% of the region's population (see Table CC-9). These larger water systems have the financial resources to hire staff to oversee daily operations, maintenance needs, and to plan for future infrastructure replacement and capital improvements. This helps to ensure that existing and future drinking water standards can be met.

PLACEHOLDER Table CC-9 Summary of Large, Medium, Small, and Very Small Community Drinking Water Systems in the Central Coast Hydrologic Region

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Agricultural Water

All Central Coast IRWM regions utilize water for agricultural purposes, with most of the demand met by groundwater extraction and surface water diversions. Major centers of agriculture include Gilroy, Hollister, Pajaro Valley, Watsonville, Salinas Valley, Paso Robles, San Luis Obispo, Santa Maria, Lompoc, Solvang, and Santa Barbara.

San Benito County and Santa Clara County use water purchased from USBR via the San Felipe Project in addition to groundwater supplies and recycled water. The majority of San Felipe water goes toward agricultural irrigation, with the remainder for domestic, municipal, industrial purposes, and for groundwater recharge. Southern Santa Clara County uses San Felipe water for agricultural irrigation and groundwater recharge.

Urban Water

Central Coast Urban Water Use by IRWM Region

The urban water suppliers of the Central Coast are in Table CC-10, along with total estimated delivered supplies. Urban water use includes residential, schools, parks, restaurants, hotels, office buildings, firefighting, water main flushing, and losses from leaks in the water system.

Outside of urban areas served by water purveyors, residential and small community water needs are self-supplied.

PLACEHOLDER Table CC-10 Urban Water Suppliers by IRWM Region

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Water Conservation Act of 2009 (SB x7-7) Implementation Status and Issues

Twenty-five Central Coast urban water suppliers have submitted 2010 urban water management plans to DWR. The Water Conservation Law of 2009 (SBx7-7) required urban water suppliers to calculate baseline water use and set 2015 and 2020 water use targets. Based on data from the 2010 urban water management plans, Central Coast Hydrologic Region had a population-weighted baseline average water use of 145 gallons per capita per day and an average population-weighted 2020 target of 125 gallons per capita per day. The Baseline and Target Data for individual Central Coast urban water suppliers is available on the Department of Water Resources (DWR) Urban Water Use Efficiency website.

The Water Conservation Law of 2009 (SBx7-7) required agricultural water suppliers to prepare and adopt agricultural water management plans by December 31, 2012, and update those plans by December 31, 2015, and every 5 years thereafter. One Central Coast agricultural water supplier has submitted 2012 agricultural water management plans to DWR.

Water Balance Summary

This section is under development.

PLACEHOLDER Figure CC-10 Central Coast Region Water Balance by Water Year, 2001-2010

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

PLACEHOLDER Table CC-11 Central Coast Hydrologic Water Balance Summary, 2001-2010

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Project Operations

The flood management reservoirs of the Central Coast Hydrologic Region are two major multipurpose reservoirs with flood management reservations, San Antonio Reservoir on the San Antonio River, and Twitchell Reservoir on the Cuyama River, and a small flood storage amount in Nacimiento Reservoir on Nacimiento Creek.

Water Quality

Surface Water Quality

In 1998, the Central Coast Water Board established a regional monitoring program, the Central Coast Ambient Monitoring Program (CCAMP) to assess the health and beneficial use support of the region's surface waters on a regular basis. In addition, since 2004, the Cooperative Monitoring Program for Agriculture (CMP), developed under the Conditional Waiver for Irrigated Lands (Ag Order), has been monitoring 50 long-term trend monitoring sites in agricultural areas (Figure CC-11).

The Water Board uses CCAMP, CMP and other data to assess the health of the region’s surface waters and identify waters (streams, lakes, bays and estuaries) in the region that do not meet water quality objectives and are not supporting their designated beneficial uses, as outlined in the Central Coast Region’s Water Quality Control Plan (Basin Plan). Those waters are placed on the Clean Water Act Section 303(d) list of impaired water bodies and the Water Board develops Total Maximum Daily Loads

(TMDLs) to restore their beneficial uses.

PLACEHOLDER Figure CC-11 Central Coast Hydrologic Units and Monitoring Sites

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Water Board staff has developed a multi-metric approach to assess general surface water quality conditions that combines and scores multiple parameters into a *water quality index* (Worcester, 2011). Parameters for this water quality index include water temperature, unionized ammonia, water column chlorophyll a, total dissolved solids (TDS), nitrate-nitrite (as N), orthophosphate, turbidity, and dissolved oxygen. Each parameter is scored into one of five categories: good condition (green), slightly impacted (yellow), impacted (red), and very impacted (dark red). Unscored areas are white, and most occur in the upper watershed areas (Figure CC-12). Water quality evaluations were performed at 250 sites, revealing that the most severely impacted areas of the Central Coast are 1) the lower Salinas watershed and tributaries, Tembladero Slough-Salinas Reclamation Canal watershed and Moro Cojo Slough (hereafter referred to as the "lower Salinas area") and 2) the lower Santa Maria watershed and tributaries, and lower Oso Flaco Creek (hereinafter referred to as the "lower Santa Maria area"). These are both areas of intensive agricultural activity.

Surface water quality is also evaluated using a *toxicity index.* Toxicity testing exposes test organisms to water or sediment from a stream or other water body, and measures effects on survival, growth and reproduction (lethal and sub lethal effects). The surface water quality toxicity index for the Central Coast region also shows severe impacts in the lower Salinas and Santa Maria areas (Figure CC-13). Other impacted areas include the lower Santa Ynez River and the San Juan Creek and Watsonville Slough areas of the Pajaro River watershed.

PLACEHOLDER Figure CC-12 Central Coast Surface Water Quality Index using Multiple Parameters

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

PLACEHOLDER Figure CC-13 Central Coast Surface Water Quality Toxicity Index

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Two of the region's most impaired water bodies drain directly to sensitive estuarine habitat. In the north, flows from the Salinas Reclamation Canal move into the Old Salinas River and- during an incoming tide- flow into the Elkhorn Slough, a State Marine Protected Area and a National Estuarine Research Reserve. In the south, Orcutt Creek provides the primary flow into the Santa Maria estuary, which provides critical habitat for endangered snowy plovers, threatened steelhead trout, and other sensitive species.

Surface Water Quality by Watershed

Water quality for the Central Coast is problematic for both groundwater and surface water supplies, and improving both is an over-arching goal for the hydrologic region.

The Central Coast is a region of unique habitat areas, significant biodiversity, and many sensitive natural habitats and species of concern. Several areas of the California Central Coast region are severely degraded by high levels of nitrates in surface and groundwater, toxicity to test organisms, pesticides in surface water and sediment that exceed toxic thresholds, and other water quality concerns. Benthic invertebrate communities in these areas, and their associated habitat, are also degraded. These areas are generally dominated by very intensive agricultural activities, some of which result in the addition of nutrients to surface and groundwater. The term nutrient refers to the primary plant nutrients- nitrogen, phosphorus and potassium. Generally, potassium stays bound to soil and is not a water quality problem, but nitrogen in the form of ammonia and nitrate is highly mobile and soluble. Phosphorus is also mobile. The most common nutrients added to the waters of the Central Coast are nitrate and orthophosphate, and the main sources of nutrients are agricultural fertilizers, livestock operations including dairies, and wastewater from sewage treatment plants. Failing and broken septic systems also contribute nutrients to groundwater; locally, this has been a long-standing problem for the city of Los Osos in San Luis Obispo County.

San Lorenzo River and Santa Cruz Area Watersheds

Anthropogenic watershed disturbances have accelerated most of the natural processes of erosion and sedimentation in the San Lorenzo River watershed, resulting declines in anadromous fisheries and the quality of fish habitat. Fecal coliform exceeds the Basin Plan criteria in many streams and sloughs. The Santa Cruz area hydrologic unit has 33 water bodies on the Clean Water Act (CWA) 303(d) list, including the San Lorenzo River and many of its tributaries, Soquel Creek, Aptos Creek and the San Lorenzo River Lagoon.

Pajaro Watershed

Water quality problems for the watershed and the river include erosion and sedimentation, pesticides, nutrients, heavy metals, pathogens, streambed flow alterations, endangered habitat, and riparian vegetation removal. Agriculture is the dominant land use in the watershed, and grazing is common in the remote areas of the watershed such as along the upper San Benito River. Agricultural lands are the major source of nutrient and sediment loading into the Pajaro River. Low-density residential development, flood control projects, sand and gravel and mercury mining, and off-road vehicle activity have contributed to accelerated erosion and sedimentation, impacting steelhead habitat for migration and spawning. Fecal coliform levels in the Pajaro River and many of its tributaries exceed water quality objectives, and cyanobacteria cause harmful algal blooms in Pinto Lake near Watsonville. The CWA 303(d) list contains 29 water bodies, including Coralitos Creek, Harkins Slough, the Pajaro River, Watsonville Slough, Llagas Creek, and Uvas Creek.

Elkhorn Slough Watershed

Water quality concerns include erosion, pesticides, bacteria, and scour. Surrounding agricultural activities and Moss Landing Harbor activities, including ongoing dredging, are impacting the slough. The CWA 303(d) list contains six water bodies, including Carneros Creek, Bennet Slough, and Moss Landing Harbor.

Carmel River Watershed

Steelhead trout are common in the Carmel River, and there are currently no segments of the river or its tributaries identified as impaired on the CWA 303(d) list of impaired waters; however, water supply and habitat issues are major concerns. The CWA 303(d) list contains one water body, Tularcitos Creek.

Salinas River Watershed

Agriculture is the dominant land use within the Salinas watershed, and some agricultural practices have resulted in degradation of water resources. Over the last 100 years, groundwater pumping for irrigation has led to seawater intrusion nearly six miles inland near the Castroville area, and has necessitated the abandonment of several water supply wells. Additionally, nitrate contamination is widespread throughout the Salinas Valley Groundwater Basin. Surface waters are also impacted by high levels of nitrate, as well as toxicity and pesticides. The CWA 303(d) list contains 32 water bodies, including the Salinas Reclamation Canal, Tembladero Slough, Blanco Drain, Espinosa Slough, segments of the Salinas River, Natividad Creek, Merrit Ditch, and Alisal Slough. These water bodies are listed for fecal coliform, nutrients, toxicity and pesticides. Overall, fecal coliform bacteria impair recreational water uses of the lower Salinas River and its tributaries. Elevated nutrient concentrations have led to the degradation of municipal and domestic water supplies and have impaired most aquatic freshwater habitat beneficial uses for the lower Salinas River and its tributaries. The pesticides chlorpyrifos and diazinon are present in several areas at levels that are not protective of aquatic life- beneficial uses, such as fish habitat, migration, spawning and development.

Santa Lucia Hydrologic Area/Big Sur

This area is located along the remote Big Sur coastline, so many of the watersheds have little or no disturbance by agricultural or urban activities. Upper watersheds originate in the Los Padres National Forest, on the steep northwestern slopes of the Santa Lucia Mountains. Impacts to the forested upper watersheds stem primarily from roads, cattle grazing, fire management, inactive mines, and other sources of sediment. Rural residential uses are common at lower watershed elevations. No water bodies are listed on the CWA 303(d) list.

Morro Bay

Morro Bay and estuary provide critical habitat for marine mammals, fish, shellfish, more than 200 species of birds, and other life, including 16 threatened and endangered species. Anthropogenic watershed disturbances have accelerated the natural processes of erosion and sedimentation in the estuary and bay resulting in impairment of biological resources and recreational uses. Water quality objectives for fecal coliform are often exceeded, impairing recreational use and shellfish harvesting. The CWA 03(d) list contains 26 water bodies, including Chorro and Los Osos Creeks and many of their tributaries, and the Morro Bay Estuary. The tributaries Chorro and Los Osos Creeks to Morro Bay are impaired by nutrients, fecal coliform, sediment and low dissolved oxygen.

Santa Maria Watershed

Land uses in the lower Santa Maria River watershed include rangeland, urban development, and irrigated agriculture. The Santa Maria watershed has 15 water bodies on the CWA 303(d) list, including Bradley Canyon Creek, Blosser Channel, Orcutt Creek, Main Street Canal and the Santa Maria River. The Santa Maria River and its estuary, Oso Flaco Creek, the Bradley Channel, and the Main Street Canal are impaired by fecal coliform, nutrients, ammonia, salts, temperature, dissolved oxygen, toxicity, and pesticides. The Santa Maria watershed experiences extensive water column invertebrate toxicity and the estuary undergoes routine toxic concentrations of chlorpyrifos.

Santa Ynez Watershed

Urban development, increased groundwater pumping, ranching, irrigated agriculture, and expanding recreational use have all contributed to the degradation of water quality in the Santa Ynez watershed.

Areas of concern include erosion, sedimentation, flood control and habitat loss (especially for steelhead). Summer flow in the lower Santa Ynez River is dominated by a wastewater treatment plant discharge from the City of Lompoc. The CWA 303(d) list contains six water bodies, including the Santa Ynez River, Salispuedes Creek, and Santa Rosa Creek. The Santa Ynez River is listed as impaired by nitrate, sodium, chloride, E. coli, fecal coliform, low dissolved oxygen, water temperature, and total dissolved solids.

Santa Barbara/South Coast

The South Coast watersheds consist of numerous coastal-drainage streams, with several streams flowing through upland areas which contain grazing rangelands and orchards before flowing through more intensively developed land which includes the urban areas of Goleta, the City of Santa Barbara and Carpinteria. These areas of mixed land use include many greenhouses and nurseries. Routine monitoring of the ocean near stream outflows frequently finds levels of fecal coliform bacteria in violation of water quality standards, requiring the County's Environmental Health Services Department to close beaches to public access. Other water quality issues include sedimentation, pesticides and nutrients. The CWA 303(d) list contains 38 water bodies, including San Jose Creek, Jalama Creek, Canada del Refugio, Glen Annie Canyon, Mission Creek, Carpinteria Creek, Franklin Creek, and Rincon Creek.

Surface Water Quality Parameters of Special Concern

For the Central Coast region, surface water quality parameters of special concern include nitrate, water toxicity, pesticides, fecal coliform, sediment, temperature, and dissolved oxygen. Surface waters that exceed the TMDLs for these parameters are placed on a Clean Water Act Section 303(d) list of impaired water bodies.

Nitrate is a severe and widespread pollutant for the Central Coast region. Nitrate enters the waters of the region most commonly as runoff from agricultural fields or through percolation to groundwater. The 2010 List of Impaired Waterbodies (State Water Resources Board, 2010) includes 47 Central Coast water bodies that have drinking water beneficial uses impaired by nitrate pollution. The three major agricultural areas of the Central Coast contain 68% of these nitrate listings: the Lower Salinas (15 water bodies), the Pajaro River (5 water bodies), and the lower Santa Maria (12 water bodies).

Fecal coliform is an indicator for pathogenic bacteria, and enters the waters of the region through storm water runoff (which picks up bacteria from pet, animal, and human waste), the presence of cattle and other animals in creeks, and through surfacing water from failing septic systems. Measurements of fecal coliform in many Central Coast water bodies exceed Basin Plan criteria, impairing water contact recreation and shellfish harvesting.

Toxicity is a measure of the detrimental effects of pollutants on aquatic organisms and can be caused by metals, fertilizers, pesticides, petroleum products and other organic compounds. Region-wide, CCAMP and the CMP have conducted toxicity monitoring in 80 streams and rivers at sample sites near the most agriculturally intensive land use. No toxic effects were observed in 16% of the sample sites, and some measure of lethal effect was observed at 65% of the sample sites. Results of this monitoring indicate that 90% of all severely toxic sample sites measured on the Central Coast occur in the agricultural areas of the Lower Salinas, Pajaro River, and the lower Santa Maria. Within these areas, 29 water bodies are listed as impaired by toxicity.

