San Luis & Delta-Mendota Water Authority

2019
Westside-San Joaquin Integrated Regional Water Management Plan

January 2019



Prepared by:

WOODARD &CURRAN

Table of Contents

List of Figures

List of Tables

List of Appendices

Abbreviations

AB	Assembly Bill
ACS	American Community Survey
AF	Acre-feet
ASCE	American Society of Civil Engineers
AWMP	Agricultural Water Management Plan
B:C	Benefit:cost ratio
BDCP	Bay-Delta Conservation Plan
BMPs	Best Management Practices
CalEPA	California Environmental Protection Agency
CALFED	CALFED Bay-Delta Program
CARB	California Air Resources Board
CASGEM	California Statewide Groundwater Elevation Monitoring Program
CDFW	California Department of Fish & Wildlife
CDP	Census-designated Place
CEQA	California Environmental Quality Act
cfs	Cubic Feet per Second
CNRA	California Natural Resources Agency
COA	Coordinated Operations Agreement
CREAT	Climate Resilience Evaluation and Awareness Tool
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long-term Sustainability initiative
CWC	California Water Code
CWP	California Water Plan
DAC	Disadvantaged Community
DACI Program	Disadvantaged Community Involvement Program
Delta	Sacramento-San Joaquin Delta
Divisions	Discrete sub-areas within the Water Authority
DMC	Delta-Mendota Canal
DMS	Data Management System
DOI	Department of the Interior
CDPH	California Department of Public Health
DWR	California Department of Water Resources
EDA	Economically Distressed Area
EJ	Environmental Justice
ESA	Endangered Species Act

GCM	General Circulation Model
GHG	Greenhouse gas
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
ID	Irrigation District
ILRP	Irrigated Lands Regulatory Program
Intertie	Delta-Mendota Canal/California Aqueduct Intertie
IRWM	Integrated Regional Water Management
IRWMP	Integrated Regional Water Management Plan
LID	Low-Impact Development
MCL	Maximum Contaminant Level
MHI	Median Household Income
M&I	Municipal and Industrial
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NRHP	National Register of Historic Places
NVRRWP	North Valley Regional Recycled Water Program
O&M	Operation and Maintenance
Prop	Proposition
PV	Present Value
QA/QC	quality assurance/quality control
RFMP	Regional Flood Management Plan
RMS	Resource Management Strategy
ROD	Record of Decision
RWMG	Regional Water Management Group
RWMP	Recycled Water Master Plan
SB	Senate Bill
SDAC	Severely disadvantaged community
SGMA	Sustainable Groundwater Management Act
SJRFA	San Joaquin River Funding Area
SJRIP	San Joaquin River Improvement Project
SLDMWA	San Luis & Delta-Mendota Water Authority
SNMP	Salt and Nutrient Management Plan
SWP	State Water Project
SWRCB	State Water Resources Control Board
SWRP	Stormwater Resources Plan
TAF	thousand acre-feet

TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TRD	Trinity River Division
UWMP	Urban Water Management Plan
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish & Wildlife Service
WD	Water District
WQCP	Water Quality Control Plan
WSA	Water Supply Assessments
WSJ IRWMP	Westside-San Joaquin Integrated Regional Water Management Plan
WSJ Region	Westside-San Joaquin Region

Chapter 1 Governance

1.1 Regional Water Management Group

The Regional Water Management Group (RWMG) for the Westside-San Joaquin (WSJ) Integrated Regional Water Management (IRWM) Region is the San Luis & Delta-Mendota Water Authority (SLDMWA), which is governed by its Board of Directors. SLDMWA was established as a Joint Powers Authority in January 1992 and consists of 28 member agencies. Twenty-six of these agencies contract with the United States Bureau of Reclamation (USBR) for the delivery of water from the Central Valley Project (CVP). SLDMWA's member agencies hold total contractual entitlements from the CVP for approximately 3.3 million acre-feet of water per year. Of this amount, approximately 2.8 million acre-feet (AF) per year are contracted for delivery to approximately 1.2 million acres of agricultural lands within areas of San Joaquin, Stanislaus, Merced, Fresno, Kings, San Benito, and Santa Clara counties. Approximately 150,000 to 200,000 AF per year are contracted for municipal and industrial (M&I) use by almost 2 million people within the service areas, including the City of Tracy and urban areas within Santa Clara County, such as Silicon Valley. The remaining amount, approximately 270,000 AF per year, is delivered to more than 90,000 acres of managed wetlands and wildlife refuges for habitat enhancement and restoration activities within the largest continuous wetland in the Western United States.

