San Luis Obispo County Region
Integrated Regional Water Management (IRWM)
Regional Water Management Group (RWMG)

AGENDA

Date: February 7, 2018
Time: 10:00 AM – 12:00 PM
Location: SLO City/County Library Community Room, 995 Palm St, San Luis Obispo, CA 93401

1) Introductions/Public Comment
   a) IRWM Program Manager transition

2) Stormwater Resource Plan (SWRP) development
   a) Update on the region-wide SWRP efforts (handouts will be provided)

3) Climate Change Section - 2018 IRWM Plan Update
   a) Update on Climate Change Workshop
   b) Consider recommended identified vulnerabilities
   c) Consider recommended vulnerability prioritization
   d) Consider incorporating any or all prioritization categories (e.g., Very High and High) into the Objectives and/or Project Review Factors in the IRWM Plan
   e) Consider recommended inclusion and emphasis in the Climate Change section on housing & development related vulnerabilities identified during the January 31, 2018 Workshop
   f) Discuss Climate Change requirements including RWMG feasibility to address priority vulnerabilities and policies/procedures that promote adaptive management

4) Update on the 2018 IRWM Plan Adoption Schedule

NOTICE: All IRWM notices will be emailed only by the online mailing list service. Please sign-up for the IRWM Stakeholder mailing list online at
http://www.slocountywater.org/irwm

NEXT RWMG MEETING:
Wednesday **March 7, 2018** at 10:00 AM – 12:00 PM
SLO City/County Library Community Room, 995 Palm St, San Luis Obispo CA

For more information, please contact
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TO: IRWM Regional Water Management Group

FROM: Mladen Bandov, Water Resources Engineer

DATE: February 7, 2018

SUBJECT: Item #3: Climate Change Section – 2018 IRWM Plan Update

Recommendations

1. Consider recommended identified vulnerabilities
2. Consider recommended vulnerability prioritization
3. Consider incorporating any or all prioritization categories (e.g., Very High and High) into the Objectives and/or Project Review Factors in the IRWM Plan
4. Consider recommended inclusion and emphasis in the Climate Change section on housing & development related vulnerabilities identified during the January 31, 2018 Workshop
5. Discuss Climate Change requirements including RWMG feasibility to address priority vulnerabilities and policies/procedures that promote adaptive management

Discussion

Identified Vulnerabilities

On January 4, 2018, County staff initiated an online survey to solicit input from RWMG members and stakeholder on a climate change vulnerability assessment. Key indicator questions used to identify vulnerabilities in the survey were prescribed by the 2016 IRWM Guidelines, outlined specifically in Section 4 and Appendix B of the Climate Change Handbook for Regional Water Planning, which is online at http://www.water.ca.gov/climatechange/CCHandbook.cfm

This online survey ran through January 19, 2018 and collected RWMG member and stakeholder responses to the draft answers of the key indicator questions, evaluated if the draft answers were sufficient and providing addition information that identified water-related resources, assets and systems that would be vulnerable to the effects of climate change. Some of the climate change effects include extended drought, sea level rise, and temperature rise among others discovered during the preceding literature review. Each identified vulnerability was evaluated for exposure, sensitivity, and likelihood to impacts of climate change effects and resulted in a prioritization score.

The results of the online survey were compiled and included in a workbook format as part of the materials submitted for the public Climate Change Workshop on January 31, 2018. The draft technical memorandum for the Climate Change Vulnerability Assessment incorporates RWMG member and stakeholder input from the survey and workshop (**Attachment 1**).

Prioritized Vulnerabilities

During the January 31, 2018 public workshop, each identified vulnerability was discussed including assigned prioritization from the online survey. RWMG members and stakeholders participated in an evaluation of the prioritization category (i.e., High, Medium, and Low) and submitted a worksheet indicating if they agreed with the assignment or if not to provide an alternate prioritization.

During the workshop, the following revisions were made to the prioritized vulnerabilities list:

- Housing and development was called out as a vulnerability not identified directly in the worksheet
- The six (6) highest scoring vulnerabilities were assigned a prioritization category of "Very High"
- Several priority categories were changed as a result of the worksheets submitted by RWMG members

RWMG members should consider further analyzing the highly ranked vulnerabilities and incorporating them into regional objectives. The draft Climate Change Vulnerability Prioritization (**Attachment 2**) should also be subjectively influenced by the following:

1. Overall regional planning priorities including the RWMG's willingness to invest in projects intended to mitigate against these vulnerabilities
2. Environmental equity and justice factors, such as impacts to disadvantaged communities
3. Risks associated with vulnerabilities
4. Presence of multiple climate change and non-climate change related stressors
5. The usefulness of quantifying vulnerabilities to inform RWMG decisions

Consider Recommended Inclusion and Emphasis in Climate Change section on housing and development vulnerabilities

During the workshop, participants discussed adding housing and development, including associated construction industry activities, as a water-related climate change vulnerability. The consensus among the participants was to include a description of housing/development as an identified vulnerability in the region, and to emphasis in the Climate Change section of the IRWM Plan the prioritized vulnerabilities that relate to housing and development.

A preliminary assessment of the vulnerabilities that are related to housing and development might include the following:

- Water Demand 4: Drought-sensitive groundwater basins
- Water Demand 5: Communities with water curtailment efforts
- Water Supply 2: Water supply from coastal aquifers
- Water Supply 3: Inability to store carryover supply surpluses

Should the RWMG recommend an emphasis of a housing and development vulnerability, County staff would include a description in the update of the Climate Change section of the IRWM Plan.

RWMG decision-making process on climate change requirements

County staff is updating Section P. Climate Change of the IRWM Plan to meet the 2016 IRWM Plan Standards. It is recommended that the RWMG consider discussing and addressing the following climate change standard requirements:

- Determining the feasibility of the RWMG to address those vulnerabilities
- Incorporation of strategies to eliminate or minimize the prioritized vulnerabilities
- Policies or procedures that promote adaptive management, as more climate change effects manifest, new tools are developed, and additional information becomes available

Attachment:

1. Technical Memo on Draft Climate Change Vulnerability Assessment
2. Draft Climate Change Vulnerability Prioritization

This draft technical memo was prepared by County of San Luis Obispo Public Works staff in collaboration with Water Systems Consulting, Inc (WSC) to develop the climate change vulnerability assessment for the 2018 IRWM Plan update. The Department of Water Resources (DWR) awarded grant funding from Proposition 1 to support this planning effort.

CLIMATE CHANGE VULNERABILITY ASSESSMENT

1 Purpose

The purpose of this document is to provide information relevant to the San Luis Obispo (SLO) County Climate Change Vulnerability Assessment as part of the SLO County Integrated Regional Water Management (IRWM) Plan (IRWMP) climate change update. The existing 2014 IRWMP Climate Change Vulnerability Assessment described in Section P.10 will be updated with input from IRWM stakeholders in order to: 1) characterize regional water resources vulnerable to climate change; 2) identify climate change impacts that could affect the planning region; and 3) assess the potential vulnerabilities for each of the IRWM's subregions. These three tasks will be completed to satisfy the requirements of the California Department of Water Resources' (DWR's) 2016 IRWM Grant Program Guidelines (1) and the Climate Change Handbook for Regional Water Planning (Climate Change Handbook), Section 4 and Appendix B (2).

2 Climate Change Vulnerability Assessment

2.1 Identifying Climate Change Impacts

Climate change impacts and vulnerabilities will be identified through an iterative and collaborative process of literature review and stakeholder input. Prior to stakeholder input being solicited via the IRWM Climate Change Workshop, WSC in collaboration with SLO County has identified appropriate literature sources and summarized regional climate change impacts (Section 2.1.1).

2.1.1 Regional Climate Change Impacts

The 2014 IRWMP includes a climate change analysis based on various models, which concludes that local climate change projections suggest longer and drier summers, an increased frequency and severity of droughts, increased evapotranspiration rates, increased temperatures, increased winter runoff, increased storm severity, more frequent wildfires, sea level rise, and reduced groundwater recharge. Impacts on regional water resources from these projected changes can be identified and analyzed to determine prioritized vulnerabilities. DWR's Climate Change Handbook recommends assessing seven vulnerability categories impacted by climate change. Climate change impacts affecting those seven vulnerability categories in the region may include, but are not limited to, those described below.