Regionally, erosion and excessive sedimentation in rivers and streams have led to a decline in anadromous fish habitat for migration and spawning. Common causes of erosion and excessive sedi-

mentation include clearing land for development without adequate storm water controls, farming too close to creek banks or on steep slopes, and increased storm water runoff from impervious surfaces. Degradation of riparian corridors through encroachment and poor land management practices reduces riparian vegetation, which leads to a reduction in shaded areas of a creek or stream. Without shade, water temperatures rise and dissolved oxygen levels decrease, and the riparian habitat for fish and aquatic life is severely compromised.

Groundwater Quality

Groundwater Quality Parameters of Special Concern

Nitrate

The Central Coast region has widespread and severe groundwater nitrate pollution within areas of intensive agricultural land use as documented by numerous studies and regional monitoring data. The most significant areas of nitrate impact associated with irrigated agriculture are within the Salinas Valley, Gilroy-Hollister Valley, Pajaro Valley, and Santa Maria River Valley basins, and to a lesser extent within southern portions of the San Luis Obispo Valley and the Santa Ynez River Valley basins. Numerous lines of evidence indicate irrigated agriculture is the primary source of the ongoing nitrate pollution. Although less significant, nitrate pollution from point source municipal discharges and domestic septic systems can be locally relevant. In particular, localized nitrate pollution within the Langley Area and Corral de Tierra Area sub-basins of the Salinas Valley, and portions of the Los Osos Valley and Santa Ynez River Valley basins is likely attributable to higher-than-normal septic system densities and/or unfavorable soil conditions.

Salts

Although additional study is needed, there is a potential for significant regional-scale salt loading to groundwater from various point and non-point source discharges, particularly within areas with high agricultural and municipal wastewater return flows. Whereas salt impacts from seawater intrusion as a result of overdraft conditions are generally well defined, non-point source loading of salts and the resulting impacts (increased soil and groundwater salinity) are relatively undefined in the Region. Historical studies indicate that agricultural operations are the leading source of salt loading to the Salinas and Pajaro Valley groundwater basins. To a lesser extent, analogous to the nitrate loading estimates, point source wastewater (both industrial and municipal) and septic system discharges also contribute to salt loading to groundwater within localized areas around these discharges.

Basin Overdraft/Seawater Intrusion

Groundwater overdraft within several Central Coast groundwater basins has resulted in seawater intrusion and the loss of riparian habitat due to insufficient base flows. Excessive pumping (primarily to meet agricultural demands) continues to cause seawater intrusion into the Salinas Valley and Pajaro groundwater basins, with increasing portions of these basins becoming unusable for agriculture and municipal supply. Seawater intrusion attributable primarily to over-pumping of groundwater for municipal supply has been documented in the Los Osos Valley groundwater basin. Excessive pumping of the Carmel Valley alluvial aquifer has resulted in the significant loss and degradation of riparian and aquatic habitat within both the Carmel River and Carmel River Lagoon, which are critical habitats for threatened steelhead trout.

Portions of the Gilroy-Hollister and Santa Maria River Valley basins are or were historically in overdraft, but changes in basin management practices appear to have stabilized- or caused a rebound in-

groundwater levels within these basins. The Gilroy-Hollister, Salinas Valley, and Santa Maria River Valley groundwater basins are actively managed to enhance groundwater recharge in order to meet pumping demand and to offset pumping via recycled water use. Surface water diversions from the Salinas Valley Water Project to the Castroville Seawater Intrusion Project have reportedly offset additional pumping west of Salinas that will halt, if not push back, seawater intrusion in this area. Although these and other related conjunctive use projects can be effective, maximizing irrigation efficiency is essential given that irrigated agriculture accounts for a majority of groundwater pumping.

Drinking Water Quality

In general drinking water systems in the region deliver water to their customers that meet federal and state drinking water standards. Recently the Water Boards completed a draft assessment of community water systems that rely on contaminated groundwater. This draft report identified 68 community drinking water systems in the region that rely on at least one contaminated groundwater well as a source of supply. Nitrate and naturally-occurring arsenic are the most prevalent groundwater contaminants affecting community drinking water wells in the region. The majority of the affected systems are small water systems which often cannot provide the economies of scale necessary to construct, operate, and maintain a water treatment facility.

In the Salinas Valley, groundwater accounts for nearly 100% of the potable supply. A 2012 UC Davis study found the largest percentage of nitrate exceedances are in the northern, eastern, and central Salinas Valley, and approximately one-third of the domestic and irrigation wells tested exceed the nitrate drinking water standard of 45 ppm (10 mg/liter as nitrogen) (Harter et al., 2012.). Smaller water systems and domestic wells are typically reliant on shallow groundwater wells and are often located in rural agricultural areas where nitrate pollution is the most significant. Consequently, residents of the Salinas Valley may be impacted by nitrate contamination exposing local residents to unsafe nitrate-contaminated groundwater now or in the future.

Near Coastal Issues

Seawater Intrusion

Many coastal groundwater basins of the Central Coast have been, and continue to be, threatened by seawater intrusion. Seawater intrusion in the northern Salinas Valley was first documented in 1933 by the California State Water Commission. Seawater intrusion in the Pajaro groundwater basin was first identified in the 1940s and current pumping now exceeds estimates of sustainable yield by more than 20,000 acre-feet per year. Seasonal groundwater withdrawals for agriculture in Santa Cruz and Monterey counties were recognized then and now as a contributing factor to seawater intrusion.

The City of Santa Cruz Water Department (SCWD) and Soquel Creek Water District (SqCWD) have been collaborating to conserve, protect and create reliable water resources. Both have already implemented numerous stringent conservation and curtailment requirements to maximize efficient water use, but the region needs a reliable supplemental water source that will provide needed supply during droughts and protect groundwater aquifers from seawater intrusion. After over 20 years of multiple studies and scores of public meetings, SCWD and SqCWD have identified desalination as the best option for delivering this supplemental water source. This program is currently in an Environmental Review process evaluating the potential for a 2.5 million gallon per day desalination facility in Santa Cruz. No decision has yet been made on the actual construction of the proposed project.

Further south, continued groundwater pumping in overdraft conditions is contributing to seawater intrusion along several coastal basins in San Luis Obispo County. Seawater intrusion is problematic in the community of Los Osos, where the impact of intrusion has been estimated to be migrating 100 feet per year. Recent studies show strong potential for seawater intrusion into the Nipomo area.

Santa Barbara and areas near Santa Maria have experienced signs of seawater intrusion, which at this time do not pose a threat to drinking water supplies. Santa Barbara County, as with all coastal areas, will be impacted by the potential sea-level rise associated with climate change. Topographically, the County is subject to rapid flooding due to its position between the Pacific Ocean and steep coastal ranges. Despite utilizing multiple coastal aquifers, significant seawater intrusion does not appear to be occurring. After the 1986 – 1991 period of drought, the City of Santa Barbara constructed a desalination plant but has since de-activated it due to the cost of operation and the availability of other supplies. It remains available in case of emergency or extreme water shortage.

Another near-coastal issue is stormwater runoff and sewage spills into the ocean. In Santa Cruz, recent upgrades to the wastewater collection system will reduce the potential for sewage leaks and spills from entering coastal waters.

Flood Management

The Central Coast has a long history of flooding in most of the region's rivers and creeks. Traditionally, the approach to flood management was to develop narrowly focused flood infrastructure projects. This infrastructure often altered or confined natural watercourses, which reduced the chance of flooding thereby minimizing damage to lives and property. This traditional approach looked at floodwaters primarily as a potential risk to be mitigated, instead of as a natural resource that could provide multiple societal benefits.

Today, water resources and flood planning involves additional demands and challenges, such as multiple regulatory processes and permits, coordination with multiple agencies and stakeholders, and increased environmental awareness. These additional complexities call for an Integrated Water Management approach that incorporates natural hydrologic, geomorphic, and ecological processes to reduce flood risk.

The Pajaro River Parkway Plan is a good example of the new approach to flood management. This is a technical evaluation to identify public access and recreational opportunities that can be incorporated into the Levee Reconstruction Project. The plan will include an evaluation of expanding recreational opportunities within the Pajaro River levee reconstruction project area, engagement with the public, outreach and negotiation with landowners, development of alternatives, cost estimates, benefit analysis, environmental constraints analysis, and implementation plan

Damage Reduction Measures

Flood exposure in the Central Coast Hydrologic Region occurs primarily along the Salinas River Basin, the Pajaro River, and along the coastline. Floods within the Central Coast region originate principally from winter storms and coastal flooding. Most flood events occur in December and January as a result of multiple storms and saturated soil conditions, but floods can occur in October and November or during the late winter or early spring months.

In the Central Coast Hydrologic Region, more than 425,000 people and over $40 billion in assets are exposed to the 500-year flood event. Table CC-11 provides a snapshot of people, structures, crops, and infrastructure exposed to flooding in the region. Over 315 State and Federal threatened, endangered, listed, or rare plant and animal species exposed to flood hazards are distributed throughout the Central Coast Hydrologic Region. Table CC-12 lists the number of sensitive species exposed to flood hazards in 100-year and 500-year flood events.

PLACEHOLDER Table CC-12 Flood Exposure in the Central Coast Hydrologic Region Exposures to the 100-Year and 500-Year Flood Events

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

Levee Performance and Risk Studies

In the Central Coast Hydrologic Region, forty-one local flood management projects or planned improvements were identified. Twenty-five of those projects have identified costs totaling approximately $280 million. The remaining projects are in the planning phase and do not have cost estimates. Twenty-eight local planned projects use an Integrated Water Management (IWM) approach to flood management. Examples of local IWM projects include the Coastal Wetland Erosion Control and Dune Restoration Project, the Lower Carmel River and Lagoon Floodplain Restoration and Enhancement Project and, the Salinas Valley Water Project. These identified projects and improvements are also summarized in the California's Flood Future Report Attachment E: Information Gathering Technical Memorandum.

Water Governance

Flood Management Governance and Laws

California's water resource development has resulted in a complex, fragmented, and intertwined physical and governmental infrastructure. Although primary responsibility for flood might be assigned to a specific local entity, aggregate responsibilities are spread among more than 135 agencies in the Central Coast Hydrologic Region with many different governance structures. A list of agencies can be found in the California's Flood Future Report Attachment E: Information Gathering Technical Memorandum. Agency roles and responsibilities can be limited by how the agency was formed, which might include enabling legislation, a charter, a memorandum of understanding with other agencies, or ownership.

The Central Coast region contains floodwater storage facilities and channel improvements funded and/or built by State and Federal agencies. Flood management agencies are responsible for operating and maintaining 260 miles of levees, more than 70 dams and reservoirs and, more than 210 debris basins within the Central Coast Hydrologic Region. For a list of major infrastructure in this hydrologic region, refer California's Flood Future Report Attachment E: Information Gathering Technical Memorandum.

Current Relationships with Other Regions and States

This section is under development.

Regional Water Planning and Management

Integrated Regional Water Management Coordination and Planning

The Central Coast region is actively engaged in Integrated Regional Water Management (IRWM)

planning and implementation of water projects. Each of the six Central Coast IRWM regions have demonstrated a commitment to inter-regional communication and coordination by planning and participating regularly in Central Coast conference calls. The goal of IRWM is to meet regional water management challenges by developing integrated solutions and diversified water management portfolios through the collaboration of the region's stakeholders and by planning at the regional scale. The IRWM efforts serve a vital role, in combination with local and statewide planning, to provide for sustainable water use, water quality, and environmental functions. Find information about the program at www.water.ca.gov/irwm/

Santa Cruz

The Santa Cruz IRWM effort is a successful water management program, built upon a long history of stakeholder-driven watershed planning efforts by the Santa Cruz IRWM partner agencies. Consequently, the Region's boundaries are based on watersheds- not jurisdictions. Stakeholder outreach is a priority and the region was recently awarded DWR funding to conduct targeted outreach to DACs.

Several Santa Cruz IRWM partner agencies are working with the Pajaro River Watershed IRWM group on two Proposition 84-funded projects: the hydrologic study of the Watsonville Sloughs (through the Santa Cruz IRWM) and the College Lake study (through the Pajaro River Watershed IRWM). The Santa Cruz IRWM is active in the Central Coast IRWM funding area conference calls, and is in discussions with the Greater Monterey IRWM region regarding regional data management. Members of the Santa Cruz IRWM have also served on the TAC for the Greater Monterey IRWM Plan climate change chapter update.

Santa Barbara Countywide

The Santa Barbara Countywide IRWM effort, active since 2007, has resulted in project planning, regional planning, meetings, public workshops, targeted outreach and ongoing outreach. The Region is currently focused on increasing agricultural outreach and improving watershed coordination. DACs have benefited from at least six Proposition 50 and 84 projects.

Accomplishments

Water Quality Accomplishments

The Central Coast has many important collaborative efforts to protect and enhance water quality. These partnerships leverage Central Coast Regional Water Quality Control Board (CCRWQCB) staff work by bringing stakeholders and experts together to find funding and implement projects that improve water quality, provide habitat and enhance watershed functions. The CCRWQCB supports these and other efforts through grant and settlement funding and participation on technical advisory committees. Below is a list of notable partnership efforts across the region, and some of their recent projects and accomplishments.

The Integrated Watershed Restoration Program (IWRP)

IWRP began in Santa Cruz County in 2003 and has now expanded to include San Mateo and Monterey counties. The IWRP brings together local, state and federal partners to provide technical and financial assistance for multi-benefit restoration projects. IWRP has begun or completed approximately 30 projects in Santa Cruz County creeks since 2009, including projects to restore riparian and wetland habitat, and projects to aid steelhead and coho salmon recovery by improving in-stream habitat, reducing sediment

delivery to creeks, and removing barriers to migration. Direct water quality benefits from these projects include erosion reduction, sediment capture, increased in-stream dissolved oxygen levels and lower summer in-stream water temperatures.

IWRP's largest restoration project to date will protect and restore 70 acres of marginal farmland in Watsonville Slough and will be completed in 2013. This project is the culmination of nearly eight years of work with landowners and growers, and represents a partnership between Santa Cruz Resource Conservation District, the Land Trust of Santa Cruz, USDA's Natural Resources Conservation Service, US Fish and Wildlife Service's Coastal Program and the Coastal Conservancy. The project will provide a mosaic of wetland and upland habitats and provide breeding, nesting and foraging habitat and migration corridors for sensitive species of amphibians. Additional information can be found at: http://iwrp.rcdsantacruz.org/about/index.html#evol.

Elkhorn Slough Foundation

The Elkhorn Slough Tidal Wetland Project is a collaborative effort to develop and implement conservation and restoration strategies for critical estuarine habitats in Elkhorn Slough- the largest tract of tidal salt marsh in California outside of San Francisco Bay. Initiated in 2004, the project involves over 100 coastal resource managers, scientific experts, agency representatives and community members. In 2011, the Tidal Wetlands Project completed the Parsons Slough Sill project. The sill is acting to reduce erosive tides and prevent thousands of cubic yards of sediment from washing into the bay each year. It is anticipated that this project will result in restoration of an additional seven acres of tidal marsh. Additional information can be found at: http://www.elkhornslough.org/.

Agriculture Water Quality Alliance (AWQA)

The Agriculture Water Quality Alliance is a partnership of agriculture industry groups, resource conservation agencies, researchers, and environmental organizations working toward protection of the Monterey Bay National Marine Sanctuary and the adjacent watersheds while sustaining the economic viability of agriculture throughout the Sanctuary's watersheds. In 2009, AWQA received funds from USDA to assist farmers in implementing improved irrigation and nutrient management practices. In the first two years, the program helped 71 growers install 384 conservation practices, treating 12,423 acres to reduce runoff and leaching of nutrients, and conserve water. Additional information can be found at: http://www.awqa.org/ and http://www.awqa.org/farmers/AWEP.html.

