

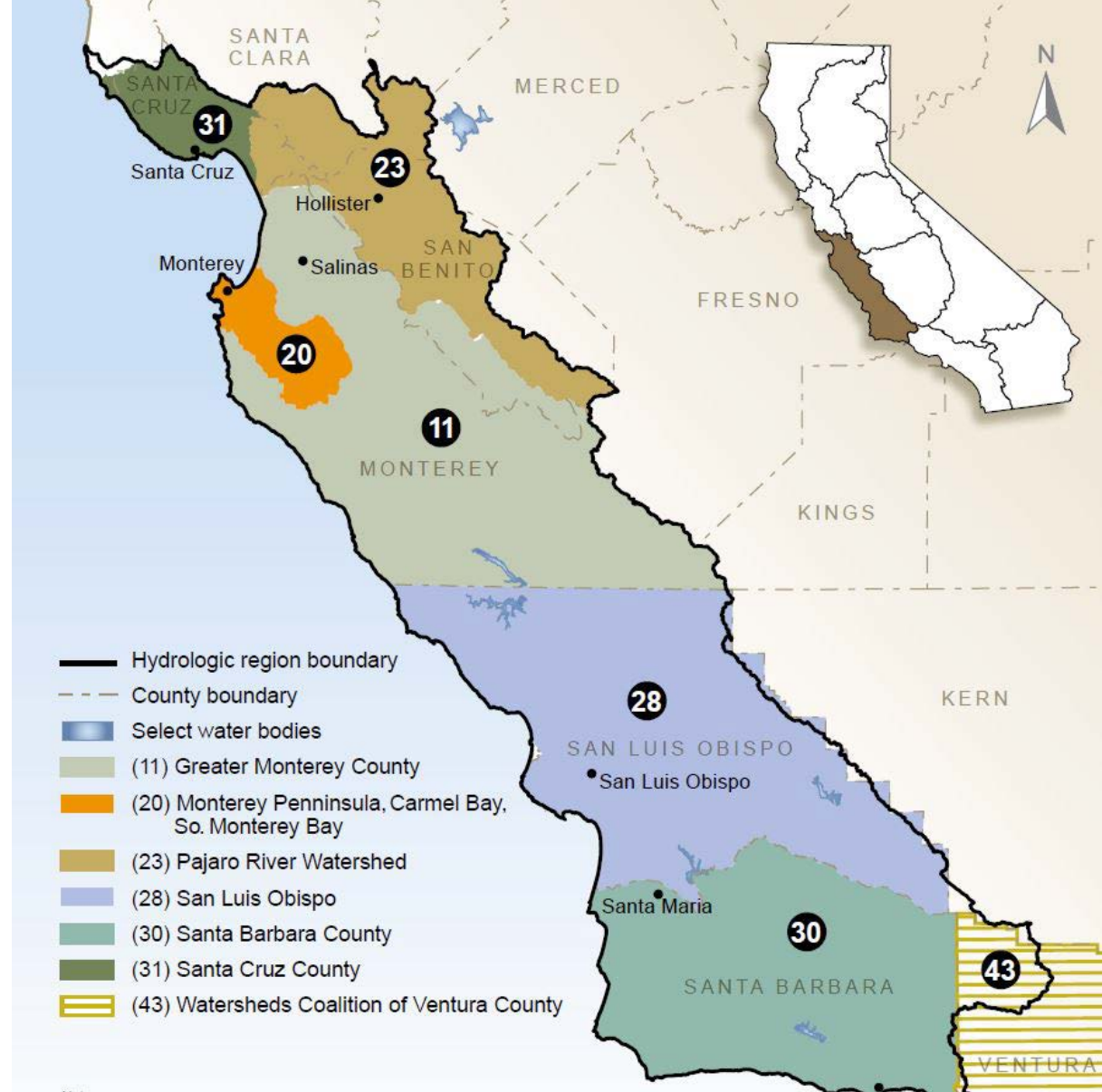
Integrated Water Resource Management in the Face of Climate Change

REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION
DECEMBER 6, 2018

Presented by
Mladen Bandov, Water Resources Engineer
Department of Public Works, County of San Luis Obispo

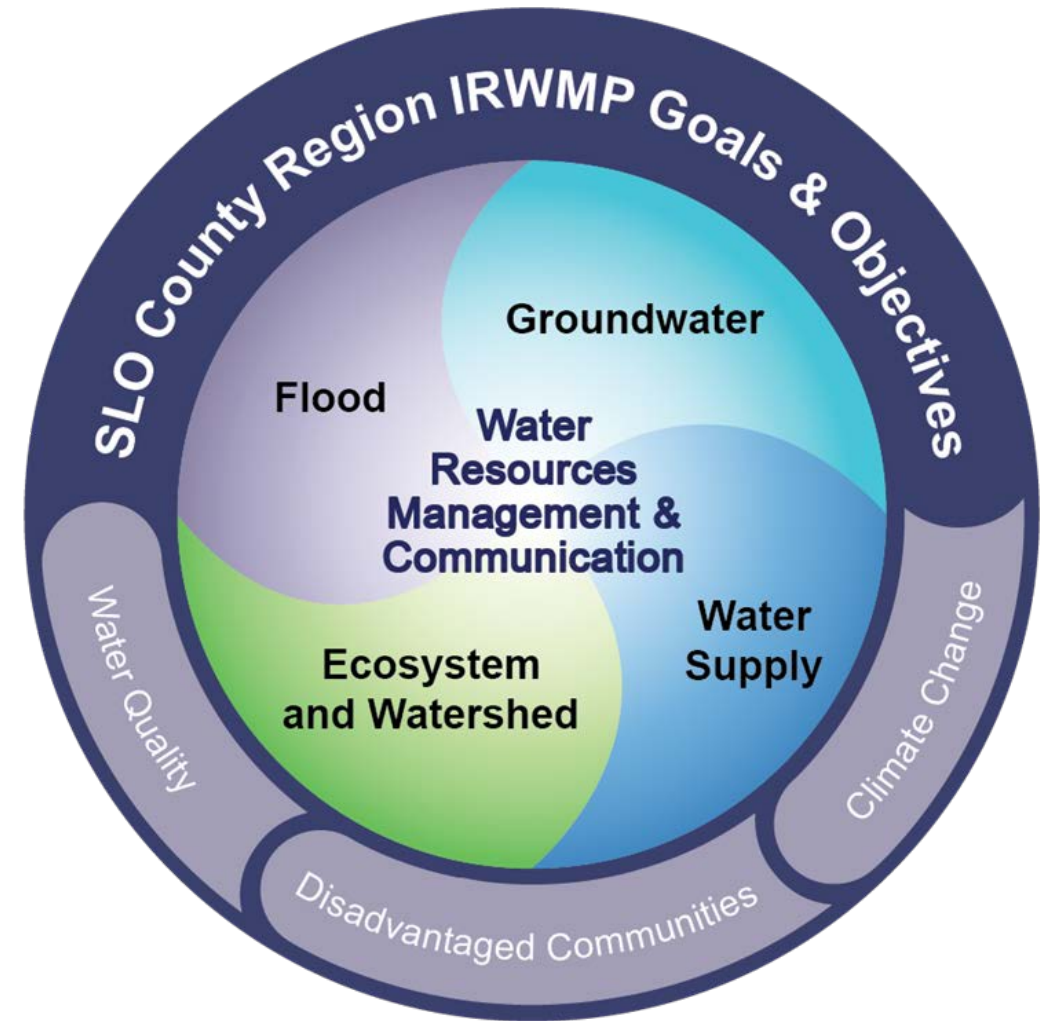


- *Integrated Regional Water Management (IRWM) Planning Act of 2002*
- *San Luis Obispo County IRWM Plan* was adopted in 2005 and updated in 2007 and 2014
- Next plan update will be completed early 2019 to meet California Department of Water Resources (DWR) requirements