1. Water Demand
    a. Seasonal agricultural water demands are expected to increase (California Department of Water Resources, 2008). Non-irrigated agriculture and rangeland will be especially vulnerable to reduced surface flows and soil moisture (California Department of Water Resources, 2008), (California Natural Resources Agency, 2009).

b. Evapotranspiration rates are expected to increase (California Natural Resources Agency, 2009), which will increase agricultural water demands.
c. A longer growing season will also increase agricultural water demands (California Natural Resources Agency, 2009).
d. Landscaping and other domestic seasonal use, such as cooling processes, is expected to increase (California Department of Water Resources, 2008), (California Natural Resources Agency, 2009).
e. As average air and surface water temperatures increase, cooling water needs may also increase (California Department of Water Resources, 2011). Industries, such as energy production, may see increases in demand or production in response to climate change that in turn increase process water usage.
f. As average temperatures increase and droughts become more frequent, seasonal water use, which is primarily outdoor use, could increase. Seasonal use impacts peak demands that often coincide with low flow summer periods. Increasing seasonal demands puts the region at risk of water shortages (GEOS Institute, 2010).
g. A variety of crops are grown in the region and many are seasonally variable and are sensitive to changes in growing season and heat patterns (GEOS Institute, 2010).
h. Curtailments are challenging especially for small and isolated communities without access to other water sources. If drought conditions continue or worsen, it is unclear how curtailments can be achieved in economically distressed communities with diminishing water supplies and no access to alternative supplies. Lack of drinking water access can lead to poor health, disease spreading, and death (California Natural Resources Agency, 2009). A local drought emergency was enacted in SLO County from 2014 through 2017 that restricted water usage and required acquiring alternate water sources while reservoir levels were allowed to recover.

2. Water Supply
    a. While precipitation projections are less definitive than other climate variables, there is general consensus that precipitation in the Southwestern US will decline over the second half of the 21st Century (US Global Change Research Program, Climate Change Science Program, 2009).
    b. Water supply shortages are expected to worsen (GEOS Institute, 2010).
    c. Groundwater recharge is expected to decrease (GEOS Institute, 2010).
    d. Coastal aquifers will be subject to seawater intrusion, especially in aquifers with high pumping rates (California Department of Water Resources, 2008).
    e. Droughts are expected to be more severe and potentially more frequent (California Department of Water Resources, 2008), (California Natural Resources Agency, 2009).
    f. In sustained drought conditions, use of surface waters may be curtailed, requiring more consumption of groundwater and thus increasing vulnerability to water shortage (California Natural Resources Agency, 2009). Groundwater utilization is expected to increase based on projections to 2035 (2014 IRWMP, Section D). The region may see more severe storm events that result in quick pulses of heavy runoff. Infrastructure does not exist to capture the momentary surplus of water, and poor land use practices prevent much of the rain from infiltrating into the ground (GEOS Institute, 2010).
    g. The State Water Project (SWP) supply has been limited due to pumping restrictions on the Delta and may continue to require restrictions in the future (Carollo Engineers, 2012). A sustained drought may increase hardships on the water rights holders in the region (California Department of Water Resources, 2011).
    h. Changes in surface water supply, snowmelt patterns that affect SWP supply, and increasing demands may make it difficult to balance water needs. Vulnerabilities for ecosystems and municipal/agricultural water needs may be exacerbated by instream flow requirements that are not quantified, not accurate

for ecosystem needs under multiple environmental conditions including droughts, and not met by regional water managers (California Department of Water Resources, 2011).

i. Aquatic species that are already vulnerable to periods of low flow may become increasingly more vulnerable as hydrologic patterns change. The shift in hydrologic flow patterns can disrupt necessary flows and cause biodiversity shifts, loss of habitat, and barriers to species migration (California Natural Resources Agency, 2009). Groundwater pumping leads to lowering of the water table, causing low flows and dry periods in rivers and streams, contraction of riparian areas and wetlands, and stress to aquatic organisms (GEOS Institute, 2010). Steelhead are very sensitive to weather events, sediment, and stream flow. With worsening conditions, steelhead in San Luis Obispo County could follow the pattern seen in other areas, where spawning no longer occurs (GEOS Institute, 2010). The region contains multiple fisheries and habitat for sensitive species that depend on stream flows. The Watershed Management Planning Project Report analyzed instream flow conditions, however, the need for further monitoring and data collection was identified to determine if flow has been insufficient for aquatic life (2014 IRWMP).

3. Water Quality
    a. Eutrophication is expected to occur more often in surface waters as water temperatures increase (California Department of Water Resources, 2008).
    b. Longer low-flow conditions may lead to higher contaminant concentrations (California Natural Resources Agency, 2009).
    c. High turbidity is expected to become more of a concern as storm severity increases and wildfires become more frequent (California Department of Water Resources, 2008).
    d. Increased sedimentation in rivers and streams is expected (GEOS Institute, 2010).
    e. Other water quality issues that typically accompany severe storms (such as spikes in *E. coli* or *cryptosporidium*) are expected to become more frequent (Bates, B.C., Z.W. Kundzewicz, S. Wu and J.P. Palutikof, Eds., 2008).
    f. Pollutant loads may increase with more intense storms (California Department of Water Resources, 2008).
    g. Increased salinity intrusion into estuaries and brackish environments as seasonal freshwater flows decrease and sea levels rise (California Department of Water Resources, 2008).
    h. Warming temperatures will result in lower dissolved oxygen levels in water bodies which also contributes to algal blooms and eutrophication (California Natural Resources Agency, 2009). Changes in streamflows and increased storm intensity that causes heavy runoff may alter pollutant concentrations in water bodies reducing water quality (California Natural Resources Agency, 2009).
    i. While it is unclear how average precipitation will change with temperature, it is generally agreed that storm severity will probably increase. More intense, severe storms may lead to increased erosion, which will increase turbidity in surface waters. Areas that already observe water quality responses to rainstorm intensity may be especially vulnerable (California Department of Water Resources, 2011).
4. Sea Level Rise
    a. Saltwater intrusion to coastal aquifers with shallow water tables will worsen with sea levels rise (GEOS Institute, 2010).
    b. Coastal erosion is expected to increase in severity in many locations (U.S. Environmental Protection Agency, 2009). Coastal erosion can cause severe damage to coastal developments and facilities (GEOS Institute, 2010). Beach erosion is expected to increase and may require more frequent sand replenishment (GEOS Institute, 2010).
    c. Coastal structures, especially earthen levees, are placed under additional stress and are more likely to fail as sea level rises (California Department of Water Resources, 2008), (California Natural Resources Agency, 2009).

d. Coastal flooding is more likely to inundate coastal infrastructure as base sea levels increase (California Department of Water Resources, 2008). Areas within the tidal reach may also be more susceptible to flooding. Tourism infrastructure including roads, buildings, harbors, and piers may be damaged by higher sea levels (GEOS Institute, 2010).
e. Low-lying coastal habitats that are particularly vulnerable to climate change include estuaries and coastal wetlands that rely on a delicate balance of freshwater and salt water (California Department of Water Resources, 2011).

5. Flooding
    a. Potential damage to agriculture systems (GEOS Institute, 2010).
    b. Storms are expected to increase in intensity. The 2009 California Water Plan recommends that no new critical facilities (e.g., fire stations, hospitals, schools, emergency shelters) be built within a 200-year flood plain (California Department of Water Resources, 2008), (California Natural Resources Agency, 2009).
    c. Higher volumes of floodwater are anticipated as more precipitation falls as rain (California Department of Water Resources, 2008).
    d. Flooding is expected to cause beach erosion (GEOS Institute, 2010).
    e. Reservoirs and other facilities with impoundment capacity may be insufficient for severe storms in the future. Facilities that have been insufficient in the past may be particularly vulnerable (California Department of Water Resources, 2011).
    f. Wildfires alter the landscape and soil conditions, increasing the risk of flooding within the burn and downstream areas. Some areas are expected to become more vulnerable to wildfires over time.
6. Ecosystem and Habitat Vulnerability
    a. Sedimentation is likely to increase in marshes, estuaries and coastal streams (GEOS Institute, 2010).
    b. Coastal birds may decline (GEOS Institute, 2010).
    c. Saltwater is likely to intrude estuaries, creeks and wells along the coast (GEOS Institute, 2010).
    d. Rare habitats could decline (GEOS Institute, 2010).
    e. Marine and nearshore marine species are threatened by acidification of ocean water and changes in ocean currents (GEOS Institute, 2010).
    f. Changes in fog could lead to loss of elfin forests (coastal oak forests) (GEOS Institute, 2010).
    g. Sensitive species are at risk (GEOS Institute, 2010).
    h. Lower average rainfall, higher evaporation and increased sedimentation are expected to have negative impacts on vernal pools, wetlands and riparian areas (GEOS Institute, 2010).
    i. Changes in migration patterns and species distribution are anticipated (U.S. Environmental Protection Agency, 2009), (National Academy of Sciences, 2010).
    j. Aquatic and terrestrial invasive species may spread in some areas (National Academy of Sciences, 2010).
    k. Erosion is expected to increase with climate change, and sedimentation is expected to shift. Habitats sensitive to these events may be particularly vulnerable to climate change (California Department of Water Resources, 2011).
    l. Some specific species are more sensitive to climate variations than others and may be especially vulnerable to climate change impacts (California Department of Water Resources, 2011). Saltbush (Atriplex) and other native shrubs are expected to decline with climate change. Model projections show loss of appropriate conditions for temperate shrubland by mid-century. Shrubs could be impacted by increased drought and spread of fire with non-native grasses. Other species that may be affected include San Joaquin kit fox, LeConte's thrasher, giant kangaroo rats, blunt-nosed leopard lizards, and California condor. Pronghorn and Tule elk might decline with decreased productivity of grasslands. Populations of these species are isolated and the topography of the Carrizo Plain and surrounding areas, making it difficult for them to move to

new areas. The future climate may not be suitable for coniferous (pine) forests and woodlands (GEOS Institute, 2010).