Morro Bay National Estuary Program (MBNEP)

Morro Bay is designated as a national estuary (one of 28 in the nation) and is the largest relatively undisturbed estuary along the southern and central California coast. MBNEP is a multi-stakeholder program that works with agencies, landowners, and researchers to protect the bay and its watershed. Water quality problems include increased sedimentation, bacteria and nutrients. The CCRWQCB has adopted several TMDLs for the bay and its tributaries. By working with landowners and managers to implement rangeland and road improvements, and wetland enhancement projects, MBNEP has been able to prevent thousands of tons of sediment from reaching the bay. A recently completed project by MBNEP, in coordination with local ranchers, implemented off-stream water supplies and fencing to keep cattle out of San Luisito Creek, a subwatershed of the bay. The project resulted in a significant drop in bacterial levels in the stream by 2010, and a potential de-listing by 2013. Additional information can be found at: http://www.mbnep.org/index.html.

Reducing Sediment from Rural Roads

Santa Cruz Resource Conservation District began a rural roads cost-share funding program several years ago and completed the third phase in 2010. This program has helped landowners implement practices to reduce erosion on mountainous roads in rural Santa Cruz County. The RCD estimates that the most recent phase of the program is preventing nearly 900 tons of sediment per year from entering steelhead and salmon-bearing river systems.

Reducing Sediment, Pathogens and Nutrients from Small Livestock Operations

Ecology Action of Santa Cruz is implementing a multi-phase project to assist landowners with implementing management practices to reduce impacts from small livestock operations, which are common in rural areas throughout the region. Livestock facilities have been shown to contribute significantly to impairment of local waterways through contribution of nutrients, pathogens and sediment. For example, in the San Lorenzo river mouth, livestock contributes 30% of the known pathogen sources. Practices implemented include vegetated swales and buffer strips, manure containment, and revegetation. Since the three grant projects have been implemented, hundreds of tons of manure and hundreds of pounds of nutrients have been kept out of Central Coast waterways.

Improving Irrigation and Nutrient Management on Farm Lands

Grant funding from Propositions 50 and 84 has been allocated to the Santa Cruz County Resource Conservation District, the Monterey Bay Sanctuary Foundation, and the Cachuma Resource Conservation District for irrigation and nutrient management on agricultural lands in the Pajaro, Salinas, and Santa Maria River watersheds, respectively. Grants provide cost-share assistance for improved agricultural practices such as irrigation system conversions and tailwater treatment, and will serve as a model for agricultural BMP implementation.

Clean Water Act Section 319(h) Nonpoint Source Pollution Control Program grant funds were awarded to the Coastal San Luis Resource Conservation District to implement agricultural water quality improvement projects on rangeland and farms to reduce sediment, nutrient, and pesticide pollutant loading to Morro Bay.

Agricultural Sustainability CCVT SIP Certification

In 1996, a group of Central Coast wine-grape growers pioneered an innovative whole-farm assessment system to assess vineyard sustainability. In 2008, the Central Coast Vineyard Team (CCVT) program launched a sustainability certification program, wherein third-party auditors assess the sustainability of the entire wine-growing operation. Those that meet the Sustainability in Practice (SIP) certification requirements are eligible to use the SIP seal on their wine. Currently, there are 27,000 acres certified and 300,000 cases of wine bearing the SIP seal. http://www.vineyardteam.org/sip.

Low Impact Development

Under the guidance of the Low Impact Development Center, the following LID projects are underway:

1. A redesign of the parking lot at the Atascadero Zoo to incorporate pervious pavement, rain gardens and native vegetation to mimic the processes and functions of natural systems, allowing storm water to slow, spread and sink in. Such design features increase recharge of aquifers and filter pollutants. Additional features, such as trees and other vegetation, will provide aesthetic, cooling, and storm water management functions.

2. The Paso Robles 21st Street Complete Green Street, is a project to redesign a street near the Paso Robles Event Center that was built in a natural drainage-way and currently floods during large storms. The planned and funded project will reduce the volume and intensity of storm water runoff, increase groundwater recharge, improve pedestrian and bicyclist mobility, shade the street and promote redevelopment.

Removing Water Quality Impairments through Implementing TMDLs

The Central Coast region has many water bodies that are listed on the Clean Water Act Section 303(d) list of impaired water bodies. Total Maximum Daily Load (TMDL) development and implementation is a high priority. In 2010, the CCRWQCB was able to remove Chorro Creek (a tributary to Morro Bay), from the 303(d) list as a result of improvement in dissolved oxygen levels. The delisting was a result of actions by a discharger, several landowners, and the Morro Bay National Estuary Program. Actions included upgrade of a waste water treatment plant, restoration of a segment of Chorro Creek, and several stream fencing projects in tributaries. Dissolved oxygen is now meeting water quality standards, and nutrient and pathogen levels are declining.

Groundwater Cleanup

During the period from 2009 through 2011, 184 groundwater cleanups were completed, including 145 leaking underground fuel storage tanks and 39 other groundwater cleanup cases, such as dry cleaners and munitions production facilities. Groundwater cleanup is necessary to protect drinking water supplies throughout this groundwater-dependent region. For example, a cleanup remedy is currently underway in the Llagas groundwater basin in southern Santa Clara County, where potassium perchlorate from a facility that manufactured signal flares created a contaminant plume that reached 10 miles in length and polluted 188 domestic wells. The Water Board ordered cleanup in 2007, and by 2010, over 255 million gallons of groundwater had been treated and 176 of the polluted domestic wells were meeting the drinking water standard for percholorate (94%). Additional information can be found at: http://www.waterboards.ca.gov/rwqcb3/board_info/agendas/2011/July/Item9/9_stfrpt.pdf.

Challenges

Region Challenges

Disadvantaged Community Water Systems

Disadvantaged communities in the region often cannot provide the economies of scale necessary to construct, operate and maintain new water facilities to meet drinking water standards. Recent grant funding has assisted some systems to begin design and construction of these needed projects, however not all projects were funded. Additional grant funding is needed to assist these and future projects.

Proposition 218

Water and wastewater systems in the region continue to plan, design and complete upgrades to their water and wastewater systems in order to meet stricter drinking water and wastewater regulations. These upgrades typically require rate increases from rate payers who may challenge these rate increases through the Proposition 218 process, which requires that any local tax imposed to pay for specific governmental programs be approved by two-thirds of the voters. The required system upgrades may be jeopardized if the rate increases are overturned, which may result in continued violations of drinking water or

wastewater effluent standards or continued deterioration of water system facilities that have outlived their useful life.

Disposal of Drinking Water Treatment Waste Products

Disposal of drinking water treatment waste products can significantly increase treatment costs that are ultimately passed on to rate payers. When selecting drinking water treatment alternatives, especially for arsenic, water systems must consider the cost to dispose of drinking water treatment waste products such as backwash water or spent filter media. Spent filter media must be evaluated under the California Waste Extraction Test (WET), which is more stringent than the federal leaching tests, for classification prior to determining appropriate disposal options. As well, some spent filter media may qualify as a hazardous or radioactive waste due to the concentration and leaching characteristics of the contaminant.

Protecting Groundwater Basins

A major challenge in the Central Coast is protecting groundwater basins. The decades-long accumulation of nitrates in the groundwater basins of the Salinas, Pajaro and Santa Maria watersheds, as the result of the intensive, year-round agriculture that produces the majority of the nation's lettuce, celery, cabbage and strawberries, and the associated groundwater pumping demands, threatens the sustainability of the region's main source of water. Central Coast groundwater basins supply not only irrigation water, but also drinking water to the majority of the region's growing population.

Area Challenges

Santa Cruz

- IRWM - Funding and resource limitations continue to be the biggest challenge;the Santa Cruz IRWM finds it difficult to assign staff to work on un-funded IRWM efforts. Also, there is very little funding- relative to the rest of the state- available to the Central Coast funding area and hydrologic region (only $52M), over half of which has already been spent. As well, inter-regional IRWM planning is difficult because the Central Coast IRWM regions must compete against each other for limited grant funds.
- Water Reliability in Santa Cruz County - An evaluation of water supplies and demands for the City of Santa Cruz and the Soquel Creek Water District indicated that a new water supply source will be necessary to meet community demands, reduce groundwater pumping and maintain in-stream flows for fish. In 2010, both water systems completed a joint desalination pilot study to evaluate alternative treatment systems for a seawater reverse osmosis desalination plant.

Pajaro River Watershed

- Improve Water Quality in Northern San Benito County

Monterey Peninsula

- Water Reliability in Monterey Peninsula - The Monterey Peninsula must develop new water supplies due to a water rights cease and desist order requiring Cal-Am Water Company (the major local water supplier) to reduce water diversion from the Carmel River and an adjudication of the Seaside groundwater basin requiring Cal-Am to reduce its groundwater pumping. The Monterey Peninsula Water Management District (MPWMD) estimates that 6,000 to 8,000 acre-feet per year on average are needed to replace the required reduction in water diversions from the Carmel River and Seaside Groundwater Basin.

San Luis Obispo

- Paso Robles Groundwater Basin Overdraft remains controversial.

Santa Barbara

- IRWM - The greatest challenge is the amount of funding since there are six Central Coast IRWM regions competing for a limited amount of money. For inter-regional planning, it is a challenge to sort through stakeholders to find and connect project partners.
- Upgrade of the City of Santa Barbara's Cater Water Treatment Plant - The City of Santa Barbara is currently constructing (December 2013 completion date) an ozone treatment facility, at their 37 MGD conventional surface water treatment plant, to replace chlorine as a pre-oxidant. They are also constructing a centralized groundwater treatment facility to maximize usage of their groundwater sources. These upgrades are needed to meet more stringent disinfection byproduct regulations.

Flood Challenges

Flood management in the Central Coast Hydrologic Region of California has a unique set of challenges that were identified during meetings with local agencies in the hydrologic region. These challenges include:

- Impacts of sea level rise
- Operations and maintenance costs
- Environmental regulations that restrict the ability of agencies to utilize options for flood management
- Inconsistent and unreliable funding
- Inadequate access to training and/or experienced flood managers
- Difficulty quantifying the benefit (intangible) of improved habitat and other intangible aspect of a project to prove that the project provides a net benefit
- Inadequate agency alignment and inconsistent agency roles and responsibilities
- Inadequate public awareness about flood risk
- Land use planning and economic pressures promote development in the floodplain in some areas
- Permitting that is costly and difficult to navigate

Implementation Activities (2009-2013)

Implementation Projects

Santa Cruz

- Four major successful projects in the Santa Cruz area are the Conjuctive Use and Enhanced Aquifer Recharge, the Integrated Watershed Restoration Program, a desalination analysis and the Davenport Water Treatment Plant Improvements. The Conjunctive Use and Enhanced Aquifer Recharge identified preferred projects for the lower San Lorenzo River, and led to the current effort to develop a water exchange project between four water districts in the Santa Cruz IRWM Region. The Integrated Watershed Restoration Program (IWRP) is implementing watershed enhancement projects, erosion control projects, habitat restoration projects, watershed education programs, and a permit coordination program to promote voluntary participation in long-term watershed restoration. TheCity of Santa Cruz partnered with the Soquel Creek Water District to complete a rigorous and successful analysis of a potential desalination plant. The Davenport County Sanitation District completed construction of a new

membrane filtration system and water tank for the Davenport drinking water system, which no longer met state or federal drinking water standards.

Pajaro River Watershed

The San Jerardo Water System Improvements Project. Construction was completed on a new well, transmission pipelines, water storage tank, and a booster pump station for the disadvantaged community of San Jerardo. The community has been on a bottled water order since 2001 due to contamination of its well with both nitrate and trichloropropane (TCP).

San Luis Obispo

Lake Nacimiento Regional Pipeline Project - San Luis Obispo County completed construction of a 45-mile raw water transmission pipeline with the ability to deliver 15,750 acre-feet per year of raw water to the communities of Paso Robles, Templeton, Atascadero, and San Luis Obispo.

Looking to the Future

Future Conditions

Future Water Demand

In this section a description is provided for how future Central Coast hydrologic region water demands might change under scenarios organized around themes of growth and climate change described earlier. The change in water demand in the Central Coast from 2006 to 2050 is estimated for agriculture and urban sectors under 9 growth scenarios and 13 scenarios of future climate change. The climate change scenarios included the 12 Climate Action Team scenarios described earlier and a 13th scenario representing a repeat of the historical climate (1962-2006) to evaluate a "without climate change" condition.

Urban Demand

Figure CC-14 shows a box plot of demand change in urban water under 9 growth scenarios for the Central Coast region with variation shown across 13 scenarios of future climate including one scenario representing a repeat of the historical climate. A box plot is a graphical representation showing the minimum, 25th percentile, median, 75th percentile, and maximum values. The red dot shows the mean or average value. The change in water demand is the difference between the historical average for 1998 to 2005 and future average for 2043 to 2050. Urban demand is the sum of indoor and outdoor water demand where indoor demand is assumed not to be affected by climate. Outdoor demand, however, is dependent on climate factors like amount of precipitation falling and the average air temperature. Urban demand increased under all 9 growth scenarios tracking with population growth. On average, it increased by about 40 thousand acre-feet under the three low population scenarios, 130 thousand acre-feet under the three current trend population scenarios and about 230 thousand acre-feet under the three high population scenarios when compared to historical average of about 270 thousand-acre-feet. The results show change in future urban water demands are less sensitive to housing density assumptions or climate change than to assumptions about future population growth.

PLACEHOLDER Figure CC-14 Change in Urban Water Demand, Central Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

Agricultural Demand

Figure CC-15 shows a box plot of statewide change in agricultural water demand in the Central Coast under 9 growth scenarios with variation shown across 13 scenarios of future climate including one scenario representing a repeat of the historical climate Agricultural water demand decreases under all future scenarios due to reduction in irrigated lands as a result of urbanization and background water conservation when compared with historical average water demand of about 1030 thousand acre-feet. Under the three low population scenarios, the average reduction in water demand was about 100 thousand acre-feet while it was about 210 thousand acre-feet for the three high population scenarios. For the three current trend population scenarios, this change was about 40 thousand acre-feet. The results show that low density housing would result in more reduction in agricultural demand since more lands are lost under low-density housing than high density housing.

PLACEHOLDER Figure CC-15 Change in Agricultural Water Demand, Central Coast Hydrologic Region

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

Future Water Quality

Below are recommendations that, if implemented on a regional scale, will protect water quality and public health, promote sustainable water supplies, and improve our ability to measure performance in protecting and restoring groundwater resources. Most require coordination and cooperation among many entities, and may entail changes in policy as well.

Groundwater Recharge Area Protection - The Central Coast Region relies heavily on groundwater for drinking water and agricultural irrigation. Preservation of groundwater quality in source areas will be accomplished by identifying and protecting groundwater recharge locations.

- Identify and map recharge areas (consistent with AB 359, Huffman 2011)
- Develop local and statewide land use management requirements (e.g., ordinances, regulations, Basin Plan amendments, etc.) to protect and restore recharge areas.
- Implement programs and projects to increase the amount of clean water recharge (e.g., Low Impact Development).
- Utilize Integrated Regional Water Management to address complex issues, such as infiltration management, basin recharge, etc.

Regional/Basin-wide Groundwater Monitoring and Assessment- Understanding of the quality and quantity of water in our groundwater basins is essential to successful management. The following strategies will provide increased data availability/transparency and use:

- Coordinate with local agencies to build on existing programs and develop programs where they are lacking.
- Improve data management - build on GeoTracker GAMA as the centralized database to consolidate groundwater quality, and CASGEM for well and hydrogeologic data.

- Develop monitoring programs for shallow groundwater.
- Implement drinking water quality monitoring requirements, with reporting into GeoTracker, for the most at-risk population of water users who rely on domestic wells and local small and state small water systems/wells for their potable supply.

Source Control of Nitrate and Salt Loading to Groundwater - The significant and ongoing loading of nitrate and salts is the largest threat to public health and groundwater quality within the region. Irrigated agriculture is the most significant source of loading.