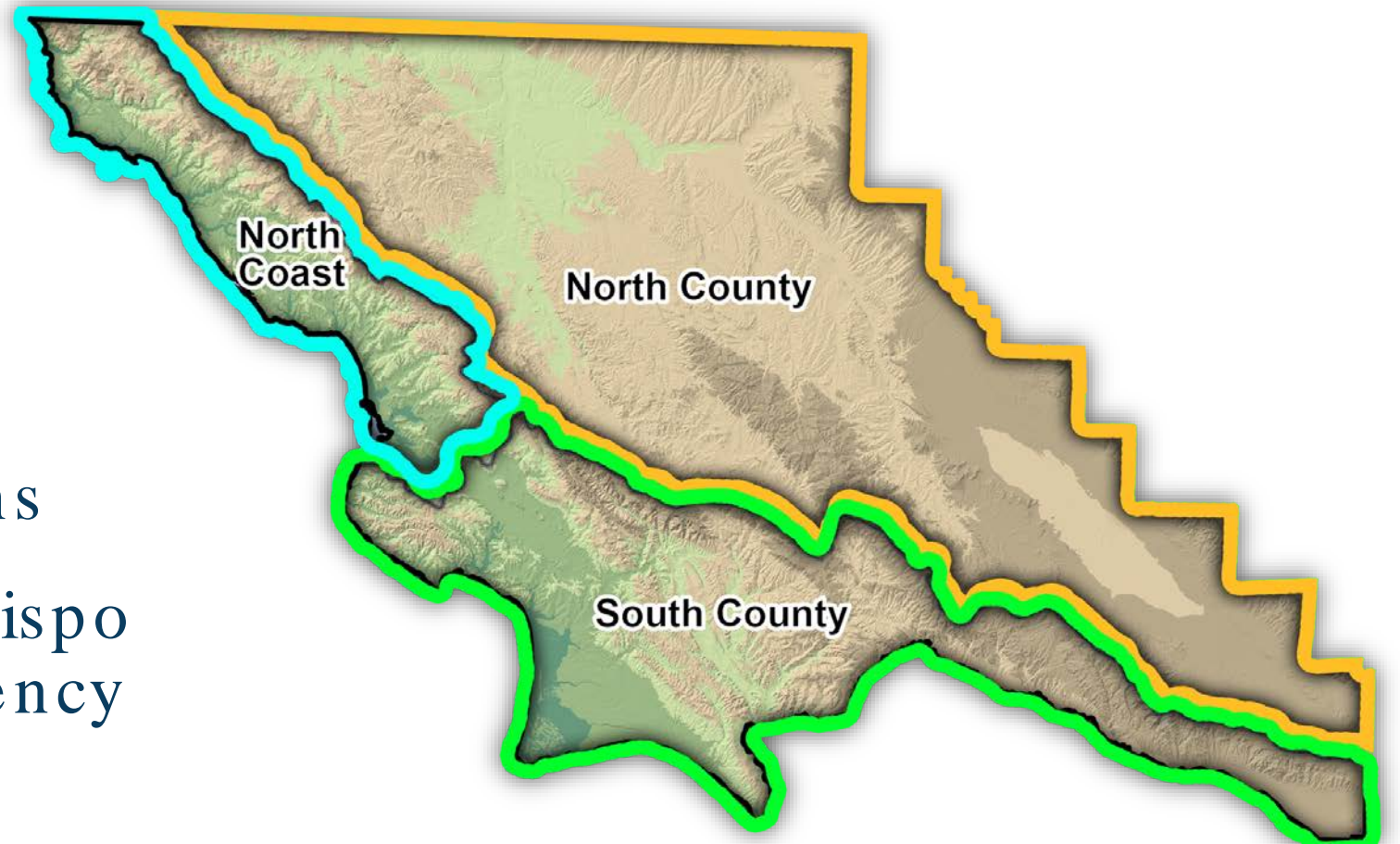
Intent of the IRWM Plan

To create a united framework among San Luis Obispo County stakeholders for sustainable water resource management