m. Species that are already threatened or endangered may have a lowered capacity to adapt to climate change (California Department of Water Resources, 2011).

7. Hydropower
    a. Changing volumes of total snowpack and changing seasonal melting patterns of snow may require changes in reservoir management strategies. Depending on other reservoir release constraints (such as environmental flow release requirements), this could negatively impact hydropower generation (California Department of Water Resources, 2008).
    b. Increasing temperatures will also increase energy demands, especially during peak demand times (California Department of Water Resources, 2008).

2.2 Climate Change Vulnerability Assessment Checklist

Regional climate change impacts from Section 2.1.1 are considered at the subregional level in this section of the memo to establish a preliminary vulnerability assessment for seven water and climate change related categories recommended in the Climate Change Handbook. The 2014 IRWMP discusses prioritized vulnerabilities, but lacks a description of the decision-making process implemented to determine the prioritization of the vulnerabilities. A preliminary list of questions and considerations, or a "Checklist", from the Climate Change Handbook Section 4.3 and Appendix B, is shown below with initial attempts to describe relevant impacts and considerations for each issue relevant to each subregion. These initial considerations are provided to encourage input from stakeholders about relevant key indicators of potential vulnerabilities in each subregion. Once these vulnerabilities are identified, a system will be applied to prioritize them.

2.2.1 Water Demand

1. Are there major industries that require cooling/process water in your planning region?

Several prominent industries in San Luis Obispo County require water for their operations. Notable industries include wineries, breweries, hospitals, energy production, hotels, and education. Additionally, agriculture is a major industry throughout the County and has a significant water demand for irrigation and other processes.

North Coast Subregion

Cuesta College requires water to maintain operations and serve its students and staff. Similarly, the California Men's Colony requires water to serve its residents and maintain operations. Wineries along the North Coast also contribute to the industrial water demand in the subregion.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

Wineries and vineyards throughout the North County have large water demands for growing and wine production. Another major industrial water use in the subregion is process water required by breweries. The Atascadero State Hospital and other hospitals are notable industrial water users in the subregion.

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

The Diablo Canyon Power Plant requires cooling and process water for its operations. The Santa Maria Refinery in Nipomo is a major industrial water user. Cal Poly San Luis Obispo has a significant water demand to maintain operations and serve its students and staff. There are also several breweries throughout the South County Subregion that require water for the brewing process. Hospitals, including Sierra Vista Regional Medical Center and French Hospital Medical

Center, are another prominent industry in the subregion that requires process water. The Arroyo Grande Oil Field uses large amounts of water during oil pumping.

South County Subregion ☒Yes ☐No ☐Uncertain

2. Does water use vary by more than 50% seasonally in parts of your region?

North Coast Subregion

Seasonal water use is affected by tourism and agriculture in the North Coast Subregion. San Simeon CSD and Cambria CSD both have a noticeably higher water demand from June to October. Los Osos CSD has a significant difference in seasonal water demand, but it is not more than 50%.

North Coast Subregion ☐Yes ☐No ☒Uncertain

North County Subregion

Seasonal water use is affected by agriculture in the North County Subregion. Templeton CSD, Atascadero MWC, and the City of Paso Robles all have significantly lower water demands during winter months.

North County Subregion ☐Yes ☐No ☒Uncertain

South County Subregion

Seasonal water use is affected by agriculture and tourism in the South County Subregion. The City of Pismo Beach, Nipomo CSD, and Oceano CSD all have significantly lower water demands during winter months. During the summer, the City of San Luis Obispo experiences an increase in irrigation water use but a decrease in domestic water use with the absence of Cal Poly students. Overall, seasonal water use does not vary by more than 50%.

South County Subregion ☐Yes ☐No ☒Uncertain

3. ***Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?***

The highest ranked crops by dollar amount are grapes/wine, vegetables, strawberries, avocados, broccoli, and cattle/calves, all which are climate sensitive. The total value of agricultural production in 2016 was over $900 million (County of SLO 6). A report by the USDA determined San Luis Obispo County had a high crop vulnerability ranking.

- While grapes are relatively drought tolerant crops, they are sensitive to temperature, frost, and other climate-related factors. The quality of wine grapes is especially sensitive to climate, so increased temperatures could significantly reduce the quality and economic value of wine grapes (“Grapes” 1-2).
- Cattle production decreased 36% from 2015 to 2016 due largely to the decrease in rangeland caused by the drought (County of SLO 8). Changes in air temperature and decreased humidity can cause respiratory problems for cattle.
- Strawberries are extremely sensitive to soil salinity. Increasing salt levels in soil would decrease growth rate and fruit yield of strawberries as well as increase irrigation demands for soil leaching. Additionally, strawberries are sensitive to fungal diseases and unusually warm temperatures (“Strawberries” 1-2).
- Broccoli is moderately climate sensitive. Broccoli has a narrow temperature range of 60 to 65˚F and is harmed by temperatures exceeding 80˚F. The vegetable is also sensitive to invertebrate pests and bacterial and fungal diseases, which are likely to pose a greater risk with increased temperatures (“Broccoli” 1-2).
- Avocados are a highly climate sensitive crop requiring wet conditions. Avocados need large amounts of water and frequent irrigation, and their sensitivity to soil salinity could increase this already high water demand. The fruit is sensitive to cold weather and can die during a freeze, but increased fall temperatures could also decrease avocado yields (“Avocados” 1-2).

North Coast Subregion

Avocados, grapes, and berries are all grown in the North Coast Subregion.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
The primary crop in the North County Subregion is wine grapes. The cattle industry is also prominent in this subregion.

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion
Strawberries, avocados, and grapes are some of the major crops grown in the South County Subregion.

South County Subregion ☒Yes ☐No ☐Uncertain

4. ***Do groundwater supplies in your region lack resiliency after drought events?***

North Coast Subregion
Multiple groundwater basins in the subregion (some of the largest/highest yield and storage capacity basins) have a Level I (2 basins) or Level III (2 basins) severity rating as assigned by the SLO County Planning Department. These basins experience reduced recharge and ability to meet demand during drought conditions. About 50% of the North Coast's urban water supply is from groundwater (SLO 2014 IRWMP D-18). Drought conditions make groundwater basins more susceptible to salt water intrusion and often result in increased chloride levels. This has been witnessed in groundwater wells in Los Osos. San Simeon CSD is dependent on a single creek basin, which is susceptible to adverse effects of drought events.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
The Paso Robles Basin, the largest and highest yielding basin in the subregion, is a critically over-drafted basin (DWR). The groundwater basins in this subregion have low storage and difficulty meeting demands especially during drought events (SLO 2014 IRWMP C-13). About 70% of the North County water supply is from groundwater (SLO 2014 IRWMP D-18).

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion
The Cuyama Valley Basin is a critically over-drafted basin, and the Santa Maria Valley Basin is a high priority basin (DWR). Droughts reduce basin recharging and the ability of the basin to meet demand. About 30% of the South County water demand is supplied by groundwater (SLO 2014 IRWMP D-18). However, Nipomo CSD is unique in that it obtains 50-100% of its water supply from groundwater.

South County Subregion ☒Yes ☐No ☐Uncertain

5. ***Are water use curtailment measures effective in your region?***

A local drought emergency was enacted in SLO County from 2014 through 2017 that restricted water usage and required acquiring alternate water sources while reservoir levels were allowed to recover.