- Implement the Central Coast's Irrigated Lands Regulatory Program to monitor and reduce pollutant loading from irrigated agriculture.
- Facilitate the development and implementation of salt and nutrient management plans (per SWRCB Recycled Water Policy, Resolution 2009-0011).
- Develop regional permitting strategy, in alignment with pending salt and nutrient management plans, to address salt and nutrient loading from municipal discharges and recycling projects (e.g., develop consistent permit requirements and support development of coastal brine disposal facilities).

Widespread Improvements in Agricultural Irrigation Efficiency and Management - The Central Coast has approximately 435,000 acres of very productive irrigated agriculture, much of it intensively cropped nearly year-round, making it the third largest land use in the region, after open space and rangeland. Irrigated agriculture is the largest user/pumper of groundwater within the agricultural areas of the region, and contributes the largest fraction of return flows to both surface water and groundwater. Improved irrigation management can reduce off-site movement of water that carries pollutants to surface and groundwater, reduce erosion and sedimentation, and reduce overdraft of groundwater basins.

- Improve water use measurement
- Improve irrigation scheduling, such as through expanded use of climate information (CIMIS)
- Increase knowledge of crop water needs

Riparian Buffer Zone Designation and Protection - Riparian lands adjacent to streams, lakes, or other surface water bodies that are adequately vegetated provide an important environmental protection and water resource management benefit.

- Implement specifications for the establishment, protection, and maintenance of riparian vegetation
- Adopt a Basin Plan amendment for riparian protection
- Adopt local ordinances protecting riparian areas
- Improve statewide riparian and wetland protection policies
- Implement rangeland management measures

Widespread Implementation of Low Impact Development (LID) - Low Impact Development techniques, such as increasing urban surface permeability and creating swales and vegetated areas to allow increased infiltration of rainwater, can improve water quality by reducing pollution being transported to streams and coastal areas (e.g. bacteria, pesticides, and fertilizers) and increasing recharge of clean groundwater.

- Adopt local ordinances requiring LID
- Establish standards for hydromodification
- Expand the Central Coast LID Initiative

Widespread Implementation of Urban Water Conservation - Urban water conservation has the potential to improve water quality by reducing basin overdraft/seawater intrusion in some areas and eliminating summer flows that carry pollutants to surface waters.

- Increase use of incentives to encourage rapid adoption of water saving technologies (e.g., toilet exchange programs, credits for drought-tolerant landscaping, grey water retrofits, rainwater collection systems)

The recommendations, implementation actions and accomplishments of the Central Coast Water Board identify solutions and actively address the water quality challenges we face. Integrated Regional Water Management, the Central Coast Ambient Monitoring Program, the Cooperative Monitoring Program, and the Low Impact Development Initiative are just a few examples of how coordinating and leveraging both internal and external resources has the potential to achieve tangible results on a regional scale.

Integrated Water Management Plan Summaries

Inclusion of the information contained in IRWMP's into the CWP Regional Reports has been a common suggestion by regional stakeholders at the Regional outreach meetings since the inception of the IRWM program. To this end the California Water Plan has taken on the task of summarizing readily available Integrated Water Management Plan in a consistent format for each of the regional reports. This collection of information will not be used to determine IRWM grant eligibility.

This effort is ongoing and will be included in the final CWP updates and should include up to 4 pages (one fold out 11x17 double sided) for each IRWMP in the regional reports.

In addition to these summaries being used in the regional reports we intend to provide all of the summary sheets in one IRWMP Summary "Atlas" as an article included in Volume 4. This atlas will, under one cover, provide an "at-a-glance" understanding of each IRWM region and highlight each region's key water management accomplishments and challenges. The atlas will showcase how the dedicated efforts of individual regional water management groups (RWMGs) have individually and cumulatively transformed water management in California.

All IRWMP's are different in how are organized and therefore finding and summarizing the content in a consistent way proved difficult. It became clear through these efforts that a process is needed to allow those with the most knowledge of the IRWMP's, those that were involved in the preparation, to have input on the summary. It is the intention that this process be initiated following release of the CWP Update 2013 and will continue to be part of the process of the update process for Update 2018. This process will also allow for continuous updating of the content of the atlas as new IRWMP's are released or existing IRWMP's are updated.

Resource Management Strategies

Santa Cruz

- **Agricultural Water Use Efficiency** – Under the County's new well ordinance, all new agricultural wells are required to develop and implement a water conservation plan as a condition of permit approval.
- **Urban Water Use Efficiency** – Water districts within the Santa Cruz IRWM region have some of the lowest per-capita water use rates within the State (and likely, the nation). Each of the

district's updated urban water management plans call out for conservation, and those programs are continually being updated and improved.

- **Water Transfers** – The County, City of Santa Cruz, Soquel Creek Water District, Scotts Valley Water District and San Lorenzo Valley Water District are studying the feasibility of a water exchange project. This effort is currently funded by Proposition 84, under which regulatory and engineering constraints will be examined, and preliminary designs and cost estimates generated.
- **Conjunctive Management & Groundwater Storage** – The County successfully completed a conjunctive use analysis for the lower San Lorenzo River with funds from a Proposition 50 IRWM grant. The study looked at various conjunctive use alternatives and identified three priority projects. This project laid the groundwork for the current water exchange project, described above.
- **Desalination: Brackish & Seawater** – see earlier description under __.
- **Recycled Municipal Water** – The City of Scotts Valley and the Scotts Valley Water District operate a facility to provide recycled water for landscape irrigation to reduce groundwater pumping from the aquifer. Under a Proposition 50 IRWM grant, the Scotts Valley Water District implemented a project to expand the City's recycled water distribution system. A project is currently being pursued with local funding to recycle the balance of Scotts Valley wastewater for irrigation on a nearby golf course, which will reduce the demand for municipal water.
- **Drinking Water Treatment and Distribution** – The City of Santa Cruz and San Lorenzo Valley Water District operate a centralized water treatment plant to treat surface water prior to distribution. The other water agencies typically utilize wellhead treatment at their individual wells prior to distribution.
- **Groundwater/Aquifer Remediation** – Santa Cruz County Environmental Health Service has a comprehensive program to assist the Regional Water Board in the clean up of contaminated groundwater, particularly in the Scotts Valley area, where contamination plumes pose potential threats to municipal wells.
- **Pollution Prevention** – Almost all local jurisdictions are implementing pollution prevention efforts. Much of this work is done under NPDES stormwater permits.
- **Urban Runoff Management** – Same as for pollution prevention.
- **Agricultural Lands Stewardship** – A high percentage of agricultural operations within the region conduct agricultural land stewardship. This work has been carried out under the Monterey Bay National Marine Sanctuary's Ag and Rural Lands plan, supported by Federal 319(h) and State Proposition 13, 40, 50 and 84 grants. The Resource Conservation District of Santa Cruz County together with the Natural Resources Conservation Service and willing landowners have implemented numerous projects.
- **Economic Incentives** – Water agencies utilize tiered pricing and rebates to encourage water conservation. Revenues generated from water rates also support watershed management and groundwater basin management.
- **Ecosystem Restoration** – Much of the restoration activities within the region are being coordinated through the Resource Conservation District of Santa Cruz County. The Resource Conservation District currently has two programs that address habitat restoration: the Healthy Watersheds Restoration Program (HWRP) focuses on smaller-scale restoration projects, while the Integrated Watershed Restoration Program (IWRP) focuses on larger-scale restoration projects.

- **Forest and Watershed Management** – The City of Santa Cruz and San Lorenzo Valley Water District both own extensive forested watershed lands. They have developed watershed management plans to improve the watershed and limit potential impacts of timber harvesting. Timber harvesting that takes place on private and state owned lands is subject to special rules for the Santa Cruz Mountains, which prohibit clear-cutting and provide for waterway protection.
- **Land Use Planning and Management** - The Santa Cruz County General Plan includes many policies and programs for water resource, watershed, and aquifer protection, including restrictions in mapped groundwater recharge areas and water supply watersheds. Santa Cruz County has ordinances for protection of riparian corridors and erosion control as well as pollution prevention.
- **Recharge Area Protection** – Santa Cruz County has mapped primary groundwater recharge areas and has specific policies for minimum parcel size, septic system design and maintenance of infiltration in those areas.
- **Water-dependent Recreation** – The region supports a moderate amount of water dependent recreation, including boating and fishing in Loch Lomond; white-water boating, salmon and steelhead fishing, swimming and wading in the San Lorenzo River; and swimming, surfing and boating in the near-coastal waters.
- **Flood Risk Management** – Flood risk management is accomplished through flood plain zoning and development restrictions, operation of an ALERT flood warning system, projects to reconstruct and raise bridges on the San Lorenzo River and Soquel Creek, grants for elevation of flood-prone homes in the Felton area, and levee reconstruction and maintenance on the lower San Lorenzo River.

San Luis Obispo

- Reduce Water Demand through conservation.
- Increase Water Supply through optimizing use of the Nacimiento Water Project and State Water Project; increasing recycled water use; groundwater banking and recharge; desalination; new off-stream and on-stream storage; and precipitation enhancement .
- Practice Resource Stewardship through improved Land Use Management.
- Improve Operational Efficiency and Transfers through Salinas Reservoir and Lopez Lake expansion and exchanges; optimization of Nipomo supplemental water project.

Climate Change

Observations and Projections

Climate change is already impacting many resource sectors in California, including water, transportation and energy infrastructure, public health, biodiversity, and agriculture (USGRCP, 2009; CNRA, 2009). Climate model simulations based on the Intergovernmental Panel on Climate Change (IPCC) 21st century scenarios, project increasing temperatures in California, with greater increases in the summer. Projected changes in annual precipitation patterns in California will result in changes to surface runoff timing, volume, and type (Cayan, 2008).

While the State of California is taking aggressive action to mitigate climate change through greenhouse gas (GHG) reduction and other measures, global impacts from carbon dioxide and other GHGs that are already in the atmosphere will continue to impact climate throughout the rest of the century (CARB, 2008; IPCC, 2007; UNEP, 2009). Resilience to an uncertain future can be achieved by implementing

adaptation measures sooner rather than later. Due to the economic, geographical and biological diversity of the state, vulnerabilities and risks due to current and future anticipated changes are best assessed on a regional basis. Many resources are available to assist water managers and others in evaluating their region-specific vulnerabilities and identifying appropriate adaptive actions (EPA/DWR, 2011; CNRA, 2012).

Adaptation

Local agencies, as well as federal and state agencies, face the challenge of interpreting new climate change data and information and determining which adaptation methods and approaches are appropriate for their planning needs. The Climate Change Handbook for Regional Water Planning provides an analytical framework for incorporating climate change impacts into the regional and watershed planning process and considers adaptation to climate change (EPA/DWR, 2011). This handbook provides guidance for assessing the vulnerabilities of California's watersheds and hydrologic regions to climate change impacts, and prioritizing these vulnerabilities.

Mitigation

This is the first California Water Plan to include specific energy intensity information related to water. There is a need to mitigate for climate change by reducing the greenhouse gas (GHG) emissions related to water usage, and comparing energy intensity of various water supplies when making portfolio choices. While both adaptation and mitigation are needed to manage risks and are often complementary and overlapping, there may be unintended consequences if efforts are not coordinated.

When making water management choices, the energy intensity of individual supplies can become part of the decision making process. Figure 13 indicates relative energy intensity of raw water extraction and conveyance for the primary water supply sources for this region (caption and footnotes under development). It provides a tool to assist decision making in water management regarding water and energy efficiency and to help evaluate what type of water supply portfolio should be used to meet demand within the hydrological region.

PLACEHOLDER Figure CC-16 Energy Intensity Light Bulbs in Central Coast

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

Regional Temperature Trends

The Western Regional Climate Center (WRCC)* has been recording temperature and precipitation data for the past century. The Central Coast Hydrologic Region is covered by two WRCC regions - the Central Coast and San Joaquin Valley regions. Temperatures in the WRCC Central Coast region during the period of record indicate that a mean increase of about 1.1 – 2.0 °F (0.6 – 1.1 °C) has occurred, with minimum values increasing more than maximums [1.6 – 2.6 °F (0.9 – 1.4 °C) and 0.4 – 1.5 °F (0.2 – 0.8 °C), respectively]. Temperatures in the WRCC San Joaquin Valley region show a similar trend. A mean increase of 0.9 – 1.9 °F (0.5 – 1.0 °C) was recorded, with minimum temperatures increasing 2.0 – 3.0 °F (1.1 – 1.6 °C) compared to the mean maximum temperature trend, which was relatively stable.

Temperature, Precipitation, and Sea Level Rise Projections

Temperature projections from climate models are in wide agreement on a warming trend statewide.

Future impacts by 2050 for the Central Coast Hydrologic Region are projected to include as much as a 1.0 – 2.0 °F (0.6 – 1.1 °C) increase in winter temperatures and a 2.0 – 3.0 °F (1.1 – 1.7 °C) increase in summer temperatures, under a high emissions scenario (Cal-EMA/CNRA, 2012). A recent highly sophisticated study of projected temperatures for 2070 indicates that the region could experience a 3.6 °F (2.0 °C) increase overall, with an increase of 2.9 °F (1.6 °C) in mean winter temperatures and 4.0 °F (2.2 °C) in summer (Pierce et.al., 2012). By 2100, an increase of 4 – 5 °F (2.2 – 2.8 °C) in winter and 4-7 °F (2.2 – 3.9 °C) in summer are expected (Cal-EMA/CNRA, 2012).

Extreme precipitation events are projected to increase with climate change (Dettinger, 2012). Changes in annual precipitation across California, either in timing or total amount, will result in changes to the type of precipitation (rain or snow) in a given area, and to surface runoff timing and volume. Most climate model precipitation projections for the State anticipate drier conditions in southern California, with heavier and warmer winter precipitation in northern California. More intense wet and dry periods are anticipated, which could lead to flooding in some years and drought in others. Since there is less scientific detail on localized precipitation changes, there exists a need to adapt to this uncertainty at the regional level (Leung, 2012).

The National Research Council has projected that sea level will rise approximately 2-12 inches (4-30 cm) by 2030, 5-24 inches (12-61 cm) by 2050 and 17-66 inches (42-167 cm) by 2100 (NRC, 2012). For the Central Coast, approximately 66 percent of the region's water comes from groundwater, and salt water intrusion into the coastal groundwater aquifers is a current and historical problem. It is likely that, as sea level continues to rise and groundwater continues to be extracted, this problem will be exacerbated (Cal-EMA/CNRA, 2012).

Flood Risk

A recent study that explores future climate change and flood risk in the Sierra using downscaled simulations (computer projections refined to a scale smaller than global models), from three global climate models (GCMs) under a GHG scenario which is reflective of current trends, indicates a tendency toward increased 3-day flood magnitude. By the end of the 21st century, all three projections yield larger floods for both the moderate elevation northern Sierra Nevada watershed and for the high elevation southern Sierra Nevada watershed, even for GCM simulations with 8–15% declines in overall precipitation. The increases in flood magnitude are statistically significant for all three GCMs for the period 2051–2099. By the end of the 21st century, the magnitudes of the largest floods increase to 110% to 150% of historical magnitudes. These increases appear to derive jointly from increases in heavy precipitation amount, storm frequencies, and days with more precipitation falling as rain and less as snow. The frequency of floods by the end of this century increased for two of the models, but remained constant or declined for the third model (Das et al., 2011). While this study focused on the Sierra Nevada, these scenarios could potentially be indicative of other regional settings with flood risks.

Ecosystem Services and Agriculture

Critical habitats in the region such as near-shore ecosystems and estuaries will be impacted by sea level rise. Coastal infrastructure will be particularly vulnerable to increased storm surges. For Central Coast counties, the estimated increase in acreage vulnerable to flooding is 36 percent in Santa Barbara, 15 percent in San Luis Obispo, 12 percent in Santa Cruz, and 11 percent in Monterey (Cal-EMA/CNRA, 2012). It is anticipated that these storm surge events, which will result in flooding and erosion, will be more damaging to the coastline than the gradual sea level rise that California is experiencing, and these

changes to the coastline will likely have a significant economic impact on the region's coastal tourism industry (CNRA, 2009).