Table 1-1 lists SLDMWA's member agencies, and Figure 1-1 shows those member agencies' locations within the WSJ Region.

Table 1-1: SLDMWA Member Agencies

Banta-Carbona Irrigation District	**Henry Miller Reclamation District #2131**	Reclamation District 1606
Broadview Water District	**James Irrigation District**	**San Benito County Water District**
Byron Bethany Irrigation District	Laguna Water District	**San Luis Water District**
Central California Irrigation District	Mercy Springs Water District	**Santa Clara Valley Water District**
City of Tracy	Oro Loma Water District	**Tranquillity Irrigation District**
Del Puerto Water District	**Pacheco Water District**	Turner Island Water District
Eagle Field Water District	**Panoche Water District**	West Side Irrigation District
Firebaugh Canal Water District	**Patterson Irrigation District**	**West Stanislaus Irrigation District**
Fresno Slough Water District	Pleasant Valley Water District	**Westlands Water District**
Grassland Water District		

*Bold text indicates a representative currently serves on the Board of Directors as a Director or Alternate.

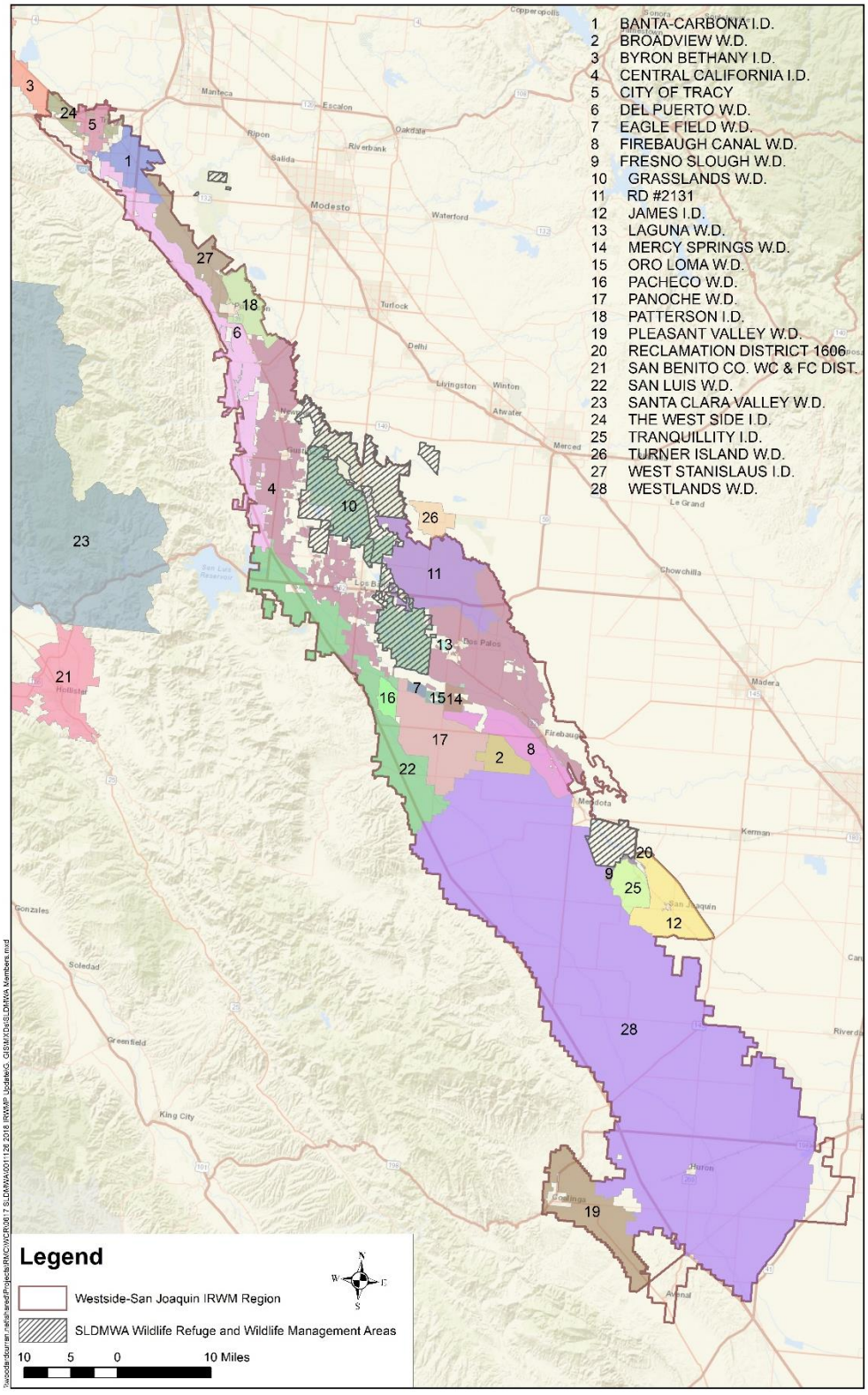


Figure 1-1: SLDMWA Member Agencies in the Westside-San Joaquin Region

As shown in Table 1-1, SLDMWA meets California Water Code (CWC) Section 10539 requirements for the RWMG, as it consists of more than three local agencies, all of which have statutory authority over water supply and management. While the RWMG includes only water districts (WDs) and irrigation districts (IDs), other land use and local planning entities have participated in the IRWM planning process.

One of the primary purposes of establishing SLDMWA was to assume the operation and maintenance (O&M) responsibilities of certain USBR CVP facilities, with the goal of increasing reliability of the facilities while containing costs. In addition, SLDMWA serves the information and representation needs of its members by developing information and protecting their common interests on a variety of issues such as: Sacramento-San Joaquin Delta (Delta) exports, water supply, water quality, water development, conservation, distribution, drainage, contractual rights, surface and groundwater management, and any other common interest of the member agencies. This information is made available to members, the general public, and legislative, regulatory and judicial bodies. The member agencies have legal authority to complete a range of tasks (which may vary by agency), including the following:

- Acquire works and to produce, store and distribute water for irrigation, domestic, M&I purposes, and provide drainage or reclamation works incidental thereto.