North Coast Subregion
Los Osos CSD implemented a Water Shortage Contingency Plan during the recent drought, and water usage dropped to 50 gallons per day per capita.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

Efforts in the City of Paso Robles during the recent drought were effective in reducing per capita water use. The US-LT RCD developed the Agricultural Water Offset program, which limited the establishment of new irrigated lands in Paso Robles Groundwater Basin, but this did not necessarily prevent new groundwater pumping operations outside of the basin boundary.

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

While curtailment measures in Nipomo were successful in reducing groundwater pumping by 50%, they did not result in a significant increase in the groundwater level. Restrictions on outdoor water use in the City of San Luis Obispo have been effective at reducing the city's water consumption. The City of Arroyo Grande successfully curtailed water use by 35% from 2013 to 2016.

South County Subregion ☒Yes ☐No ☐Uncertain

6. *Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?*

A study completed by Stillwater Sciences in 2014 determined the minimum instream seasonal flow requirements needed to sustain basic aquatic systems for stream systems throughout the County. Central coast steelhead trout were used as the indicator species for this study. Based on a 2017 report by the Central Coast Salmon Enhancement, there are streams within all three subregions that did not meet these minimum flow requirements in the past two years. In 2016, only 14 percent of the sites measured met spring flow requirements, and only 17 percent of measured sites met summer flow requirements (CCSE).

North Coast Subregion

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

South County Subregion ☒Yes ☐No ☐Uncertain

2.2.2 Water Supply

1. Does a portion of the water supply in your region come from snowmelt?

North Coast Subregion

The City of Morro Bay, California Men's Colony, Cuesta College, and County Operations Center all receive water from the State Water Project (SWP).

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

Shandon has a water service amount of 100 AFY from the SWP.

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

The City of Pismo Beach, Oceano CSD, Avila Beach CSD, Avila Valley MWC, San Miguelito MWC, and San Luis Coastal USD all receive water from the SWP.

South County Subregion ☒Yes ☐No ☐Uncertain

2. Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?
See Question 1 above.

North Coast Subregion

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

South County Subregion ☒Yes ☐No ☐Uncertain

3. Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?
North Coast Subregion
The Pico Creek Valley, San Simeon Valley, Chorro Valley, Morro Valley, and Los Osos Valley Basins have all encountered sea water intrusion and are water supply sources for the subregion (SLO 2014 IRWMP).

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
There are no coastal aquifers in this subregion.

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion
The Avila Valley Sub-basin and Santa Maria Valley Basin have both experienced sea water intrusion and serve as water supply sources for the subregion (SLO 2014 IRWMP).

South County Subregion ☒Yes ☐No ☐Uncertain

4. Would your region have difficulty storing carryover supply surpluses from year to year?
Surplus supplies of State Water can be stored via San Luis Reservoir, which is operated by DWR and the Central Valley Project. State water contracts limit the quantity of water allowed to be stored by each contractor, and stored water is subject to spills based on the amount of water in the SWP system.

North Coast Subregion
San Simeon has no way of carrying over supply surpluses.

North Coast Subregion ☐Yes ☐No ☒Uncertain

North County Subregion
The Salinas Reservoir, overseen by the City of San Luis Obispo, is limited in its ability to store new inflow due to criteria set forth by the SWRCB which only allow for new inflow to be stored when there is a live steam in the Salinas River.

Monterey County operates and maintains the Nacimiento Reservoir. The District and the contractors of Nacimiento Water have contracts for water but no rights to storage. Supply surpluses in Shandon are stored in San Luis Reservoir and experience significant losses through evaporation.

North County Subregion ☐Yes ☐No ☒Uncertain

South County Subregion

It is possible to store carryover supplies in Lopez Reservoir but only when the water level reaches 40.5% capacity (20,000 AF). The Low Reservoir Response Plan (LRRP) allows agencies to carryover any of their unused annual entitlement for future use when reservoir levels are low. The LRRP allows for reduced entitlement deliveries as well as reduced downstream releases to preserve or stretch out supplies for up to 2-3 years. When the LRRP is not in effect, agencies occasionally have access to surplus water but can only use it in that same year; they cannot store it for use in future years.

South County Subregion ☒Yes ☐No ☐Uncertain

5. Has your region faced a drought in the past during which it failed to meet local water demands?

During water years 2014 and 2015, due to statewide drought conditions, the State Water Resources Control Board (SWRCB) curtailed post-1914 tributary water rights to the Sacramento-San Joaquin Delta. A local drought emergency was in effect from 2014-2017 during which time alternate water sources were needed.

North Coast Subregion

State Water Project water has experienced increased salt levels during drought conditions, which resulted in violation of water quality standards in the Chorro Valley Water System.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

To ensure water demand could be met during drought conditions, the City of San Luis Obispo added water supply sources and long-standing water conservation programs. In Nipomo, recent drought conditions have contributed to groundwater levels at record lows.

South County Subregion ☒Yes ☐No ☐Uncertain

6. Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?

The 2014 San Luis Obispo County Watersheds Management Plan determined that invasive species identification and assessment as a county-wide priority data gap. The California Invasive Plant Council has recognized areas of spreading invasive species in all three of the County's subregions, and there has already been a significant increase in the overall size of acres covered by invasive species in local watersheds. Yellow star thistle, veldt grass, and arundo are three invasive species with notable management issues in San Luis Obispo County. Additionally, invasive mussels in reservoirs and water management facilities are a concern. Mitigation sites are especially vulnerable to invasive species management issues.

North Coast Subregion

Cape Ivy in the Morro Bay watershed has been an invasive species of special concern.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

South County Subregion ☒Yes ☐No ☐Uncertain

2.2.3 Water Quality

1. Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?

According to the Cal-Adapt Wildfire: Fire Risk Map, the SLO County IRWM Planning Region may experience a slight increase in annual mean hectares burned by wildfire (Cal Fire).

North Coast Subregion

The risk of wildfires near Whale Rock Reservoir are a significant contamination risk to the water supply ("Whale Rock" 18). The major source of contamination for the water body is sedimentation from erosion, which would be exacerbated by wildfires in the nearby area ("Whale Rock" 1). Dead trees and large areas of dry bush create a wildfire threat to water bodies throughout the North Coast Subregion – not just Whale Rock Reservoir.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

The Nacimiento Reservoir is in an area with a high risk of wildfires, and possible wildfires pose a threat to the water quality in the reservoir ("Nacimiento Reservoir" 1). Similarly, wildfires are a risk in the nearby areas of the Salinas Reservoir and threaten water quality (Cal Fire).

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

Large amounts of dry brush have been noted throughout the Lopez Lake watershed and contribute to the significant risk of potential contamination due to wildfires ("Lopez Lake" 2). Wildfires would lead to increased sedimentation and add stress to other water quality concerns within the reservoir.

South County Subregion ☒Yes ☐No ☐Uncertain

2. Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?

North Coast Subregion

The San Simeon, Cayucos Creek, and Morro Bay Watersheds all have low dissolved oxygen, among other water quality issues (SLO 2014 IRWMP). Bacteria impairment can be exacerbated by warm temperatures, which accelerates the growth of bacteria. Water bodies with bacteria impairment include Morro bay estuary, Chorro Creek, Los Osos Creek and Warden Creek. Cattle grazing in the Whale Rock Reservoir watershed has been linked to increased turbidity and nutrient levels in the area's water bodies ("Whale Rock" 1). These conditions encourage algal blooms and are worsened in times of drought and high temperatures.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

Middle Salinas-Atascadero and Cholame Creek Watersheds have low dissolved oxygen (SLO 2014 IRWMP). The Nacimiento Reservoir has a recent trend of high algal levels in summer months. Increased erosion, drought conditions, and high temperatures all contribute to harmful levels of algae growth in the reservoir ("Nacimiento Reservoir" 27-28). Similarly, the recent drought conditions resulted in record high levels of nutrients in the Salinas Reservoir, which has contributed to a trend of high algae levels in warm summer and fall months ("Salinas Reservoir" 12).

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

San Luis Obispo Creek and Pismo Creek Watersheds have low dissolved oxygen. San Luis Obispo Creek and Santa Maria River have chlorpyrifos and other water quality issues (SLO 2014 IRWMP). The Lopez Lake Reservoir experienced harmful algal blooms during the recent drought conditions and has a recorded trend of algae spikes during warm summer months ("Lopez Lake" 14).

South County Subregion ☒Yes ☐No ☐Uncertain

3. Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?