Regional Water Management Group (RWMG)

- 29 local agencies and nonprofit organizations
- County of San Luis Obispo is the RWMG Lead Agency



2016
Integrated
Regional Water
Management
Grant Program
Guidelines

Volume 1 – Grant Program Processes
July 2016



CALIFORNIA NATURAL RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES
DIVISION OF
INTEGRATED REGIONAL WATER MANAGEMENT



IRWM 2016 Plan Standards

- The IRWM Plan must address both **adaptation** to the effects of climate change and **mitigation** of GHG emissions [WATER CODE §10541(E)(10)]

Key updates:

- Vulnerability assessment according to DWR's *Climate Change Handbook for Regional Water Planning*
- List of prioritized vulnerabilities



Section 4

Assessing Regional Vulnerability to Climate Change

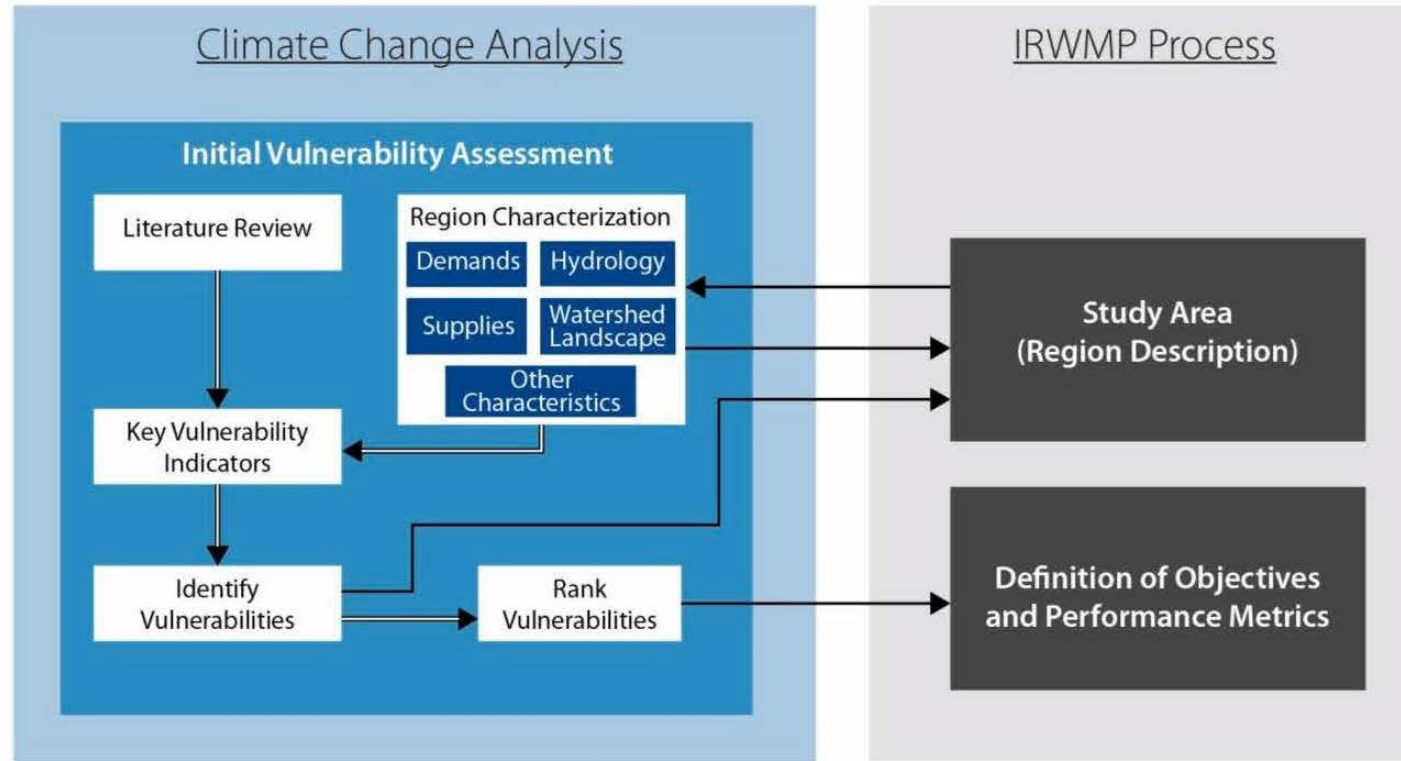


Figure 4-1. Process for Assessing Vulnerability to Climate Change as part of an IRWMP.