- Furnish water for any present or future beneficial use; acquire, appropriate, control, conserve, store and supply water, including drainage and flood waters; drain and reclaim lands, use water under district control for recreational purposes.
- Furnish sufficient water for, and put water to, any beneficial use and to control, distribute, store, spread, treat, recapture any water for beneficial use.
- Reclaim and protect land from overflow and to irrigate lands within or outside the Reclamation Districts.
- Acquire water and water rights; import water and conserve water; control flood and storm waters; protect watercourses and watersheds of streams; conserve flood and storm waters for beneficial uses; prevent waste or diminution of water supply; obtain, retain and reclaim storm, flood or other waters.
- Enter into contracts, undertake acts necessary to their purposes, and exercise a variety of related powers.

The governing body of SLDMWA consists of a 19-member Board of Directors, divided into five Divisions, with directors and alternates selected within each Division. The Board is listed on the SLDMWA website and updated as needed. Divisions were established by location and type of water contract. Each Director, and respective Alternate Director, is a member of the governing body or an appointed staff member of his or her agency. The Board is supported by standing committees that synthesize various technical and policy issues, such as financial and water related matters, and make recommendations for the full Board's consideration. Other standing committees direct the affairs of sub-groups of members, such as the Grassland Basin Drainage Steering Committee or Sustainable Groundwater Management Act (SGMA) Management Committee(s), subject to review and approval by the full Board. In addition, working groups and steering/technical committees are formed as necessary to focus on matters of particular expertise such as water quality and groundwater management.

SLDMWA assumed responsibility for the O&M of certain South-of-Delta federal facilities in phases. In October 1992, SLDMWA entered into the first of a multi-phased Cooperative Agreement with USBR, with the first phase for the O&M of the Delta-Mendota Canal (DMC). The purpose of this Agreement was to provide the personnel, materials, supplies and equipment necessary to properly operate, maintain and repair certain portions of the Delta Division, San Luis Unit, and West San Joaquin Divisions of the CVP.

In October 1993, the second phase was initiated. This included the addition of the Tracy Pumping Plant, O'Neill Pumping and Generating Plant, Tracy O&M Facilities, and the San Luis Drain to the list of facilities SLDMWA was to operate and maintain. The maintenance functions at the Tracy Fish Facility were included in this phase as well.