A 2017 report by Central Coast Salmon Enhancement showed that stream systems throughout the County have recently experienced decreased seasonal low flows. During these low flow periods, water quality and ecosystem processes are highly sensitive to minor alterations and contamination.

North Coast Subregion

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

South County Subregion ☒Yes ☐No ☐Uncertain

4. Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?

Beneficial uses are identified by the Watershed Management Planning Project Report for all but one of the watersheds in the region.

North Coast Subregion

Swimming and oyster harvesting in the Morro Bay watershed have been limited in the past due to bacteria levels.

North Coast Subregion ☐Yes ☐No ☒Uncertain

North County Subregion

North County Subregion ☐Yes ☐No ☒Uncertain

South County Subregion

South County Subregion ☐Yes ☐No ☒Uncertain

5. Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?

Runoff into Whale Rock Reservoir (Cayucos Water Treatment Plant) and Lopez Lake (Lopez Water Treatment Plant) brings sediment into the reservoirs causing turbidity levels to rise. This can dramatically affect the treatability of the water source and increase the risk of exposure to water borne illnesses due to Cryptosporidium, Giardia, and E. Coli as chlorine and filtration demands are elevated during these times. It typically takes several big storms to see such a result in water quality at the water treatment plants, and it can take days for the turbid water to reach the end of the reservoir where water is distributed to the water treatment plants. Fortunately, County facilities can handle these changes to the water source and have not had a violation because of turbidity breakthrough or low chlorine after such rain events.

Storm runoff similarly affects Nacimiento Lake and Salinas Reservoir and treatment facilities in the City of Paso Robles and City of San Luis Obispo, respectively, must respond to the water quality shifts.

North Coast Subregion

Heavy rains in San Simeon forced the community to add a well filtration system to handle increased contamination.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

South County Subregion ☒Yes ☐No ☐Uncertain

2.2.4 Sea Level Rise

1. Has coastal erosion already been observed in your region?

North Coast Subregion

Coastal erosion has been observed within the North Coast Subregion; however, the shoreline trends vary across the region and over time. A USGS study found that in the short-term over 80% of the subregion is experiencing net erosion (Hapke 50). San Simeon has been forced to add armoring to the shoreline to protect beach access and the waste water treatment plant.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

There are no coastal areas in this subregion.

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion

The South County Subregion has experienced notable coastal erosion. Coastal bluffs in Pismo Beach are experiencing erosion rates of six to eight inches per year, which resulted in the construction of a sea wall in 2017 (LA District US Army Corps of Engineers 17). Avila Beach is also using a sea wall to protect roads and infrastructure from coastal erosion (Wallace Group).

South County Subregion ☒Yes ☐No ☐Uncertain

2. Are there coastal structures, such as levees or breakwaters, in your region?

North Coast Subregion

Coastal structures along the North Coast include the San Simeon Pier, Cayucos Pier, and Morro Bay breakwaters.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
There are no coastal areas in this subregion.

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion
The Arroyo Grande Creek Channel Levee located in the South County Subregion is intended to mitigate flooding. Other notable coastal structures along the South Coast include the Port San Luis breakwater, Harford Pier, Unocal Pier, Avila Beach Pier, and Pismo Beach Pier.

South County Subregion ☒Yes ☐No ☐Uncertain

3. Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation at less than six feet above mean sea level in your region?
San Luis Obispo County Planning Department is currently working on a study that will provide information about specific infrastructure at risk from sea level rise.

North Coast Subregion
Based off the NOAA Sea Level Rise Viewer, roads and infrastructure within areas of San Simeon, San Simeon Ranch, Morro Bay, Morro Bay State Park, and Los Osos would be impacted by six feet of sea level rise.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
There are no coastal areas in this subregion.

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion
Based off the NOAA Sea Level Rise Viewer, roads and infrastructure near Pismo State Beach and in Oceano would be impacted by six feet of sea level rise. Specifically, the South SLO County Wastewater Treatment Plant is at risk of sea level rise impacts.

South County Subregion ☒Yes ☐No ☐Uncertain

4. Are there climate-sensitive low-lying coastal habitats in your region?
North Coast Subregion
The US Fish and Wildlife Service has designated several Critical Habitats throughout the North Coast Subregion; these federally recognized areas are considered essential for the survival of an endangered or threatened species. Critical Habitats along the North Coast have been recognized for the following species: Steelhead, California red-legged frog, Banded dune snail, Western snowy plover, Morro Bay kangaroo rat, and Tidewater goby. Morro Bay Estuary, in particular, is home to multiple fully protected species and is one of 28 areas protected through the EPA's National Estuary Program.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

There are no coastal habitats in this region.

North County Subregion ☐Yes ☒No ☐ Uncertain

South County Subregion

The coastal area of the South County Subregion also contains several Critical Habitats. Endangered and threatened species dependent on coastal habitats along the South Coast include Tidewater goby, Steelhead, La Graciosa thistle, and Western snowy plover ("ECOS"). Pismo Beach is also home to a Monarch Butterfly Grove – a species which is currently under review for protection under the Endangered Species Act ("Monarch butterfly").

South County Subregion ☒Yes ☐No ☐Uncertain

5. Are there areas in your region that currently flood during extreme high tides or storm surges?

North Coast Subregion

During king tides, the water level in Morro Bay is just inches below docks and waterfront restaurants. Many popular coastal areas in Morro Bay State Park are completely underwater during king tides. Communities in Los Osos have also experienced flooding during king tides. During previous storm surges, Pico Creek lagoon has experienced salt water intrusion.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

There are no coastal areas in this subregion.

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion

Pismo Beach experienced flooding during storm surges in 2016 that resulted in closing the pier (KSBY). During king tides, beaches and coastal habitats in Pismo Beach experience flooding. In the past, storm events have caused flooding of the Oceano Lagoon and Highway 1 in Oceano.

South County Subregion ☒Yes ☐No ☐Uncertain

6. Is there land subsidence in the coastal areas of your region?

The only land subsidence that has been observed in the coastal areas of San Luis Obispo County occurred in and around Oceano due to the December 2003 San Simeon Earthquake. The land subsidence was a result of liquefaction during shaking by the earthquake.

North Coast Subregion

North Coast Subregion ☐Yes ☒No ☐Uncertain

North County Subregion

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion

South County Subregion ☐Yes ☒No ☐Uncertain

7. Do tidal gauges along the coastal parts of your region show an increase over the past several decades?

North County Subregion

It can be assumed that sea level trends in the North County Subregion are similar to those studied at Port San Luis and other surrounding areas. Nearby studies indicate the mean sea level is increasing along California's central coast ("Sea Level Trends").

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
There are no coastal areas in this subregion.

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion
According to NOAA's Tides and Currents Sea Level Trends gauge for Port San Luis, the change in mean sea level is 0.84 mm/year with a 95% confidence interval. This calculation is based off data from 1945 to 2016 and is equivalent to a change of 0.28 feet in 100 years ("Sea Level Trends").

South County Subregion ☒Yes ☐No ☐Uncertain

2.2.5 Flooding

1. Does critical infrastructure in your region lie within the 200-year floodplain? DWR's best available floodplain maps are available at: *http://www.water.ca.gov/floodmgmt/lrafmo/fmb/fes/best_available_maps/.*
No areas in the region are within the 200-year floodplain.

North Coast Subregion

North Coast Subregion ☐Yes ☒No ☐Uncertain

North County Subregion

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion

South County Subregion ☐Yes ☒No ☐Uncertain

2. Does part of your region lie within the Sacramento-San Joaquin Drainage District (SSJDD)?
No areas in the region are within the SSJDD.

North Coast Subregion

North Coast Subregion ☐Yes ☒No ☐Uncertain

North County Subregion

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion

South County Subregion ☐Yes ☒No ☐Uncertain

3. Does aging critical flood protection infrastructure exist in your region?
North Coast Subregion

Two 1940-era Chorro Creek bridges within the California Men's Colony (CMC) are susceptible to collapse and/or obstruction from high water flows and flood debris leading to flooding and restricted access to the West Facility of CMC. Additionally, the Chorro Dam and spillway are aging.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
Old and damaged drainage projects and flood protection infrastructure are present throughout the North County Subregion leaving the area vulnerable to flooding.

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion
Much of the City of San Luis Obispo's downtown corridor has creeks and waterways with aging infrastructure. The Arroyo Grande Creek Channel Levee was constructed in 1961 to reduce flooding in the area (SLO Flood Control District). The Diablo Canyon Nuclear Power Plant located along the coast has critical flood protection infrastructure. The flood control gates on Oceano Lagoon are aging.