Agricultural crops in the region, particularly wine and table grapes, almonds, and avocadoes, will be affected by the increase in average temperatures as well as variations in the timing and amount of precipitation (USGRCP 2009). For the Central Coast, approximately 80% of the region's drinking and irrigation water comes from groundwater, and salt water intrusion into the coastal groundwater aquifers is a current and historical problem. As sea level continues to rise and groundwater continues to be extracted, this problem may be exacerbated (CNRA, 2012). Heat waves, defined as five days over 79 to 85 degrees along the coast and 99 to 101 degrees F inland, are expected to occur three to four more times inland by 2050. By 2100, they are expected to occur four to eight times more often in coastal areas and eight to ten times more often in inland areas (Cal-EMA/CNRA 2012). Wildfire risk will increase, with as much as a 200-350% increase in the area burned in 2085 compared to historic amounts (Westerling, 2009).

Strategies

The myriad of resources and choices available to managers can seem overwhelming, and the need to take action given uncertain future conditions is daunting. However, there are many 'low-regrets' actions that water managers in the Central Coast Hydrologic Region can take to prepare for climate change, regardless of the magnitude of future warming (GEOS/LGC, 2010). These actions often provide economic and public health co-benefits. Water and energy conservation are examples of strategies that make sense with or without the additional pressures of climate change. For the Central Coast region, developing adaptive management plans to address the impacts of sea level rise on groundwater supplies and coastal geomorphology should serve to facilitate the gradual land-ward retreat of the region's vulnerable coastal municipal and urban infrastructure (DWR, 2008; Cal-EMA and CNRA, 2012).

Many of the Resource Management Strategies from California Water Plan Update 2009 (Volume 3) provide benefits for adapting to climate change in addition to meeting water management objectives. These include:

- Agricultural/Urban Water Use Efficiency
- Conveyance – Regional/local.
- System Reoperation.
- Conjunctive Management and Groundwater Storage.
- Precipitation Enhancement.
- Surface Storage – Regional/Local.
- Pollution Prevention.
- Agricultural Land Stewardship.
- Ecosystem Restoration.
- Forest Management.
- Land Use Planning and Management.
- Recharge Area Protection.
- Watershed Management.
- Flood Risk and Integrated Flood Management.

The Central Coast Hydrologic Region contains a diverse landscape with different climate zones, making it difficult to find one-size-fits-all adaptation strategies. Water managers and local agencies must work

together to determine the appropriate planning approach for their operations and communities. While climate change adds another layer of uncertainty to water planning, it does not fundamentally alter the way water managers already address uncertainty (US EPA and DWR, 2011). However, stationarity (the idea that natural systems fluctuate within an unchanging envelope of variability) can no longer be assumed, so new approaches will likely be required (Milly, et al., 2008). Whatever approach is used, it is necessary for water managers and communities to start implementing adaptation measures sooner rather than later in order to be prepared for an uncertain future.

Local Planning

Integrated Regional Water Management (IRWM) planning is a framework that allows water managers to address climate change at the regional scale. Climate change is now a required component of all IRWM plans and IRWM regions should begin addressing climate change by performing a vulnerability assessment (DWR, 2010 and 2012). This assessment will help each IRWM region to identify and prioritize their specific vulnerabilities, and identify adaptation strategies that are most appropriate for each region and sub-region. Planning strategies to address vulnerabilities and adaptation to climate change should be both proactive and adaptive, starting with low-regrets strategies that benefit the region in the present-day while adding future flexibility and resilience under uncertainty.

Water managers need to consider both the natural and built environments as they plan for the future. Stewardship of natural areas and protection of biodiversity are critical for maintaining ecosystem services important for human society such as flood management, carbon sequestration, storm water pollution remediation, as well as, habitat for the pollinators of our natural and agricultural landscapes. Increased cross-sector collaboration between water managers, land use planners and ecosystem managers provides opportunities for identifying common goals and actions needed to achieve resilience to climate change and other stressors.

Additional Tools and Resources

The State of California has developed additional tools and resources to assist resource managers and local agencies in adapting to climate change, including:

- California Climate Adaptation Strategy (2009) - California Natural Resources Agency (CNRA) at: http://www.climatechange.ca.gov/adaptation/strategy/index.html
- California Climate Change Adaptation Planning Guide (2012) - California Emergency Management Agency (Cal-EMA) and CNRA at: http://resources.ca.gov/climate_adaptation/local_government/adaptation_planning_guide.html
- Cal-Adapt website at: http://cal-adapt.org/
- Urban Forest Management Plan (UFMP) Toolkit - sponsored by the California Department of Forestry and Fire Management at: http://ufmptoolkit.com/
- California Climate Change Portal at: http://www.climatechange.ca.gov/
- DWR Climate Change website at: http://www.water.ca.gov/climatechange/resources.cfm
- The Governor's Office of Planning and Research (OPR) website at: http://www.opr.ca.gov/m_climatechange.php.

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Personal Communications

Table CC-1 Critical Wildlife Species List for the Central Coast

Scientific Name	Common Name	Federal Status [1]	State Status [2]
Invertebrates			
Branchinecta longiantenna	Longhorn fairy shrimp	FE	
Branchinecta lynchi	Vernal pool fairy shrimp	FT	
Cicindela ohlone	Ohlone tiger beetle	FE	
Euphilotes enoptes smithi	Smith's blue butterfly	FE	
Euphydryas editha bayensis	Bay checkerspot butterfly	FT	
Euproserpinus euterpe	Kern primrose sphinx moth	FT	
Helminthoglypta walkeriana	Morro shoulderband snail	FE	
Polyphylla barbata	Mount Hermon June	FE	
Trimerotropis infantilis	Zayante band-winged grasshopper	FE	
Fish			
Eucyclogobius newberryi	Tidewater goby	FE	
Gasterosteus aculeatus williamsoni	Unarmored threespine stickleback	FE	SE
Oncorhynchus	Southern steelhead - S. CA coast DPS	FE	
Oncorhynchus kisutch	Coho salmon - Central CA coast ESU	FE	SE
Oncorhynchus mykiss irideus	Steelhead - Central CA coast DPS	FT	
Oncorhynchus mykiss irideus	Steelhead - S./Central CA coast DPS	FT	
Bird			
Aquila chrysaetos	Golden eagle	FP	FP
Brachyramphus marmoratus	Marbled murrelet	FT	SE
Buteo swainsoni	Swainson's hawk		ST
Charadrius alexandrinus nivosus	Western snowy plover	FT	
Coccyzus americanus occidentalis	Western yellow-billed cuckoo		SE
Elanus leucurus	White-tailed kite	FP	FP
Empidonax traillii extimus	Southwestern willow flycatcher	FE	SE
Gymnogyps californianus	California condor	FE	SE
Haliaeetus leucocephalus	Bald eagle		SE
Laterallus jamaicensis coturniculus	California black rail		ST
Passerculus sandwichensis beldingi	Belding's savannah sparrow		SE
Rallus longirostris levipes	Light-footed clapper rail	FE	SE
Rallus longirostris obsoletus	California clapper rail	FE	SE
Riparia riparia	Bank swallow		ST
Sternula antillarum browni	California least tern	FE	SE
Vireo bellii pusillus	Least Bell's vireo	FE	SE
Mammal			
Ammospermophilus nelsoni	Nelson's antelope squirrel		ST
Dipodomys heermanni morroensis	Morro Bay kangaroo rat	FE	SE
Dipodomys ingens	Giant kangaroo rat	FE	SE
Dipodomys nitratoides nitratoides	Tipton kangaroo rat	FE	SE
Eumetopias jubatus	Steller sea-lion	FT	
Vulpes macrotis mutica	San Joaquin kit fox	FE	ST
Amphibian			
Ambystoma californiense	California tiger salamander	FT	ST

Scientific Name	Common Name	Federal Status [1]	State Status [2]
Ambystoma macrodactylum croceum	Santa Cruz long-toed salamander	FE	SE
Anaxyrus californicus	Arroyo toad	FE	
Rana draytonii	California red-legged frog	FT	
Reptile			
Gambelia sila	Blunt-nosed leopard lizard	FE	SE, FP

Notes: KEY: FP Fully Protected FE Federally Endangered FT Federally Threatened SE State Endangered ST State Threatened SR State Rare ESU Evolutionary Significant Unit DPS Distinct Population Segment [1] website reference [2] website reference

Table CC-2 Critical Plant Species List for the Central Coast

Scientific Name	Common Name	Federal Status [1]	State Status [2]	CNPS Rank [3]	Scientific Name	Common Name	Federal Status [1]	State Status [2]	CNPS Rank [3]
Ancistrocarphus keilii	Santa Ynez groundstar			1B.1	Clarkia speciosa ssp. immaculata	Pismo clarkia	FE		1B.1
Arctostaphylos crustacea ssp. eastwoodiana	Eastwood's brittle-leaf manzanita			1B.1	Cordylanthus rigidus ssp. littoralis	Seaside bird's-beak		SE	1B.1
Arctostaphylos morroensis	Morro manzanita		ST	1B.1	Deinandra halliana	Hall's tarplant			1B.1
Arctostaphylos ohloneana	Ohlone manzanita			1B.1	Deinandra increscens ssp. villosa	Gaviota tarplant	FE	SE	1B.1
Arctostaphylos pajaroensis	Pajaro manzanita			1B.1	Dithyrea maritima	Beach spectaclepod		ST	1B.1
Arctostaphylos purissima	La Purisima manzanita			1B.1	Dudleya abramsii ssp. setchellii	Santa Clara Valley dudleya	FE		1B.1
Arctostaphylos tomentosa ssp. daciticola	Dacite manzanita			1B.1	Dudleya blochmaniae ssp. blochmaniae	Blochman's dudleya			1B.1
Arenaria paludicola	Marsh sandwort	FE	SE	1B.1	Ericameria fasciculata	Eastwood's goldenbush			1B.1
Astragalus tener var. titi	Coastal dunes milk-vetch	FE	SE	1B.1	Eriodictyon altissimum	Indian Knob mountainbalm	FE	SE	1B.1
California macrophylla	Round-leaved filaree			1B.1	Eriogonum nudum var. decurrens	Ben Lomond buckwheat			1B.1
Calycadenia villosa	Dwarf calycadenia			1B.1	Eriophyllum lanatum var. hallii	Fort Tejon woolly sunflower			1B.1
Calyptridium parryi var. hesseae	Santa Cruz Mtns. pussypaws			1B.1	Eryngium aristulatum var. hooveri	Hoover's button-celery			1B.1
Calystegia sepium ssp. binghamiae	Santa Barbara morning-glory			1B.1	Erysimum menziesii ssp. menziesii	Menzies' wallflower	FE	SE	1B.1
Camissonia benitensis	San Benito evening-primrose		ST	1B.1	Erysimum teretifolium	Santa Cruz wallflower	FE	SE	1B.1
Castilleja ambigua ssp. insalutata	Pink johnny-nip			1B.1	Erysimum yadonii	Yadon's wallflower	FE	SE	1B.1
Caulanthus amplexicaulis var. barbarae	Santa Barbara jewel-flower			1B.1	Eschscholzia rhombipetala	Diamond-petaled CA poppy			1B.1
Caulanthus californicus	California jewel-flower	FE	SE	1B.1	Hoita strobilina	Loma Prieta hoita			1B.1
Ceanothus ferrisiae	Coyote ceanothus	FE		1B.1	Holocarpha macradenia	Santa Cruz tarplant	FT	SE	1B.1
Centromadia parryi ssp. australis	Southern tarplant			1B.1	Horkelia cuneata ssp. puberula	Mesa horkelia			1B.1

Scientific Name	Common Name	Federal Status [1]	State Status [2]	CNPS Rank [3]	Scientific Name	Common Name	Federal Status [1]	State Status [2]	CNPS Rank [3]
Chlorogalum purpureum var. purpureum	Santa Lucia purple amole		ST	1B.1	Horkelia cuneata ssp. sericea	Kellogg's horkelia			1B.1
Chlorogalum purpureum var. reductum	Camatta Canyon amole		ST	1B.1	Lasthenia conjugens	Contra Costa goldfields	FE		1B.1
Chorizanthe pungens var. hartwegiana	Ben Lomond spineflower	FE		1B.1	Lasthenia glabrata ssp. coulteri	Coulter's goldfields			1B.1
Chorizanthe robusta var. robusta	Robust spineflower	FE		1B.1	Layia carnosa	Beach layia	FE	SE	1B.1
Chorizanthe robusta var. hartwegii	Scotts Valley spineflower	FE		1B.1	Layia discoidea	Rayless layia			1B.1
Cirsium scariosum var. loncholepis	La Graciosa thistle	FE	ST	1B.1	Layia heterotricha	Pale-yellow layia			1B.1
Legenere limosa	Legenere			1B.1	Piperia yadonii	Yadon's rein orchid	FE		1B.1
Leptosiphon croceus	Coast yellow leptosiphon			1B.1	Plagiobothrys diffusus	San Francisco popcorn-flower		SE	1B.1
Leptosiphon rosaceus	Rose leptosiphon			1B.1	Polygonum hickmanii	Scotts Valley polygonum	FE	SE	1B.1
Lupinus nipomensis	Nipomo Mesa lupine	FE	SE	1B.1	Potentilla hickmanii	Hickman's cinquefoil	FE	SE	1B.1
Lupinus tidestromii	Tidestrom's lupine	FE	SE	1B.1	Quercus dumosa	Nuttall's scrub oak			1B.1
Madia radiata	Showy golden madia			1B.1	Sanicula maritima	Adobe sanicle		SR	1B.1
Malacothamnus abbottii	Abbott's bush-mallow			1B.1	Streptanthus albidus ssp. albidus	Metcalf Canyon jewel-flower	FE		1B.1
Mimulus fremontii var. vandenbergensis	Vandenberg monkeyflower			1B.1	Stylocline masonii	Mason's neststraw			1B.1
Nasturtium gambelii	Gambel's water cress	FE	ST	1B.1	Suaeda californica	California seablite	FE		1B.1
Navarretia fossalis	Spreading navarretia		ST	1B.1	Trifolium buckwestiorum	Santa Cruz clover			1B.1
Navarretia prostrata	Prostrate vernal pool navarretia			1B.1	Trifolium polyodon	Pacific Grove clover		SR	1B.1
Pentachaeta bellidiflora	White-rayed pentachaeta	FE	SE	1B.1	Trifolium trichocalyx	Monterey clover	FE	SE	1B.1
Pinus radiata	Monterey pine			1B.1	Tropidocarpum capparideum	Caper-fruited tropidocarpum			1B.1

Notes: FE Federally Endangered FT Federally Threatened SE State Endangered ST State Threatened SR State Rare CNPS – California Native Plant Society Rank CA Endemic - native or indigenous to CA

Regional Endemic - native to region [1] website reference [2] website reference [3] http://www.rareplants.cnps.org/

Table CC-3 Population Estimates for the Central Coast from 2000 to 2010

County	2000	2002	2004	2006	2008	2010
San Mateo	415	406	402	394	393	388
Santa Clara	90,110	93,439	95,397	97,094	100,665	101,945
San Benito	52,809	54,872	55,299	54,951	54,949	55,200
Santa Cruz	254,815	255,890	254,986	255,107	258,737	262,552
Monterey	399,392	407,440	411,544	406,935	409,387	415,108
San Luis Obispo	245,696	252,604	257,045	260,873	265,505	269,333
Santa Barbara	397,877	404,794	410,357	412,271	418,309	423,740
Total for Hydrologic Region	1,441,114	1,469,445	1,485,030	1,487,625	1,507,945	1,528,266

Source: Population estimates are from CA Dept. of Finance. Population estimates include those portions of San Mateo and Santa Clara counties which are within the Central Coast Hydrologic Region.