Vulnerability Assessment

1. Literature Review
2. Key Indicators
3. Identify Vulnerabilities
4. Prioritize Vulnerabilities

Water Demand

- Climate-sensitive crops
- In-stream flow requirements

Water Supply

- Coastal aquifers
- Groundwater recharge
- Drought

Water Quality

- Algal blooms
- Salinity
- Lower dissolved oxygen

Sea Level Rise

- Coastal infrastructure
- Coastal habitats

Flooding

- Flood protection infrastructure
- Wildfire sedimentation

Ecosystem & Habitat Health

- Climate-sensitive habitats
- Environmental water demand

Hydropower

- Hydropower facilities
- Energy needs

Vulnerability Survey

January 4–19, 2018





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

Vulnerability Survey Results & Draft Assessment January 24, 2018



Stakeholder Climate Change Workshop

January 31, 2018

Identification Worksheet

- There has been a significant increase in the overall size of acres covered by invasive species in local watersheds.
- Chorro Reservoir is at risk of arundo management issues.
- Invasive mussels in reservoirs are a concern.
- Cape Ivy in the Morro Bay watershed has been an invasive species of special concern.

Please provide any additional suggestions to revise, add to, or update the draft response:

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).

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

Prioritization Worksheet

Each vulnerability was evaluated using the following scale and averaged for all survey responses.

	1	2	3	4	5
Exposure	Not Exposed	Somewhat Exposed	Exposed	Very Exposed	Completely Exposed
Sensitivity	Not Sensitive	Somewhat Sensitive	Sensitive	Very Sensitive	Extremely Sensitive
Likelihood	Unlikely	Somewhat Likely	Likely	Very Likely	Extremely Likely

Each vulnerability was scored using the following equation:

$$\text{Exposure} \times \text{Sensitivity} \times \text{Likelihood} = \text{Score}$$

Scores were assigned a high, medium, or low priority based on this table (to the right)

Priority	Score
High	> 27.0
Medium	20.8 - 27.0
Low	< 20.8

RWMG Members: Please write yes or no if you agree or disagree with the recommended priority. If you disagree, please suggest otherwise (High, Medium, or Low).

ID	Vulnerability	Exposure	Sensitivity	Likelihood	Score	Priority	Agree? Y/N If no, High/Med/Low
WD 1	Water-dependent industries	3.11 ⁴	2.81 ³	3.24 ³	28.31 ³⁶	High	Y
WD 2	Seasonal water demand	3.17 ³	2.50 ³	3.00 ³	23.78 ²⁷	Medium	Y
WD 3	Climate-sensitive crops	3.18	2.82	2.73	24.48	Medium	—
WD 4	Drought-sensitive groundwater basins	3.81 ⁴	3.47 ³	3.67 ³	48.52 ³⁶	High	Y
WD 5	Communities with water curtailment efforts	2.85	2.54	2.75	19.91 ^{19.91}	Low	N - M
WD 6	Insufficient instream flows	3.77	3.54	3.62	48.31	High	Y
WS 1	Water supply from snowmelt	3.00 ²	2.83 ²	2.83 ¹	24.03 ⁴	Medium	NO - LOW

SOME AREAS HAVE THIS PRIORITY ON THE COMMUNITY. THIS REGIONAL THIS IS B MEDIUM.