South County Subregion ☒Yes ☐No ☐Uncertain

4. Have flood control facilities (such as impoundment structures) been insufficient in the past?
North Coast Subregion
Flood control and drainage studies were completed by RMC, Inc. for several communities in the North Coast Subregion in 2004. The study in Cambria revealed there were insufficient underground drainage facilities and improved organization and maintenance of the area's flood control facilities was necessary ("Cambria" i). In Cayucos, a lack of initial drainage infrastructure when development began was identified as a major reason for the lack of necessary drainage facilities and frequent street flooding ("Cayucos" i). Another study done in 1997 determined that development in Los Osos without rerouting of drainage facilities had led to poor flood control in the area (Engineering Development Associates ES-1). San Simeon lacks an adequate storm drainage system; private storm drains currently provide most of the flood protection.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
A study by RMC, Inc. showed that the railroad in San Miguel was preventing runoff to the Salinas River and causing flooding ("San Miguel" ii). Additionally, a lack of curbs and gutter systems were contributing to road flooding ("San Miguel" i). In Santa Margarita, inadequate culverts and drainage structures blocked by sedimentation and debris resulted in flood risks ("Santa Margarita" i). The Templeton Drainage and Flood Control Study completed in 2014 identified several insufficient flood control facilities, including culverts along Highway 101, Main Street, and Arizona Crossing as well as restricted conveyance capacity in the Toad Creek Channel due to vegetation and sedimentation (13-16).

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion
RMC, Inc. performed flood control and drainage studies in 2004 for several communities in the South County Subregion. The Nipomo study revealed Mesa area flooding was due to development locking existing runoff flow paths and flooding in Olde Towne was the result of insufficient culverts ("Nipomo" i-ii). In Oceano, the study found stormwater was not considered during the community's initial development and that resulted in insufficient drainage facilities and frequent flooding of roads ("Oceano" i). Additionally, the Arroyo Grande Creek Channel Levee was breached in 2001 and hundreds of acres were flooded (SLO Flood Control District).

South County Subregion ☒Yes ☐No ☐Uncertain

5. Are wildfires a concern in parts of your region?
There are areas within all three subregions determined as Very High Fire Hazard Severity Zones by Cal Fire. Additionally, the Region does not have an adequate system for clearing dead trees, snags, piles of limbs, wood chips, etc.

North Coast Subregion
San Simeon lacks adequate fire protection for homes and businesses. There is not enough water storage nor fire flow to protect structures. The West Facility of the California Men's Colony is a 1940-era Army Hospital composed of highly flammable wooden materials and is located adjacent to areas susceptible to wildfire.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

South County Subregion ☒Yes ☐No ☐Uncertain

2.2.6 Ecosystem and Habitat Vulnerability

1. Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?
Increased sedimentation has been witnessed throughout the County and can cause shallower and warmer water, and in some cases, loss of estuaries.

North Coast Subregion
The Morro Bay estuary salt marsh is a critical habitat that has already been impacted by sedimentation and effects will likely be complicated by sea level rise. Morro Bay shorebird habitats and eelgrass beds have been identified as at-risk of these disrupting effects. Many species including snowy plovers, least terns, brown pelicans, and brant are expected to lose habitat and resources (Koopman 31). Additionally, Steelhead, California red-legged frog, Morro shoulderband snail, and Morro kangaroo rat Critical Habitats in the North Coast are vulnerable to the effects of erosion and sedimentation ("ECOS").

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
The Salinas River has already been impacted by increased sedimentation (Koopman 31). This sedimentation has degraded riparian habitats including areas designated as a Critical Habitat for Steelhead and California red-legged frog and supports numerous other special status species ("ECOS").

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion
Increased sedimentation and coastal erosion could disrupt Critical Habitats for Steelhead, California red-legged frogs, Western snowy plover, and La Graciosa thistle in the South County (Koopman 31). The Pismo Beach area is especially at risk of coastal erosion and flooding.

South County Subregion ☒Yes ☐No ☐Uncertain

2. Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?
North Coast Subregion

Morro Bay Estuary is an important coastal habitat supporting a diverse community of species, many of which have special species status, and is dependent on seasonal flow patterns (US-LT RCD). Morro Bay estuary is impacted by changes in freshwater flow. Understanding of specific impacts is limited, but the Morro Bay National Estuary Program is currently researching and monitoring impacts on eelgrass. Several other river and stream mouths along the North Coast are dependent on seasonal flow patterns.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
There are no coastal areas in this subregion.

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion
San Luis Obispo Creek, Pismo Creek, and Arroyo Grande Creek all form estuarine habitats dependent on seasonal flows and that support federally protected species (US-LT RCD).

South County Subregion ☒Yes ☐No ☐Uncertain

3. Do climate-sensitive fauna or flora populations live in your region?
North Coast Subregion
The elfin forests and estuary in Morro Bay are sensitive to climate change impacts, such as changes in fog, sea level rise, sedimentation, and drought (Koopman 31). These areas support various special status species that are at great risk of climate change impacts. Pine forests and woodlands along the North Coast are at risk of changing conditions that could make current habitats unsuitable, and their isolation from other suitable areas makes them especially vulnerable (Koopman 35). Steelhead trout are sensitive to increased sedimentation and declining stream flows.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
Carrizo Plain supports several climate-sensitive species, such as Pronghorn and Tule elk, which are at risk of declining grassland productivity and isolation from other suitable habitats (Koopman 37). The North County Subregion is also home to various endangered and threatened species that are at high risk of climate change impacts; these species include Steelhead, California tiger salamander, California red-legged frog, Longhorn fairy shrimp, Vernal pool fairy shrimp, Purple amole, and California condor ("ECOS").

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion
Steelhead and other protected species found in the coastal areas of the subregion are at risk of various climate change impacts that threaten the conditions required for suitable habitat ("ECOS"). Additionally, climate change effects could put new species at risk. For instance, higher temperatures and poor water quality could cause sea lions to be more susceptible to diseases (Koopman 31).

South County Subregion ☒Yes ☐No ☐Uncertain

4. Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?
North Coast Subregion

Endangered Species: Smith's butterfly, Chorro Creek bog thistle, California clapper rail, Morro Bay kangaroo rat, Morro shoulderband snail, Tidewater goby, California seablite, Indian Knob mountain-balm, Marsh sandwort, Salt marsh bird's-beak, Southern Steelhead (US-LT RCD).

Threatened Species: Steelhead, California red-legged frog, Monterey spineflower, California black rail (CA), Beach spectaclepod (CA), Morro manzanita, Western snowy plover, Southern sea otter (US-LT RCD).

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
Endangered Species: Blunt-nosed leopard lizard, Giant kangaroo rat, San Joaquin kit fox, Camatta Canyon amole, Kern mallow, Least Bell's vireo, California condor, California jewel-flower, San Joaquin wollythreads, Longhorn fairy shrimp, Tipton kangaroo rat, Bald Eagle (CA), Santa Lucia mint (CA) (US-LT RCD).

Threatened Species: Bank swallow (CA), Swainson's hawk (CA), California red-legged frog, Vernal pool fairy shrimp, Spreading navarretia, Nelson's antelope squirrel (CA), California tiger salamander, Kern primrose sphinx moth, Camatta Canyon amole, Santa Lucia purple amole (CA), Steelhead (US-LT RCD).

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion
Endangered Species: California least tern, Tidewater goby, Gambel's water cress, La Graciosa thistle, Marsh sandwort, Nipomo Mesa lupine, Pismo clarkia, California condor, Blunt-nosed leopard lizard, Giant kangaroo rat, Longhorn fairy shrimp, San Joaquin kit fox, California jewel-flower, Kern mallow, San Joaquin woollythreads, Chorro Creek bog thistle, Indian Knob mountain-balm, Pismo clarkia (US-LT RCD).

Threatened Species: California black rail (CA), California red-legged frog, California tiger salamander, Steelhead, Western snowy plover, Beach spectaclepod (CA), Surf thistle, Kern primrose sphinx moth, Nelson's antelope squirrel (CA), Swainson's hawk (CA), Vernal pool fairy shrimp, Western snowy plover, Morro manzanita, Surf thistle (US-LT RCD).

South County Subregion ☒Yes ☐No ☐Uncertain

5. Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?
In 2015, the commercial fishing industry in San Luis Obispo County had a total revenue of $10 million (County of SLO).