October 1994 saw the third phase begin. This included the added maintenance responsibilities for the Delta Cross Channel and the two fish release sites on the Delta. In October 1996 the O&M of the Mendota Pool and Kesterson Reservoir were also included.

In March 1998, SLDMWA entered into a Transfer Agreement with USBR wherein all O&M costs related to the above referenced facilities are funded directly by the water users themselves. SLDMWA continues to perform O&M of the Tracy Fish Facility, Delta Cross Channel and fish release sites under a separate Service Contract with funding provided by USBR.

The DMC/California Aqueduct Intertie (Intertie) was added to the system in 2012. The Intertie connects the CVP and State Water Project (SWP), providing operational flexibility for both systems. The Intertie restored DMC conveyance capacity back to 4,600 cubic feet per second (cfs) and improves CVP deliveries to south-of-Delta contractors (USBR, 2017).

The SLDMWA Board also directs the Grassland Basin Drainage Management Activity Agreement, Northern Delta-Mendota Region SGMA Activity Agreement, and Central Delta-Mendota Region SGMA Activity Agreement.

SLDMWA will continue to provide the leadership necessary to pursue additional reliable water supply for its member agencies and deliver the water with a reliable system in a cost-efficient manner. SLDMWA's role in IRWM planning for the WSJ Region is described in more detail in Section 1.3.

1.2 History of IRWM Planning

The initial Westside Integrated Water Resources Plan, the Region's first Integrated Regional Water Management Plan (IRWMP), was an effort undertaken by USBR, SLDMWA, and other local stakeholders beginning in 2001 to develop a plan to provide guidance for future water management and planning decisions. SLDMWA and its members were responding to diminishing supplies from the CVP due to implementation of the Endangered Species Act (ESA), Clean Water Act, and Central Valley Project Improvement Act (CVPIA). The original IRWMP served as the basis for subsequent versions, which has evolved through a series of stakeholder driven revisions. This update to the Plan is known as the 2019 Westside-San Joaquin Integrated Regional Water Management Plan (WSJ IRWMP).

The Region's past planning activities have included performing project solicitation, revising portions of the Plan, and applying for Proposition (Prop) 50 and Prop 84 IRWM grant funding. The Plan was updated in 2014 to meet the 2012 IRWM Planning Guidelines. This 2019 WSJ IRWMP Update has been prepared in order to bring the Plan into compliance with the 2016 IRWM Planning Guidelines (DWR, 2016) and address current conditions in the Region. Prior to updating the Plan, SLDMWA published a Notice of Intent (NOI) to update the Plan in accordance with Section 6066 of the Government Code. The NOI was published in the *Merced Sun-Star* on May 30, 2018 and June 6, 2018; a copy of this notice is included in Appendix A. SLDMWA will continue to work with its member agencies and project proponents to update and implement the Plan in the future. Strategies for Financing, Data Management, and Plan Performance and Monitoring, each described in their respective chapters, will enable the Region to implement the Plan in a sustainable, effective manner over the near- and long-term timeframe.

1.3 Governance

Regional Water Management Group

The SLDMWA Board of Directors acts as the governing authority for the RWMG for the Region. The SLDMWA member agencies agreed that SLDMWA should perform administrative tasks such as submitting grant applications, completing and submitting progress reports and invoices, tracking funds, and facilitating the preparation and updates of the IRWMP. Memoranda of Agreement are also executed with non-member agencies for IRWM planning coordination. Working under the direction of the Board are various committees, including the Finance and Administration Committee, the Grassland Basin Drainage Steering Committee, the O&M Technical Committee, the Water Resources Committee, and the Westside Regional Drainage Steering Committee. These committees may play a role in IRWM planning as the RWMG calls on them to do so. For example, the Water Resources Committee reviewed and prioritized the Region's objectives. The Water Resources Committee made the recommendation on the prioritization of the objectives, but also considered comments provided by the Working Group. Final decision-making authority on IRWM matters lies with the RWMG. Current Board of Directors members, who make up the RWMG, are listed in Table 1-2.