RWMSG Meeting on Climate Change Section Updates

February 7, 2018

Vulnerability Prioritization

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

RWMG Meeting on Climate Change Section Updates

February 7, 2018

1. Changes in runoff and recharge
2. Sea level rise effects on water supply conditions
3. Reduce energy consumption
4. Strategies of *CARB Scoping Plan*
5. Carbon sequestration & renewable energy

IRWM Plan Objectives

Climate Change Adaptations and Mitigation Requirements ¹		Adapting to changes in runoff and recharge	Consider the effects of sea level rise on water supply conditions	Reduce energy consumption	Strategies of CARB Scoping Plan ³	Options for carbon sequestration and renewable energy
Water Supply	Maximize accessibility of water			•		•
	Adequate water supply		•	•		•
	Sustainable potable water for rural	•	•		•	
	Sustainable water for agriculture	•	•		•	
	Water system WQ improvements	•	•			
	Implement water management Plans	•	•	•	•	•
	Conservation/water use efficiency	•	•	•	•	•
	Plan for vulnerabilities of water supply	•	•	•	•	•
	Diverse supply (recycled, desalination)	•	•	•	•	
Support Watershed Enhancement	•	•				
Ecosystem and Watersheds	Understand watershed needs	•	•			•
	Conserve balance of ecosystem	•	•			•
	Reduce contaminants	•	•			
	Public involvement and stewardship					
	Protect endangered species		•			•



RWMG Meeting on Climate Change Section Updates

February 7, 2018

Resource Management Strategies (RMS) for GHG Mitigation:

1. Energy Efficiency
2. Emissions Reduction
3. Carbon Sequestration

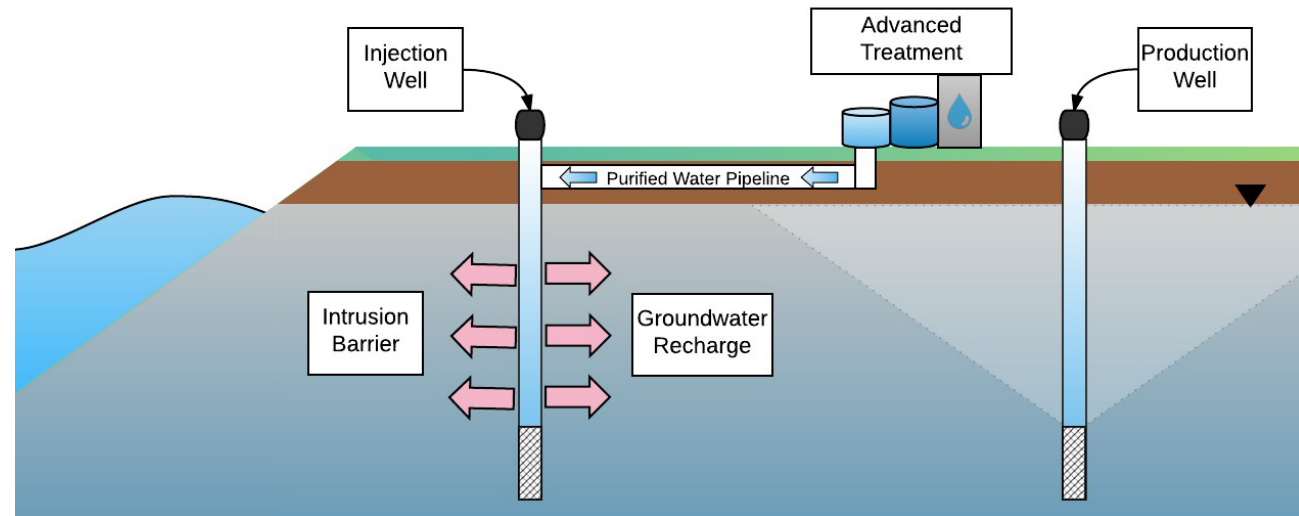
2014 IRWM Resource Management Strategies	GHG Mitigation		
	Energy Efficiency	Emissions Reduction	Carbon Sequestration
Ecosystem restoration			•
Drinking water treatment and distribution	•	•	•
Improve flood management			•
Conjunctive management and groundwater storage			
Pollution prevention		•	•
Agricultural water use efficiency	•	•	
Urban water use efficiency	•	•	
Matching water quality to use	•		•
Salt and salinity management		•	
Recycle municipal water	•	•	
Desalination			
Water transfers	•	•	
Land use planning and management	•	•	•
Surface storage – CALFED/State		•	
Surface storage – Regional/Local		•	
Watershed management	•	•	•
Drinking water treatment and distribution	•	•	•
Water transfers			
Conveyance – Regional/Local	•	•	
System reoperation	•	•	