North Coast Subregion
Morro Bay State Park, Montana de Oro State Park, San Simeon Beach, and other coastal areas attract tourists, support water-related recreation, and are threatened by sea level rise. Morro Bay economic activities include oyster farming (2 oyster farms), recreational and commercial fishing, fishing-related, fish markets and restaurants that sell local fish. There are two shops in Morro Bay dedicated to stand-up paddling, as well as numerous kayak rentals shops and three bay tour boat operators. There is a growing number of charter boats that do private sailing and fishing charters. Wildlife viewing also generates economic activity, such as the Morro Bay Winter Bird Festival. Whale Rock and Chorro Reservoirs also support fishing and other recreation activities.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
Santa Margarita Lake supports water recreation activities. The Salinas River and other riparian habitats also support tourism and water recreation.

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion
Avila Beach, Pismo Beach, Oceano Dunes, and other coastal regions in the South County have a strong tourism industry. Whale Rock Reservoir also supports water-related recreation.

South County Subregion ☒Yes ☐No ☐Uncertain

6. Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?
Stillwater Sciences completed an evaluation in 2014 of minimum instream seasonal flows required to sustain aquatic habitats for steelhead. This study determined minimum seasonal flow values required to support Steelhead habitats at 63 different analysis points across the Region (Stillwater Sciences 23-24).

North Coast Subregion

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

North County Subregion ☒Yes ☐No ☐Uncertain

South County Subregion

South County Subregion ☒Yes ☐No ☐Uncertain

7. Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?
Coastal storms bringing storm surges, waterspouts, and flooding are all possible and occur somewhat regularly along the San Luis Obispo County coastline. These events are often linked to atmospheric rivers.

North Coast Subregion
Areas at risk: Estero Bluffs State Park, Morro Bay National Estuary, Morro Bay State Park, William Randolph Hearst Memorial State Beach, San Simeon State Beach, Moonstone Beach, Cayucos Beach, Cayucos State Beach, Morro Strand State Beach, Harmony Headlands State Beach (SLO 2014 IRWMP).

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion
There are no coastal areas in this subregion.

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion
Areas at risk: Montana de Oro State Park, Port San Luis Pier and Beach, Avila State Beach, Pismo State Beach, Oceano Dunes State Vehicles Recreation Area, Guadalupe-Nipomo Dunes wetland complex (SLO 2014 IRWMP).

South County Subregion ☒Yes ☐No ☐Uncertain

8. Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change (https://www.sierraforestlegacy.org/Resources/Conservation/FireForestEcology/ThreatsForestHealth/Climate/CI-Endangered%20Species%20Coalition%20Top%20Ten.pdf

The Region does not include any of the Top 10 Places from this article.

North Coast Subregion

North Coast Subregion ☐Yes ☒No ☐Uncertain

North County Subregion

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion

South County Subregion ☐Yes ☒No ☐Uncertain

9. Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?

North Coast Subregion

Santa Rosa Creek experiences fish passage barriers due to infrastructure changes (SLO 2014 IRWMP). There are many fish passage barriers in the Morro Bay watershed, including the South Bay Boulevard bridge. The Chorro Reservoir Dam is a fish passage barrier impacting steelhead. Additionally, other infrastructure throughout Chorro Creek creates barriers to fish passage.

North Coast Subregion ☒Yes ☐No ☐Uncertain

North County Subregion

The Salinas and Estrella Rivers are important corridors for aquatic and riparian species movement but can be disrupted by declining seasonal low flows.

North County Subregion ☐Yes ☐No ☒Uncertain

South County Subregion

Arroyo Grande Creek experiences fish passage barriers, and Nipomo-Suey Creeks have habitat fragmentation due to development (SLO 2014 IRWMP).

South County Subregion ☒Yes ☐No ☐Uncertain

2.2.7 Hydropower

1. Is hydropower a source of electricity in your region?

Hydropower is not a source of electricity for San Luis Obispo County.

North Coast Subregion

North Coast Subregion ☐Yes ☒No ☐Uncertain

North County Subregion

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion

South County Subregion ☐Yes ☒No ☐Uncertain

2. Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?

North Coast Subregion

North Coast Subregion ☐Yes ☒No ☐Uncertain

North County Subregion

North County Subregion ☐Yes ☒No ☐Uncertain

South County Subregion

The City of San Luis Obispo is exploring options for hydropower.

South County Subregion ☐Yes ☐No ☒Uncertain

2.3 References

Bates, B.C., Z.W. Kundzewicz, S. Wu and J.P. Palutikof, Eds. *Climate Change and Water. Technical Paper of the Intergovernmental Panel on Climate Change.* 2008.

Cal-Adapt. "Wildfire Scenario Projections in California's Fourth Climate Change Assessment." 2015.

California Department of Food and Agriculture. "California Agricultural Statistics Review." 2015.

California Department of Forestry and Fire Protection. "Fire Hazard Severity Zones in San Luis Obispo County." Fire Resource Assessment Program, November 2007, http://frap.fire.ca.gov/webdata/maps/san_luis_obispo/fhszs_map.40.pdf.

California Department of Water Resources. "2016 Integrated Regional Water Management Grant Program Guidelines Volume 1 - Grant Program Processes." July 2016.

California Department of Water Resources. *Climate Change Handbook for Regional Water Planning.* 2011.

California Department of Water Resources. "Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water." 2008.

California Invasive Plant Council. CalWeedMapper. Cal-IPC, 2017, https://calweedmapper.cal-ipc.org/maps/.

California Natural Resources Agency. 2009. *Climate Change Vulnerability Matrix.* 2009.

Carollo Engineers. *San Luis Obispo County Master Water Report.* 2012.

CDM. "Climate Change Handbook for Regional Water Planning." November 2011.

Central Coast Salmon Enhancement. "2016 Low Flow Monitoring Report – SLO County." Wildlife Conservation Board, June 2017.

County of San Luis Obispo Department of Agriculture/Weights and Measures. "2016 Annual Report." County of San Luis Obispo, 2016, www.slocounty.ca.gov/getattachment/c4ee944c-b14f-4a1e-acf3-f8560ff59cac/2016-Annual-Crop-Report.aspx.

County of San Luis Obispo Department of Public Works. “Lopez Lake and Terminal Reservoir Watershed Sanitary Survey.” March 2016, http://www.slocounty.ca.gov/getattachment/88331ef1-680e-4b47-966f-4a23666099dd/Lopez-Lake-and-Terminal-2015.aspx.

County of San Luis Obispo Department of Public Works. “Nacimiento Water Project Watershed Sanitary Survey Fiver Year Update – 2015.” 2016, http://www.slocounty.ca.gov/getattachment/ca50fbcc-eb9f-4111-a1e0-7a60de8ce8fd/Nacimiento-Water-Project-2015.aspx.

County of San Luis Obispo Department of Public Works. “Salinas Reservoir Water Quality Monitoring Report for Water Year 2016.” 2016, http://www.slocounty.ca.gov/getattachment/8f18db5a-3eb8-4ef5-8371-d3f3b7cfd3f9/salinas.aspx.

County of San Luis Obispo Department of Public Works. “Whale Rock Reservoir 2015 Watershed Sanitary Survey Update.” 2016, http://www.slocounty.ca.gov/getattachment/7ffb9bc1-5f45-4fc2-9500-2846fa5920ca/Whale-Rock-2015.aspx.

Engineering Development Associates. “Preliminary Engineering Evaluation, Los Osos/Baywood Park Community Drainage Project.” County of San Luis Obispo Engineering Department, December 1997.

Hapke, Cheryl, David Reid, Bruce Richmond, Pere Ruggiero, and Jeff List. “National Assessment of Shoreline Change Part 3: Historical Shoreline Change and Associated Coastal Land Loss Along Sandy Shorelines of the California Coast.” USGS, 2006, https://pubs.usgs.gov/of/2006/1219/of2006-1219.pdf.

Koopman, Marni, Kate Meis, and Judy Corbett. “Integrated Climate Change Adaptation Planning in San Luis Obispo County.” The GOES Institute, Local Government Commission, November 2010, http://www.lgc.org/wordpress/docs/adaptation/slo/SLOClimateWiseFinal.pdf.

KSBY. “Section of Pismo State Beach closed due to storm surge.” 16 October 2016, http://www.ksby.com/story/33401895/section-of-pismo-state-beach-closed-due-to-storm-surge.

Los Angeles District, US Army Corps of Engineers. “Pismo Beach, CA Shoreline CAP 103 Study.” September 2008, https://pismobeach.org/DocumentCenter/View/6716.

National Academy of Sciences. *Adapting to the Impacts of Climate Change.* The National Academies Press, 2010.