Table 1-2: SLDMWA Board of Directors/RWMG Members

Board of Directors Officers	Division 3 Representatives
Cannon Michael, Chairman	Michael Stearns, Director, Firebaugh CWD Jeff Bryant, Alternate, Firebaugh CWD
Don Peracchi, Vice Chairman	James O'Banion, Director, Central California ID Chris White, Alternate, Central California ID
Joyce Machado, Treasurer/Auditor	Cannon Michael, Director, Henry Miller R.D. 2131 Randy Houk, Alternate, Columbia CC
Frances Mizuno, Secretary	Ric Ortega, Director, Grassland WD Ellen Wehr, Alternate, Grassland WD
Division 1 Representatives	**Division 4 Representatives**
James McLeod, Director, Banta-Carbona ID David Weisenberger, Alternate, Banta-Carbona ID	John Varela, Director, Santa Clara Valley WD Garth Hall, Alternate, Santa Clara Valley WD
Bobby Pierce, Director, West Stanislaus ID Vacant, Alternate, Westside ID	Gary Kremen, Director, Santa Clara Valley WD Richard Santos, Alternate, Santa Clara Valley WD
Anthea Hansen, Director, Del Puerto WD Earl Perez, Alternate, Del Puerto WD	John Tobias, Director, San Benito County WD Jeff Cattaneo, Alternate, San Benito County WD
Rick Gilmore, Director, Byron Bethany ID/CVPSA Vince Lucchesi, Alternate, Patterson ID	Joseph Tonascia, Director, San Benito County WD Sara Singleton, Alternate, San Benito County WD
Division 2 Representatives	**Division 5 Representatives**
Don Peracchi, Director, Westlands WD Dan Pope, Alternate, Westlands WD	Bill Pucheu, Director, Tranquillity ID Lance LeVake, Alternate, Pacheco WD
Vacant, Director, Westlands WD William Bourdeau, Alternate, Westlands WD	Tom Birmingham, Director, Broadview WD Jose Gutierrez, Alternate, Broadview WD
John Bennett, Director, Panoche WD Michael Linneman, Alternate, Panoche WD	Steve Stadler, Director, James ID Thomas W. Chaney, Alternate, James ID
William Diedrich, Director, San Luis WD Lon Martin, Alternate, San Luis WD	

Working Group

In addition to the committees mentioned above, ad-hoc working groups are formed as necessary to focus on matters of particular expertise or interest, including the update of the WSJ IRWMP. A Working Group was convened in order to facilitate the 2019 update of the WSJ IRWMP. All stakeholders identified during the previous Plan update were invited to participate in the Working Group. The Working Group is made up of all stakeholders that have expressed interest in participating. The Working Group provides feedback and direction on day-to-day aspects of the Plan update, such as chapter updates, project solicitation, and project prioritization. The Working Group provides recommendations to the RWMG as necessary. The Working Group also provides local knowledge for such tasks as updating stakeholder contact lists and identifying contacts to represent disadvantaged communities (DACs). Working Group members are listed in Table 1-3.

Table 1-3: Working Group Members

Name	Affiliation
Glen Allen	Fresno County
Ara Azhderian	Panoche Water District
Gabriel Delgado	Panoche Water District/Linneman Law
Maria Encinas	City of Patterson
Ben Fenters	San Luis Water District
Andrew Garcia	SLDMWA
Anthea Hansen	Del Puerto Water District
Maria Herrera, Sal Alhomedi	Self-Help Enterprises
Lacey Kiriakou	Merced County
Vince Lucchesi	Patterson Irrigation District
David Vang, Antonio Solorio	Westlands Water District
Steve Stadler	James Irrigation District

Decision-making

The various committees and working groups provide opportunities to foster integration across jurisdictional boundaries and include multiple agencies and stakeholders in the identification of regional needs, articulation of region-wide objectives, and the selection and prioritization of projects that are consistent with the objectives. Regional stakeholders interact on at least a monthly basis through the regular Board and committee meetings, as well as working group meetings, which occur more frequently during Plan updates or funding solicitation periods. The committees and working groups, with input from stakeholders, evaluate and synthesize information and develop recommendations to the RWMG which serves as the final decision-making body for the Region. This structure allows for effective decision making and communication by having the RWMG direct processes and approve final decisions, while creating the opportunity for a broad base of input, comments, and questions from all SLDMWA member agencies, as well as stakeholders and interested parties both within and outside the WSJ Region. SLDMWA has assisted in the effective management of water resources for its member agencies in the service area for over two decades and has done so through robust decision-making processes, coordination, and communication, both internally and externally. These practices are applied during all aspects of SLDMWA's responsibilities, including preparation and implementation of the WSJ IRWMP.