Table CC-4 Population Estimates and Decadal Projections for the Central Coast

Region	Estimates		Projections			
	2000	2010	2020	2030	2040	2050
State of California	34,000,835	37,312,510	40,817,839	44,574,756	47,983,659	51,013,984
Monterey	402,854	415,758	436,275	459,359	483,868	511,956
San Benito	53,635	55,341	57,138	59,259	61,032	62,217
San Luis Obispo	247,724	269,710	290,132	311,388	328,786	344,805
Santa Barbara	399,874	424,223	448,986	469,070	485,777	501,283
Santa Cruz	255,869	263,132	270,776	278,008	281,053	283,108
Total for Hydrologic Region	1,359,956	1,428,164	1,503,307	1,577,084	1,640,515	1,703,370

Note: Population estimates and projections prepared by Demographic Research Unit, CA Department of Finance, May 2012; does not include Santa Clara or San Mateo Counties. From: http://www.dof.ca.gov/research/demographic/reports/projections/interim/view.php.

Table CC-5 Disadvantaged Communities within the Central Coast

Community	Type	Population	MHI	Households
Amesti	CDP	3,339	$47,483	1,007
Boronda	CDP	1,778	$37,295	415
Casmalia	CDP	400	$42,692	98
Castroville	CDP	5,490	$44,286	1,300
Chualar	CDP	1,337	$48,516	287
Cuyama	CDP	51	$37,500	10
Freedom	CDP	2,816	$48,688	807
Guadalupe	City	6,770	$42,978	1,888
Isla Vista [1]	CDP	23,776	$30,087	5,078
Lompoc	City	41,864	$46,932	13,420
New Cuyama	CDP	413	$45,313	147
Oceano	CDP	7,883	$39,843	2,920
Pajaro	CDP	2,670	$36,094	614
Paradise Park	CDP	456	$40,134	235
San Ardo	CDP	665	$48,000	150
San Luis Obispo [2]	City	44,959	$40,812	19,734
San Miguel	CDP	2,695	$42,176	766
San Simeon	CDP	547	$43,092	221
Twin Lakes	CDP	5,005	$48,693	2,249
Watsonville	City	49,580	$46,675	13,805

Notes: [1] CDP includes UC Santa Barbara [2] City includes Cal Poly SLO

CDP = Census-Designated Place MHI = Median Household Income

Source: DWR website: http://www.water.ca.gov/irwm/integregio_resourceslinks.cfm. Disadvantaged Communities (DAC) Mapping Tool - GIS Files - Census Places

Table CC-6 Environmental Water Demands, San Luis Obispo IRWM

WPA	Major Creeks and Streams	Environmental Water Demand – Acre Feet per Year (AFY)
1. San Simeon	San Carpoforo, Honda Arroyo, Arroyo de la Cruz, Arroyo de la Laguna, Arroyo del Osos, Arroyo del Corral, Arroyo Laguna, and Pico Creek	72,980
2. Cambria	San Simeon, Santa Rosa, and Villa Creek	51,460
3. Cayucos	Cayucos and Toro Creek	26,160
4. Morro Bay	Morro and Chorro Creek	27,880
5. Los Osos	Los Osos Creek	7,040
6. SLO/Avila	San Luis Obispo Creek	33,030
7 South Coast	Pismo and Arroyo Grande Creek	32,960
8. Huasna Valley	Huasna River and Alamo Creek	25,020
12. Santa Margarita	Salinas River	32,850
13. Atascadero /Templeton	Salinas River and Paso Robles Creek	41,010
16. Nacimiento	Nacimiento River	108,390

Notes: Environmental Water Demands are calculated for each WPA and not for individual streams. Due to the lack of data and regional physiographic differences, the Environmental Water Demands for the following WPAs are UNDETERMINED: 9 Cuyama Valley, 10 Carrizo Plain, 11 Rafael/Big Spring, 14 Salinas/Estrella, and 15 Cholame Valley.

From: San Luis Obispo County Master Water Report, 2012

Table CC-7 Santa Cruz Regional Water Supply Production by Water District within IRWM Boundary

Metric	City of Santa Cruz (SCWD	San Lorenzo Valley Water District (SLVWD)	Scotts Valley Water District (SVWD)	Soquel Creek Water District (SqCWD)	Central Water District (CWD)	City of Watsonville (CW)	Other Users
Dry year Production by Source Type (2008, AFY)	**11,200**	**2,150**	**1,690**	**4,910**	**580**	**7,960**	**8,500**
Surface Water	10,700	820	0	0	0	340	1,100
Groundwater	500	1,330	1,530	4,910	580	7,620	7,400
Recycled Water	0	0	160	0	0	0	0
Wet Year Production by Source Type (AFY)	**10,000**	**2,000**	**1,400**	**4,084**	**500**	**7,200**	**6,500**
Surface Water	9,500	1,000	0	0	0	500	1,500
Groundwater	500	1,000	1,200	4,084	500	6,700	5,000
Recycled Water	0	0	200	0	0	0	0
2008 Population Serviced	91,300	22,800	10,300	37,700	2,700	65,700	31,900
Dry Year Per Capita Use (AFY/Per Capita)	0.12	0.09	0.16	0.13	0.21	0.12	0.27

Table CC-8 Santa Barbara Countywide IRWM Water Supplies

Water Service Districts in Santa Barbara County	Water Source
Carpinteria Valley Water District Service Area	Carpinteria Valley Groundwater Basin, Cachuma Project, and State Water Project (SWP)
Casmalia Community Services	Santa Maria Groundwater Basin
City of Guadalupe Service Area	Santa Maria Groundwater Basin and SWP
City of Lompoc Service Area	Lompoc Groundwater Basin
City of Santa Barbara Service Area	Cachuma Project, Gibraltar Reservoir, Devil's Canyon Creek, Mission Tunnel, Foothill and Santa Barbara Groundwater Basins, SWP, recycled and desalination (drought and emergency)
City of Santa Maria Service Area	Santa Maria Groundwater Basin, SWP, and Twitchell Reservoir recharge
City of Solvang Service Area	Santa Ynez Uplands and Santa Ynez Riparian Groundwater Basin, SWP
Cuyama Community Services District	Cuyama Groundwater Basin
Golden State Water Company Service Area	Santa Maria Groundwater Basin and SWP
Goleta Water District Service Area	Goleta North/Central Groundwater Basin, Cachuma Project, and SWP
La Cumbre Mutual Water Company Service Area	Goleta North/Central and Foothill Groundwater Basins, and SWP
Los Alamos Community Services District	San Antonio Groundwater Basin
Mission Hills Community Services District	Lompoc Groundwater Basin
Montecito Water District Service Area	Montecito Groundwater Basin, the Cachuma Project, SWP, Jameson Lake, Fox and Alder creeks, and Doulton Tunnel
Santa Ynez River Water Conservation District	Cachuma Project, SWP, Santa Ynez Uplands and Santa Ynez Riparian Groundwater Basins
Vandenberg Air Force Base Service Area	San Antonio Groundwater Basin and SWP
Vandenberg Village Community Services District	Lompoc Groundwater Basin

Table CC-9 Summary of Large, Medium, Small, and Very Small Community Drinking Water Systems in the Central Coast Hydrologic Region

Water System Size	Community Water Systems (CWS) (Systems)	(%)	Population Served (Population)	(%)
Large (> 10,000 people)	31	8%	1,201,754	82%
Medium (3,301 – 10,000 people)	25	6%	157,343	11%
Small (500 – 3,300 people)	47	12%	68,574	5%
Very Small (<500 people)	292	73%	36,411	2%
CWS that Primarily Provide Wholesale Water	5	1%	---	---
TOTAL	**400**		**1,464,082**	

Table CC-10 Urban Water Suppliers by IRWM Region

IRWM Region	Urban Water Suppliers	2010 Water Use Acre-feet/ Year
Santa Cruz	Scotts Valley Water District	2,079
	Soquel Creek Water District	4,986
	Santa Cruz City of	11,555
Santa Cruz/Pajaro River Watershed	Watsonville City of	7,658
Pajaro River Watershed	Morgan Hill City of	9,096
	Gilroy City of	9,078
Greater Monterey	California Water Service Co. King City	2,075
	California Water Service Co. Salinas District	22,057
	Soledad, City of	2,680
	Marina Coast Water District	4,795
Monterey Peninsula	California-American Water Co. Monterey District	16,033
San Luis Obispo	Paso Robles City of	8,118
	Nipomo Community Services District	3,266
	Pismo Beach City of	2,029
	Arroyo Grande City of	3,521
	Grover Beach City of	2,140
	Morro Bay City of	1,485
	San Luis Obispo City of	6,267
	Cambria Community Services District	757
Santa Barbara Countywide	Golden State Water Co. Orcutt	8,925
	Santa Maria City of	16,504
	Santa Barbara City of	13,107
	Carpinteria Valley Water District	2,137
	Lompoc City of	5,509
	Goleta Water District	11,590

Data from Urban Water Management Plans, as submitted to DWR, 2012.

Table CC-12 Flood Exposure in the Central Coast Hydrologic Region Exposures to the 100-Year and 500-Year Flood Events

Segment exposed	1% (100-year) Floodplain	0.2% (500-year) Floodplain
Population	92,700, 6%	426,900, 29%
Structure and Content Value	$10.3 billion	$36.3 billion
Crop Value	$564.4 million	$689.3 million
Crops (acres)	123,600	146,300
Tribal Lands (acres)	0	0
Essential Facilities (count)	50	230
High Potential-Loss Facilities (count)	24	32
Lifeline Utilities (count)	23	32
Transportation Facilities (count)	275	412
Department of Defense Facilities (count)	5	5
State and Federal Threatened, Endangered, Listed ,and Rare Plants [a]	202	204
State and Federal Threatened, Endangered, Listed ,and Rare Animals [a]	111	112

Source: SFMP California's Flood Future Report

[a] Many Sensitive Species have multiple occurrences throughout the state and some have very large geographic footprints that may overlap more than one analysis region. As a result, a single Sensitive Species could be counted in more than one analysis region. Because of this the reported statewide totals will be less than the sum of the individual analyses regions.