IRWM Plan – Project Implementation List Update

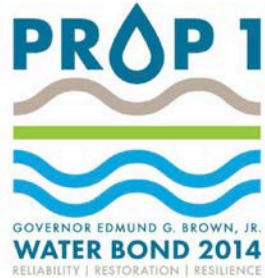
August – October 2018

WORKSHEET INSTRUCTIONS: Enter 'x' in the empty cell if the project addresses a vulnerability. Otherwise, leave blank.		Central Coast Blue
Climate Change Vulnerabilities With Prioritization	Possible Points	
Drought-sensitive groundwater basins (VH)	4	x
Insufficient instream flows (VH)	4	x
Water-dependent industries (H)	3	
Climate-sensitive crops (M)	2	
Communities with water curtailment efforts (M)	2	x
Seasonal water demand (M)	2	x
Drought-sensitive water systems (VH)	4	x
Water supply from coastal aquifers (VH)	4	x
Inability to store carryover supply surpluses (H)	3	x
Invasive species management issues (M)	2	
Water supply from snowmelt (L)	1	

Example of scored project: *Central Coast Blue*



**PROPOSITION 1
STORM WATER GRANT PROGRAM
GUIDELINES**



*FINAL
December 15, 2015*



Stormwater Resource Plan

- SWRP required to fund **stormwater & dry weather runoff capture** projects from state grants [WATER CODE §10563]

Key updates:

- Final draft SWRP to be submitted to SWRCB in December 2018
- Quantitative analysis of multiple benefit projects

Multiple Benefit Analysis for Stormwater Projects

1. Water Quality

2. Water Supply

3. Flood Management

4. Environment

BENEFIT CATEGORY and associated metrics	METRIC VALUES (sum for total)
WATER QUALITY	
Sensitive downstream receiving water (WMZs 1, 2, 3, 5, 6, 8, or 9) (Y/N)	2/0
Specific TMDL or 303(d)-listed pollutants in downstream receiving water (including groundwater used for water supply) (Y/N)	2/0
TELR TSS loading in catchment (scaled, minimum to maximum loading County-wide)	0→2
SUM	(0→6)
WATER SUPPLY	
Overlies infiltration-favorable WMZ (WMZs 1, 2, 4, 5, 8) (Y/N)	2/0
In current supply-limited area (scaled, ground subsidence from 0 to maximum value, County-wide) (identified "critical groundwater areas" = maximum value)	0→3
In projected future supply-limited area (scaled, groundwater dependence index from 0 to maximum value, County-wide) ("critical groundwater areas" = maximum)	0→1
SUM	(0→6)
FLOOD MANAGEMENT	
Existing downstream flooding and/or sedimentation risks to public property and/or human health and safety (Y/N)	4/0
TELR runoff volume in catchment (scaled, minimum to max runoff, County-wide)	0→2
SUM	(0→6)
ENVIRONMENT	
Number of at-risk aquatic animal species (from EnviroAtlas) (scaled, 0 to maximum value, County-wide) (https://www.epa.gov/enviroatlas)	0→2
Length of identified critical steelhead habitat within catchment (scaled, 0 to maximum value, County-wide)	0→3
TELR runoff volume in catchment (scaled, minimum to max runoff, County-wide)	0→1
SUM	(0→6)



Adaptive process for IRWM and stormwater resource planning efforts

- Area of vulnerability
- Impacts in physical setting
- Regional priorities and objectives
- Resource management strategies
- Projects to help adapt and reduce impacts