NOAA. Sea Level Rise Viewer v 3.0.0. NOAA Office for Coastal Management, 31 January 2017, https://coast.noaa.gov/slr/.

NOAA. Sea Level Trends. NOAA Tides & Currents, 15 October 2013, https://tidesandcurrents.noaa.gov/sltrends/sltrends.html.

North Coast Engineering, Inc. “Templeton Drainage and Flood Control Study and Project 8 Addendum.” San Luis Obispo County Flood Control and Water Conservation District, February 2014.

Raines, Melton & Carella, Inc. “Cambria Drainage and Flood Control Study.” County of San Luis Obispo Public Works Department, February 2004.

Raines, Melton & Carella, Inc. “Cayucos Drainage and Flood Control Study.” County of San Luis Obispo Public Works Department, January 2004.

Raines, Melton & Carella, Inc. “Nipomo Drainage and Flood Control Study.” County of San Luis Obispo Public Works Department, February 2004.

Raines, Melton & Carella, Inc. “Oceano Drainage and Flood Control Study.” County of San Luis Obispo Public Works Department, February 2004.

Raines, Melton & Carella, Inc. “San Miguel Drainage and Flood Control Study.” County of San Luis Obispo Public Works Department, December 2003.

Raines, Melton & Carella, Inc. “Santa Margarita Drainage and Flood Control Study.” County of San Luis Obispo Public Works Department, February 2004.

San Luis Obispo County Flood Control and Water Conservation District. “Arroyo Grande Creek Channel.” County of San Luis Obispo, https://slocountywater.org/site/Flood%20Control%20and%20Water%20Conservation%20District%20Zones/ZONE%201-1A/pdf/FloodEvacBrochureEnglish.pdf.

“San Luis Obispo 2014 Integrated Regional Water Management Plan.” County of San Luis Obispo, July 2014.

Stillwater Sciences. “San Luis Obispo County Regional Instream Flow Assessment.” Coastal San Luis Resource Conservation District, January 2014.

United States Department of Agriculture. “Avocados.” USDA Southwest Regional Climate Hub and California Sub Hub, 2016, https://swclimatehub.info/system/files/Avocados.pdf.

United States Department of Agriculture. “Broccoli, cauliflower, and cabbage.” USDA Southwest Regional Climate Hub and California Sub Hub, 2016, https://swclimatehub.info/system/files/Broccoli.pdf.

United States Department of Agriculture. “Grapes.” USDA Southwest Regional Climate Hub and California Sub Hub, 2016, https://swclimatehub.info/system/files/Grapes.pdf.

United States Department of Agriculture. “Strawberries.” USDA Southwest Regional Climate Hub and California Sub Hub, 2016, https://swclimatehub.info/system/files/Strawberries.pdf.

U.S. Environmental Protection Agency. “Synthesis of Adaptation Options for Coastal Areas.” 2009.

U.S. Fish & Wildlife Service. “Assessing the status of the monarch butterfly.” U.S. FWS, 12 December 2017, https://www.fws.gov/savethemonarch/SSA.html.

U.S. Fish & Wildlife Service. “ECOS Environmental Conservation Online System.” U.S. FWS, September 2017, https://ecos.fws.gov/ecp/report/table/critical-habitat.html.

US Global Change Research Program, Climate Change Science Program. “Best Practice Approaches for Characterizing, Communicating, and Incorporating Scientific Uncertainty in Climate Decision Making: Synthesis and Assessment Product 5.2.” 2009.

US-LT Resource Conservation District. SLO Watershed Project. 2014, http://slowatershedproject.org/.

Wallace Group. “Avila Bluff Erosion Repair.” 6 December 2012, http://www.wallacegroup.us/project/bluff-erosion-repair-project/.

San Luis Obispo County IRWM
Climate Change Vulnerability Prioritization – DRAFT 2/7/2018

RWMG members and stakeholders provided input from the January 4-19, 2018 online survey (22 responded) and January 31, 2018 public workshop (34 participated) about the regional water resources that are vulnerable to the effects of climate change. For the survey, the vulnerabilities were evaluated using exposure, sensitivity, and likelihood of impact to climate change effects, resulting in a prioritization score. During the workshop, participants discussed the assigned priority and provided input on a worksheet. The following table includes the results of those two efforts to prioritize the identified regional climate change vulnerabilities:

Category	Identified Vulnerability	Priority
Water Demand 1	Water-dependent industries	High
Water Demand 2	Seasonal water demand	Medium
Water Demand 3	Climate-sensitive crops	Medium
Water Demand 4	Drought-sensitive groundwater basins	Very High*
Water Demand 5	Communities with water curtailment efforts	Medium*
Water Demand 6	Insufficient instream flows	Very High*
Water Supply 1	Water supply from snowmelt	Low*
Water Supply 2	Water supply from coastal aquifers	Very High*
Water Supply 3	Inability to store carryover supply surpluses	High*
Water Supply 4	Drought-sensitive water systems	Very High*
Water Supply 5	Invasive species management issues	Medium*
Water Quality 1	Water bodies in areas at risk of wildfire	High
Water Quality 2	Water bodies impacted by eutrophication	High
Water Quality 3	Declining seasonal low flows	Very High*
Water Quality 4	Water bodies with restricted beneficial uses	Medium
Water Quality 5	Water quality impacted by rain events	High*
Sea Level Rise 1	Coastal erosion	Medium
Sea Level Rise 2	Coastal structures	Low
Sea Level Rise 3	Coastal infrastructure in low-lying areas	Medium*
Sea Level Rise 4	Low-lying coastal habitats	Medium*
Sea Level Rise 5	Flooding due to high tides and storm surges	Medium*
Sea Level Rise 6	Coastal land subsidence	Low
Sea Level Rise 7	Rising sea levels	Medium*
Flooding 1	Aging flood protection infrastructure	High
Flooding 2	Insufficient flood control facilities	High
Flooding 3	Increased flood risk due to wildfires	Very High*
Ecosystem and Habitat 1	Aquatic habitats at risk of erosion and sedimentation	Medium
Ecosystem and Habitat 2	Estuarine habitats dependent on freshwater flow patterns	High
Ecosystem and Habitat 3	Climate-sensitive fauna and flora	Medium
Ecosystem and Habitat 4	Changes in species distributions	High
Ecosystem and Habitat 5	Aquatic habitats used for economic activities & recreation	Low
Ecosystem and Habitat 6	Environmental flow requirements	High
Ecosystem and Habitat 7	Exposed coastal ecosystems	Low
Ecosystem and Habitat 8	Fragmented aquatic habitats	Medium
Hydropower 1	Future hydropower plans	Low

* indicates that the priority was changed from the worksheet used during the workshop.

San Luis Obispo County Region
Integrated Regional Water Management (IRWM)
slocountywater.org/irwm

2018 IRWM PLAN ADOPTION SCHEDULE

The following meetings, workshops, and actions are scheduled to achieve adoption of the 2018 Integrated Regional Water Management (IRWM) Plan for San Luis Obispo (SLO) County.

For notices via e-mail, please sign up for the IRWM Stakeholder Mailing List online at http://www.slocountywater.org/irwm

Date	Activity	Location	Key Actions
2018			
No RWMG meeting on January 3, 2018			
January 31 ***9am – 12pm***	Climate Change Public Workshop	SLO City/County Library Community Room	Updates based on IRWM Climate Change standard
February 7 10am – 12pm	RWMG Meeting	SLO City/County Library Community Room	Progress update to RWMG/Stakeholders
March 7 10am – 12pm	RWMG Meeting	SLO City/County Library Community Room	Progress update to RWMG/Stakeholders
April 4 10am – 12pm	RWMG Meeting	SLO City/County Library Community Room	Public Draft Presentation
Mid-April	Sub-Regional Workshops	Several workshops throughout the County	Public Draft Presentation
May	**IRWM Plan Public Draft Comments due**		
June 6	RWMG Meeting	SLO City/County Library Community Room	IRWM Plan Adoption Recommendation
July 17	County of SLO Board of Supervisors Meeting	County Government Center Board Chambers	Public Hearing for IRWM Plan Adoption
July thru August	**IRWM Plan Adoption by RWMG Members due**		
Early Fall	Proof of Adoption submitted to Department of Water Resources for Plan Review		

RWMG = Regional Water Management Group
WRAC = Water Resources Advisory Committee
SLO City/County Library Community Room is located at 995 Palm Street in San Luis Obispo
County of SLO Board of Supervisors Chambers is located at 1055 Monterey Street in San Luis Obispo CA