Figure CC-1 Central Coast Hydrologic Region

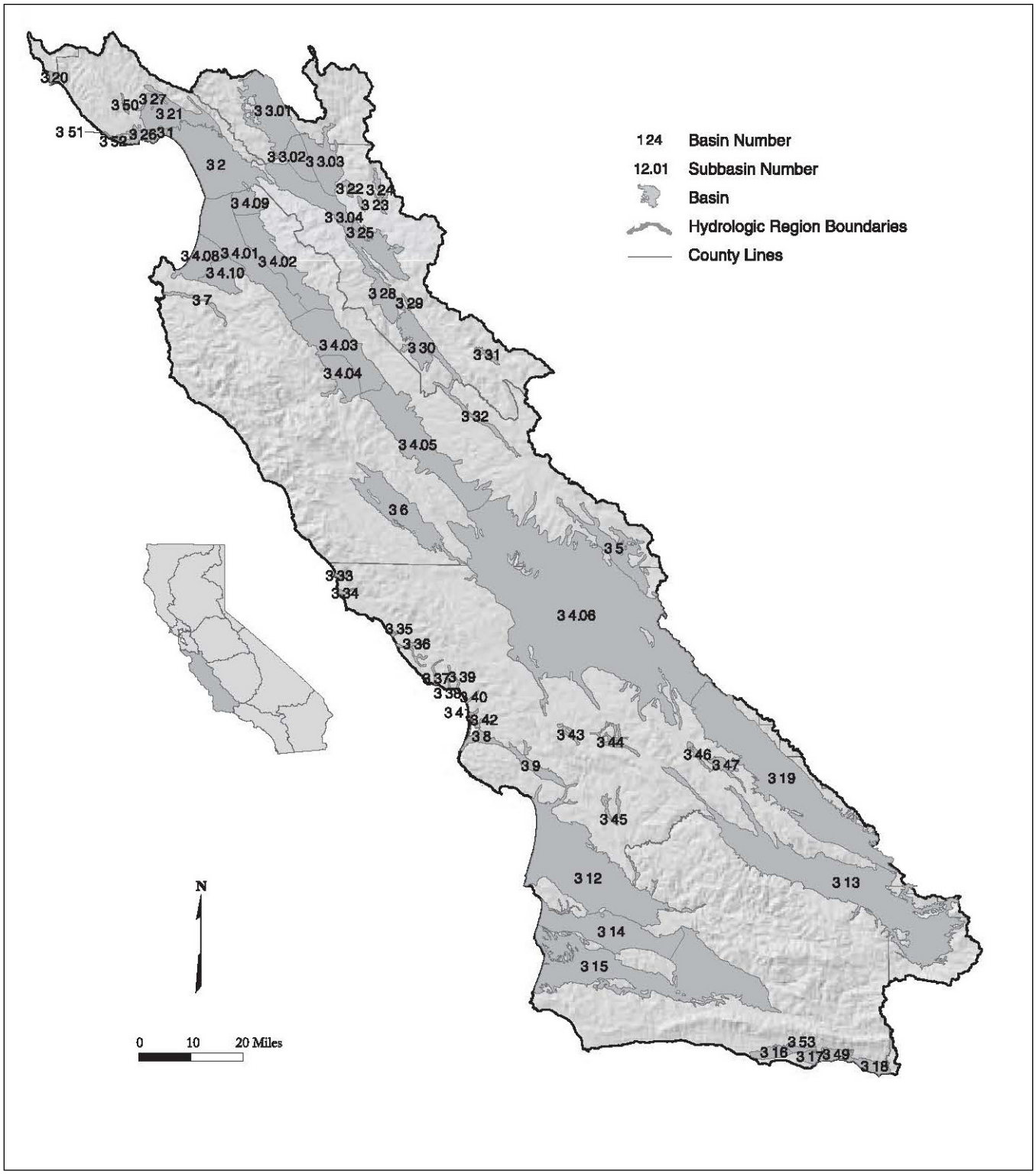


Figure CC-3 Central Coast Strawberry Production

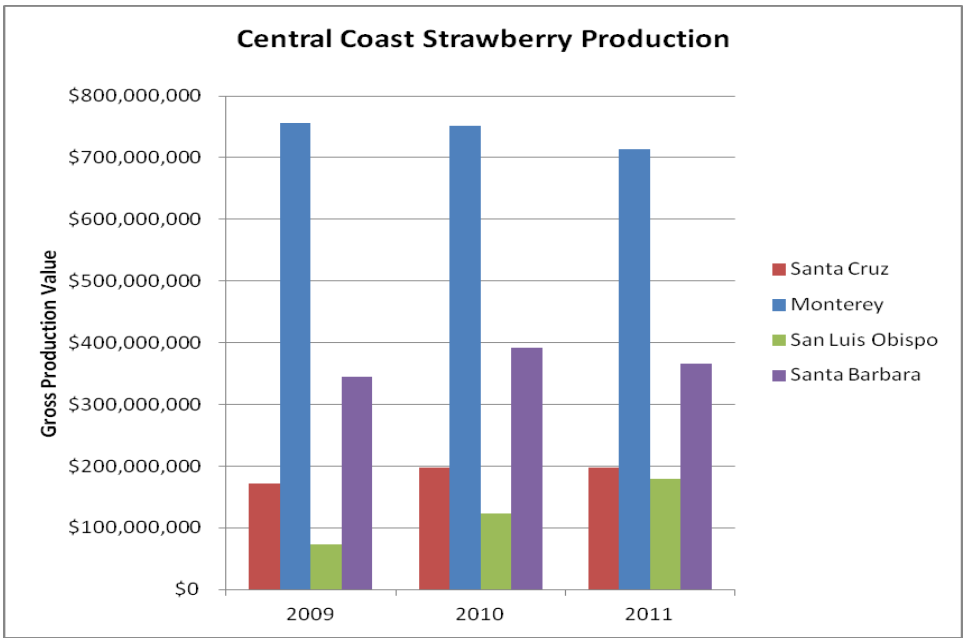
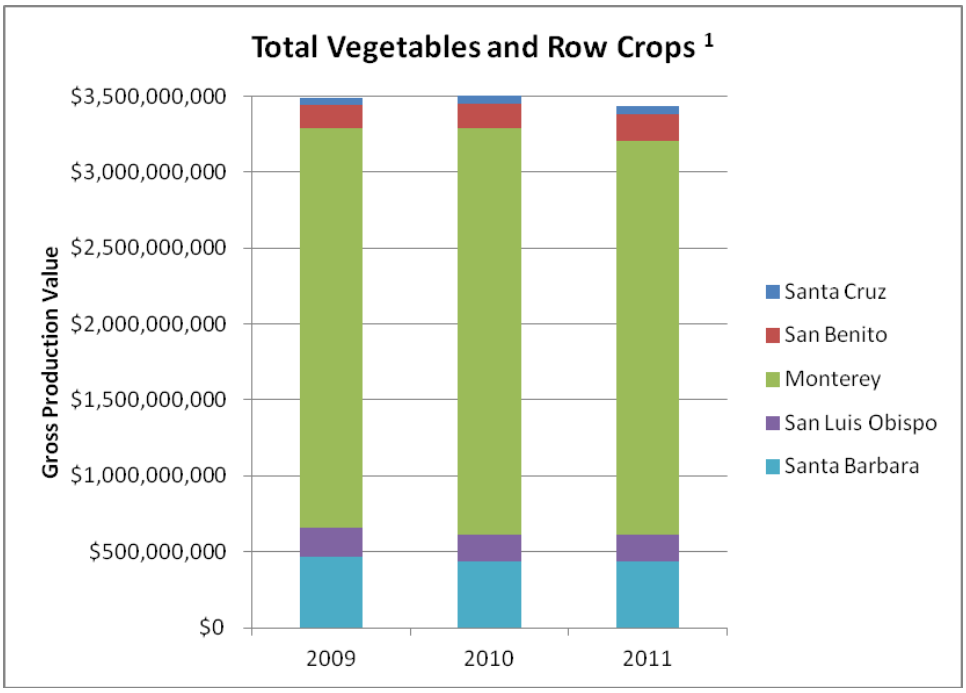
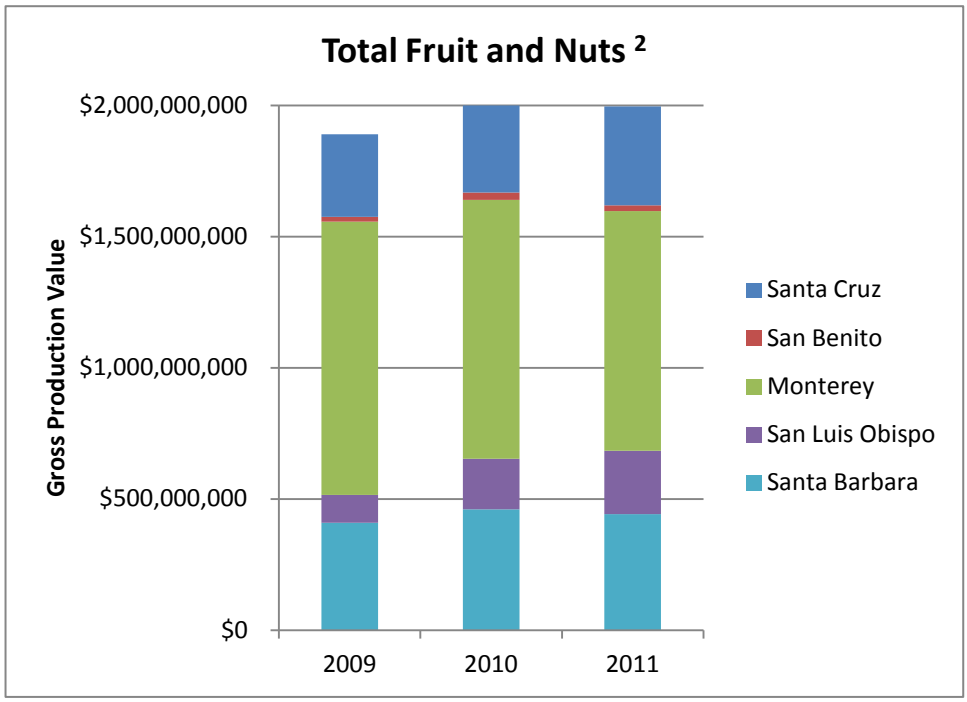


Figure CC-4 Central Coast Total Vegetables and Row Crops



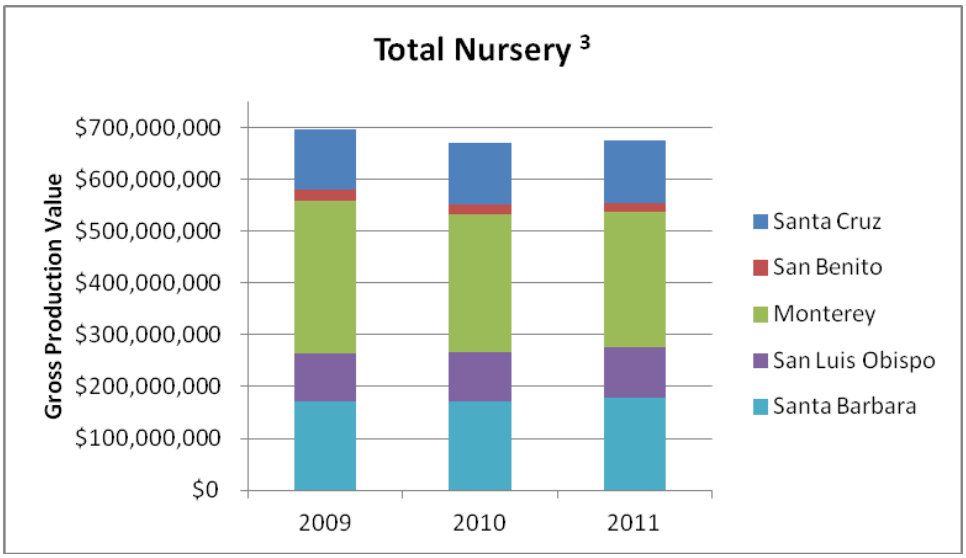
1 Total vegetable and row crops can include: Arugula, Anise, Artichokes, Asparagus, Beans, Beets, Bok Choy, Borage, Broccoli, Brussel Sprouts, Cabbage, Carrots, Cantaloupe, Cauliflower, Celery, Chicory, Chard, Chili Peppers, Cilantro, Collards, Corn, Cucumbers, Daikon, Dandelion, Dill, Eggplant, Endive, Escarole, Fennel, Garlic, Green Onions, Garbanzo Beans, Herbs, Kale, Kohlrabi, Leeks, Lettuces, Melons, Mushrooms, Mizuna, Mustard, Okra, Onions, Parsley, Parsnips, Peas, Pepper, Potatoes, Pumpkins, Radicchio, Radishes, Rutabagas, Shallots, Spinach, Squash, Sweet Corn, Tomato, Tomatillo, Turnips, and Watermelon.

Figure CC-5 Central Coast Total Fruit and Nuts



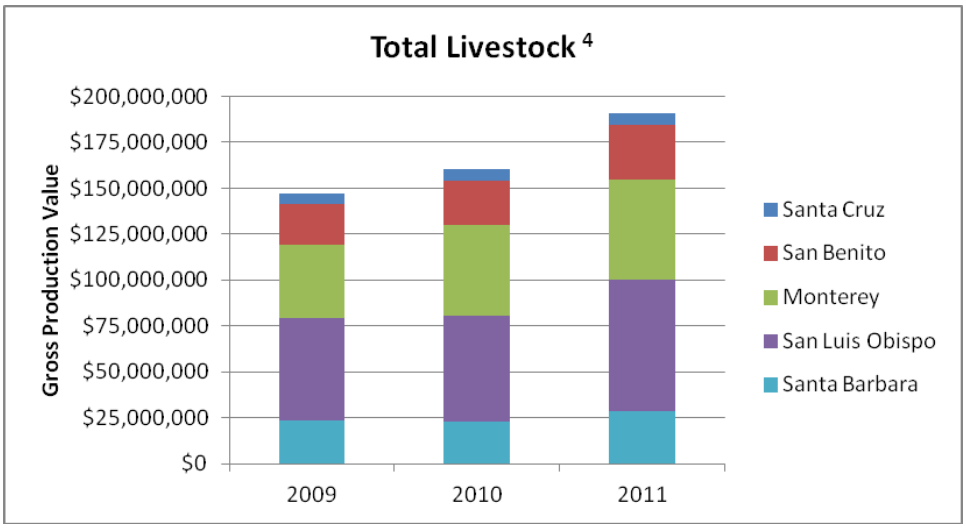
2 Total fruit and nuts can include: Almonds, Apples, Apricots, Asian Pears, Avocados, Blackberries, Blueberries, Cherries, Feijoas, Figs, Grapefruit, Kiwis, Lemons, Limes, Mandarin Oranges, Navel Oranges, Nectarines, Olives, Passion Fruit, Peaches, Pears, Persimmons, Pistachios, Plums, Pluot, Pomegranates, Prunes, Raspberries, Specialty Citrus, Table Grapes, Tangerines, Table Grapes, and Walnuts.

Figure CC-6 Central Coast Total Nursery



3 Total nursery can include: Aquatic plants, Bulbs, Cacti, Christmas trees, Farm stock transplants, Flowers, Flower seeds, Fruit-Nut trees, Herbs, Indoor potted plants, Landscape plants, Propagative plants, Scion wood, Specialty plants, Succulents, and Turf.

Figure CC-7 Central Coast Total Livestock



4 Total Livestock can include: All cattle, chicken, eggs, goats, hogs, lambs, milk, turkey, and wool.

Figure CC-8 Central Coast Acres of Wine Grapes over Time

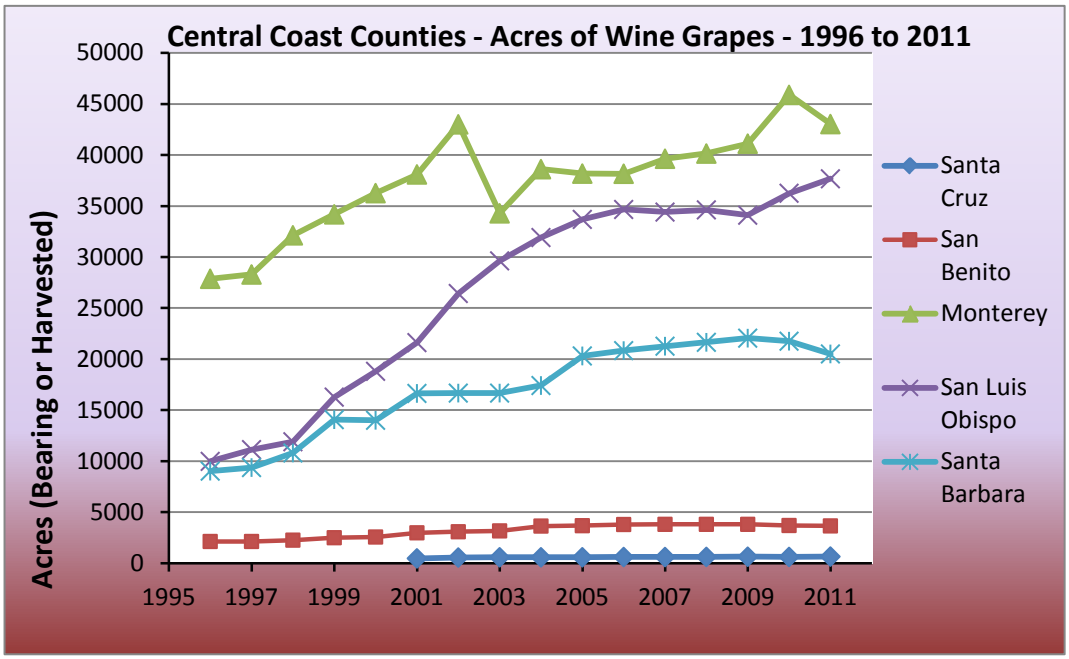
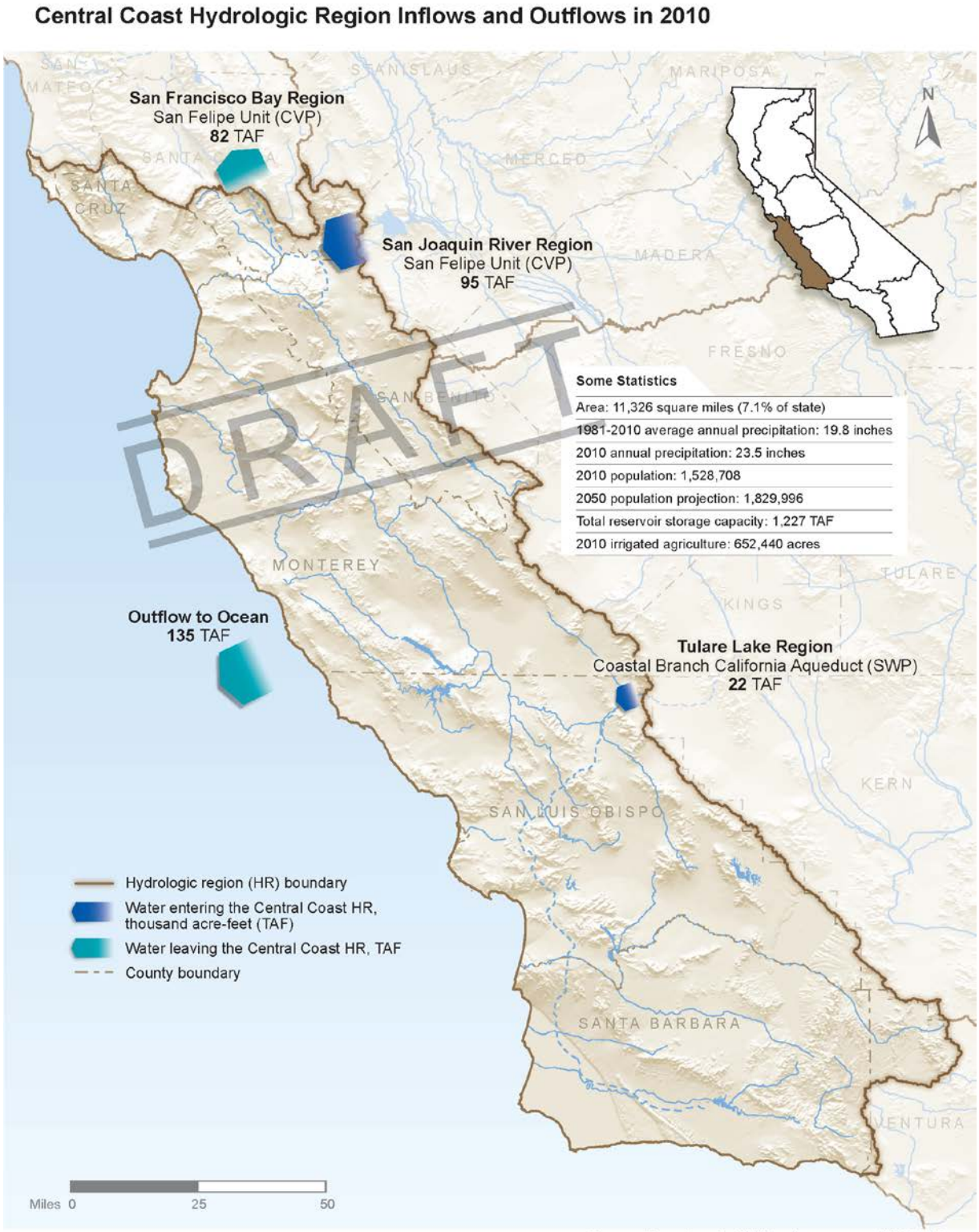


Figure CC-9 Central Coast Hydrologic Region Inflows and Outflows in 2010



Source: Department of Water Resources, CWP 2013

Figure CC-11 Central Coast Hydrologic Units and Monitoring Sites

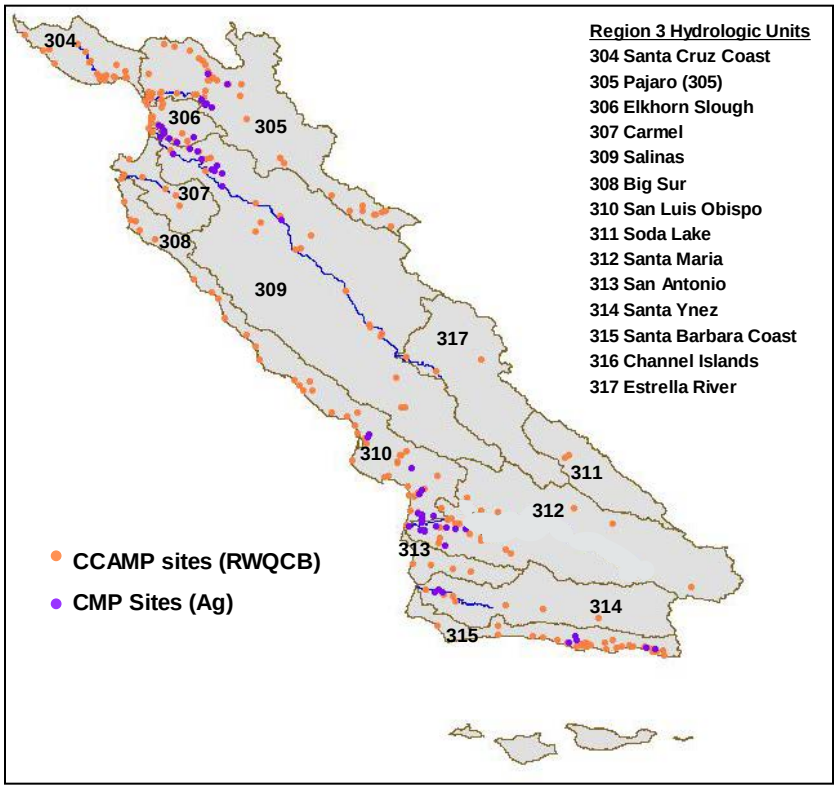


Figure CC-12 Central Coast Surface Water Quality Index using Multiple Parameters

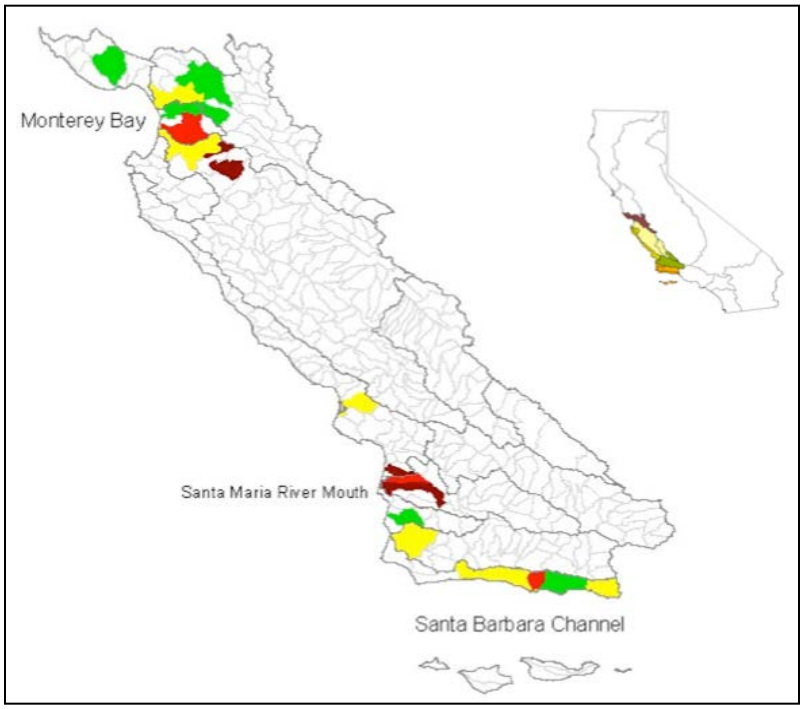
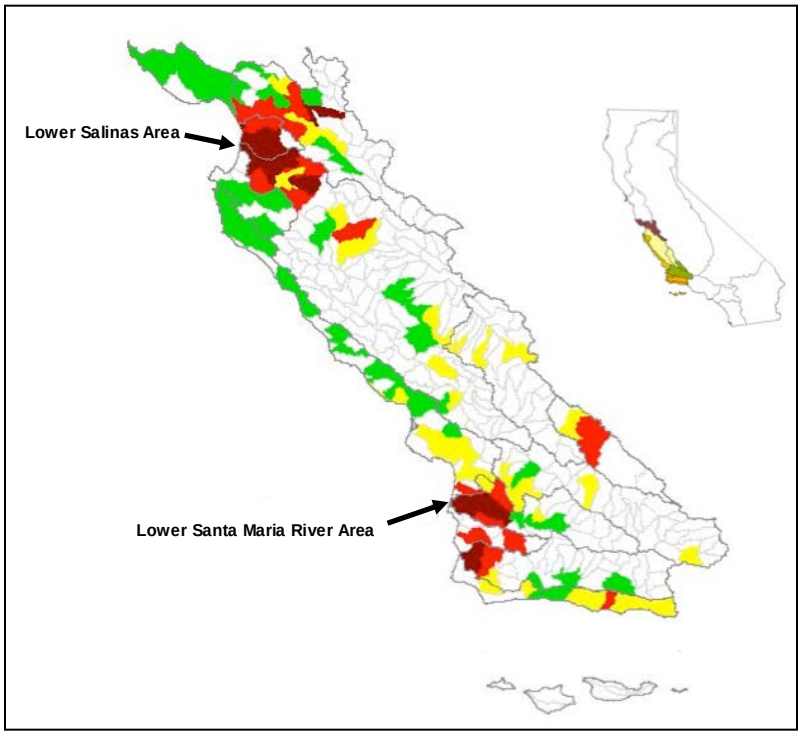


Figure CC-13 Central Coast Surface Water Quality Toxicity Index



Color scoring indicates surface water quality as follows: green = good, yellow = slightly impacted, red = impacted, and dark red = severely impacted.

Figure CC-14 Change in Urban Water Demand, Central Coast Hydrologic Region

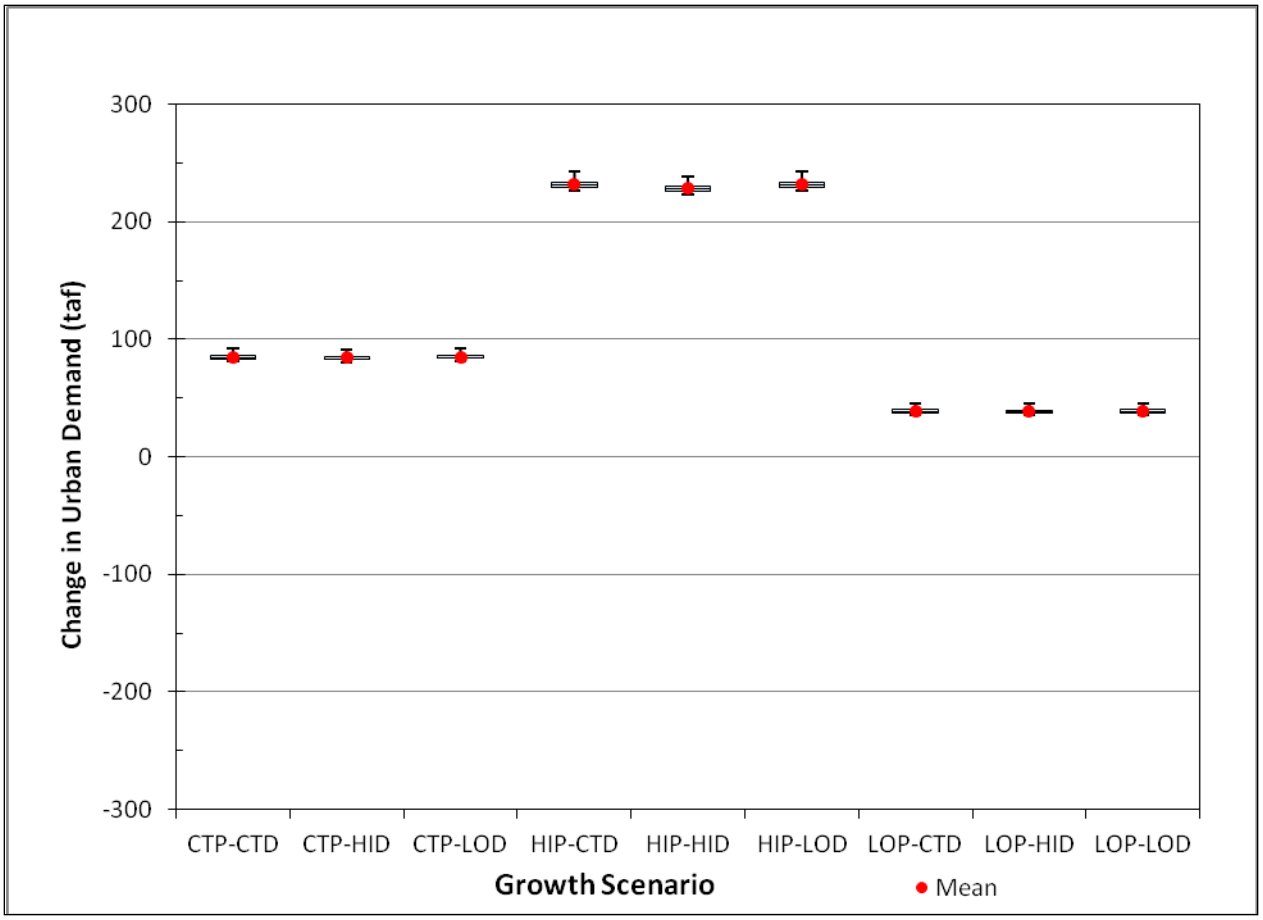
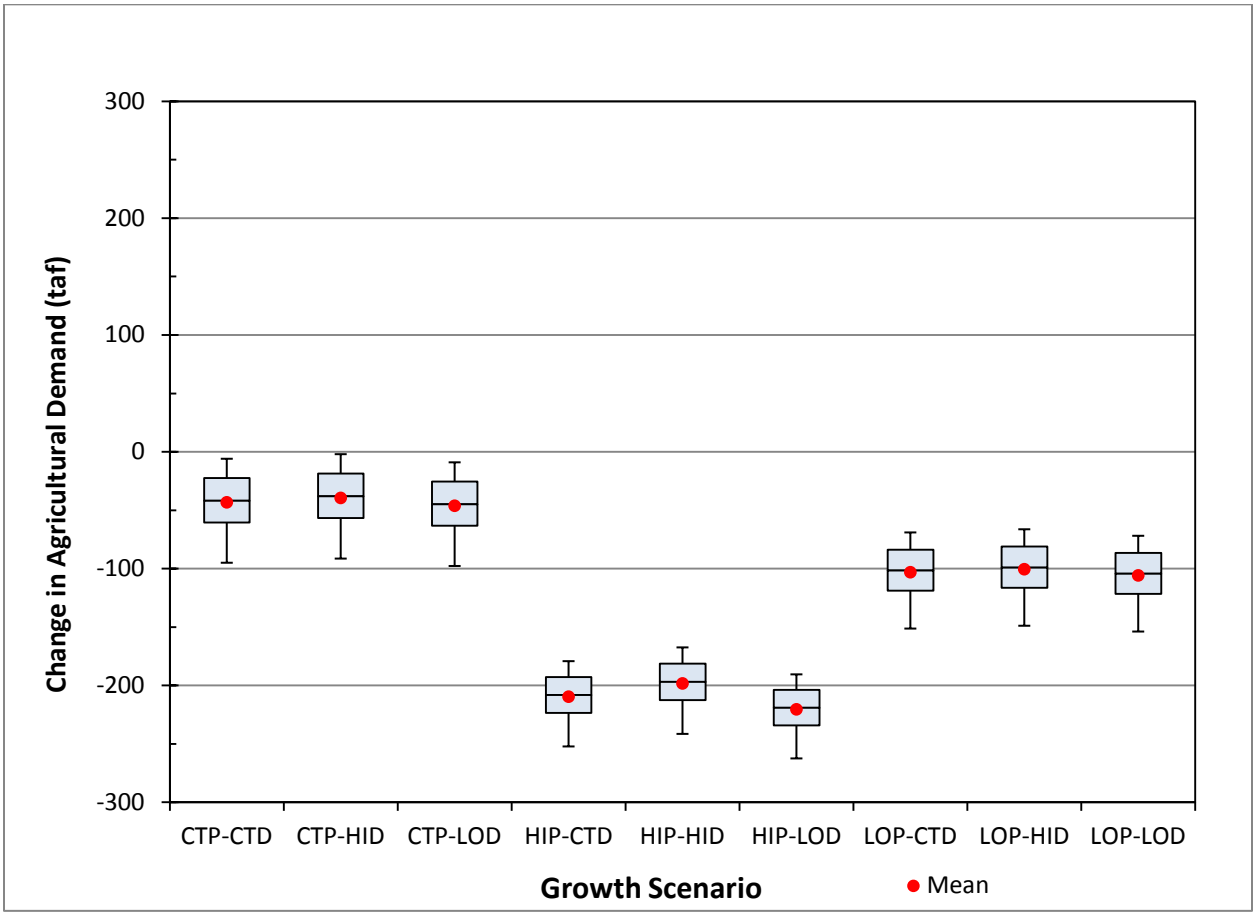


Figure CC-15 Change in Agricultural Water Demand, Central Coast Hydrologic Region



Box CC-1 **Explanation of Federal- and State-listed Plant and Wildlife Ranking/Determinations**

The Federal Endangered Species Act (ESA) requires all federal agencies to consider listed species in their planning efforts and to take positive actions to further the conservation of these species. The ESA is jointly administered by the U.S. Fish and Wildlife Service (USFWS) for terrestrial and freshwater species, and the National Marine Fisheries Service (NMFS) for marine and anadromous species. It requires Federal agencies to ensure that the actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species. The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend.

When evaluating a species for listing, the FWS considers five factors: 1) damage to, or destruction of, a species' habitat; 2) overutilization of the species for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) inadequacy of existing protection; and 5) other natural or manmade factors that affect the continued existence of the species. When one or more of these factors imperils the survival of a species, the FWS takes action to protect it, and is required to base its listing decisions on the best scientific information available. The ESA prohibits the unauthorized taking, possession, sale, and transport of endangered species.

The California Endangered Species Act (CESA) is the most comprehensive of the state acts. Modeled after the federal act, it provides a mechanism for listing species as threatened or endangered, and prohibits the taking of or trafficking in listed plant and animal species. In addition, CESA emphasizes early consultation with the CA Department of Fish and Game 1) to avoid potential impacts to rare, endangered, and threatened species, and 2) to develop appropriate mitigation planning to offset project caused losses of listed species.

CESA states that all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, will be protected, or preserved.

The mission of the **California Native Plant Society (CNPS)** is to conserve and protect California native flora. The CNPS maintains the Inventory of Rare and Endangered Plants of California (http://www.cnps.org/cnps/rareplants/inventory/index.php) to track the conservation status of hundreds of plant species, and the data are widely accepted as the standard for information on the rarity and endangerment status of California flora. The CNPS Inventory is a conservation tool that allows project proponents, local governments, and other agencies to better assess project related impacts on flora. The **California Environmental Quality Act (CEQA)** states that "special emphasis should be placed on environmental resources that are rare or unique to [a] region". The Department of Fish and Game Code mandates that plants listed in the CNPS Inventory as California Rare Plant Ranks 1A, 1B, and 2 be fully considered during preparation of environmental documents related to CEQA.