Figure 1-2: Governance Structure

The WSJ Region's governance process includes public outreach and involvement processes through the RWMG, SLDMWA Committees, and Working Group meetings. All of the meetings are open to the public, and notices for RWMG (SLDMWA Board) meetings are posted on the SLDMWA website. Additionally, the WSJ IRWMP project manager, Andrew Garcia, a senior civil engineer for SLDMWA, emails the stakeholder contact list to announce IRWM-specific information as needed. By providing community members the opportunity to attend meetings and participate as members of the working groups, balanced access and opportunity for participation in the WSJ IRWMP is ensured.

1.4 Coordination

Water Management Project Coordination

The governance structure provides the basis for coordination of water management projects and activities of participating local agencies and stakeholders in the WSJ Region. The purpose of the Plan is to identify shared water management issues and develop solutions – typically, projects – that can be implemented to achieve the Region's goals. Additionally, by coordinating on various water resources planning efforts, efficiencies can be taken advantage of and the IRWM planning processes and governance structure can be used to avoid and solve conflicts.

Coordination with Neighboring IRWM Regions

The WSJ Region is bordered by four other IRWM regions (Figure 1-3). To the east of the WSJ IRWM Region are the East Stanislaus, Merced, Madera, and the Upper Kings IRWM Regions. There are no immediately adjacent regions to the north, south, or west of the WSJ Region.

Coordination among these neighboring regions is not formalized, but SLDMWA staff and member agency representatives effectively communicate with the bordering IRWM regions and representatives of those regions for IRWM planning and other local planning efforts, such as the IRWM DAC Involvement Program

currently underway. The WSJ Region has also been collaborating with other IRWM Regions in the San Joaquin River Funding Area and the Tulare-Kern Funding Area with respect to Prop 1 IRWM implementation grants. The WSJ and Madera IRWM Regions are considering a draft Memorandum of Understanding to formalize coordination and collaboration on shared IRWM planning issues.

The WSJ Region has coordinated with the Upper Kings Region in the past. The Kings Basin Water Authority included SLDMWA on the mailing list for its IRWMP update effort and SLDMWA kept Kings Basin Water Authority informed of WSJ IRWM planning progress. Four SLDMWA members – Tranquillity ID, James ID, Fresno Slough WD, and Reclamation District 1606 – were included in the Upper Kings IRWM Region which was agreed upon by both regions as these agencies overlie the Kings Subbasin of the San Joaquin Valley Groundwater Basin and therefore, their inclusion in the Upper Kings Region provides for a cohesive hydrologic region. The shared agencies and issues (such as groundwater overdraft) between the WSJ and Upper Kings Regions create the opportunity for ongoing interregional coordination among these two Regions. The WSJ Region has suggested to the Upper Kings Region that the two RWMG entities execute a Letter of Agreement on Communication similar to the Madera and Upper Kings Regions. This agreement is pending.

Additionally, the WSJ and East Stanislaus Regions have a well-established relationship and have been coordinating for years through ongoing communication. Members of the East Stanislaus RWMG have participated in meetings of the WSJ Region and vice versa. Representatives from the City of Patterson (Mike Willet, formerly Public Works Director of the City of Newman) and the City of Turlock (Garner Reynolds, formerly Public Works Director for the City of Patterson), participated in both the WSJ and East Stanislaus IRWM planning process during past plan updates. These representatives contributed to the development and implementation of the project solicitation and prioritization process for the Regions, among other tasks. Additionally, the two Regions coordinate regularly regarding an interregional project – the North Valley Regional Recycled Water Program (NVRRWP), a recycled water project that delivers recycled water from the Cities of Modesto and Turlock in the East Stanislaus Region to Del Puerto WD in the WSJ Region and CVPIA-designated wildlife refuges. Recently, the two Regions have been coordinating via the Stanislaus County Multi-Agency Regional Stormwater Resources Plan (SWRP). Representatives from both the East Stanislaus and WSJ Regions participate on the SWRP Technical Advisory Committee. Further coordination also occurs as projects are submitted to the SWRP.

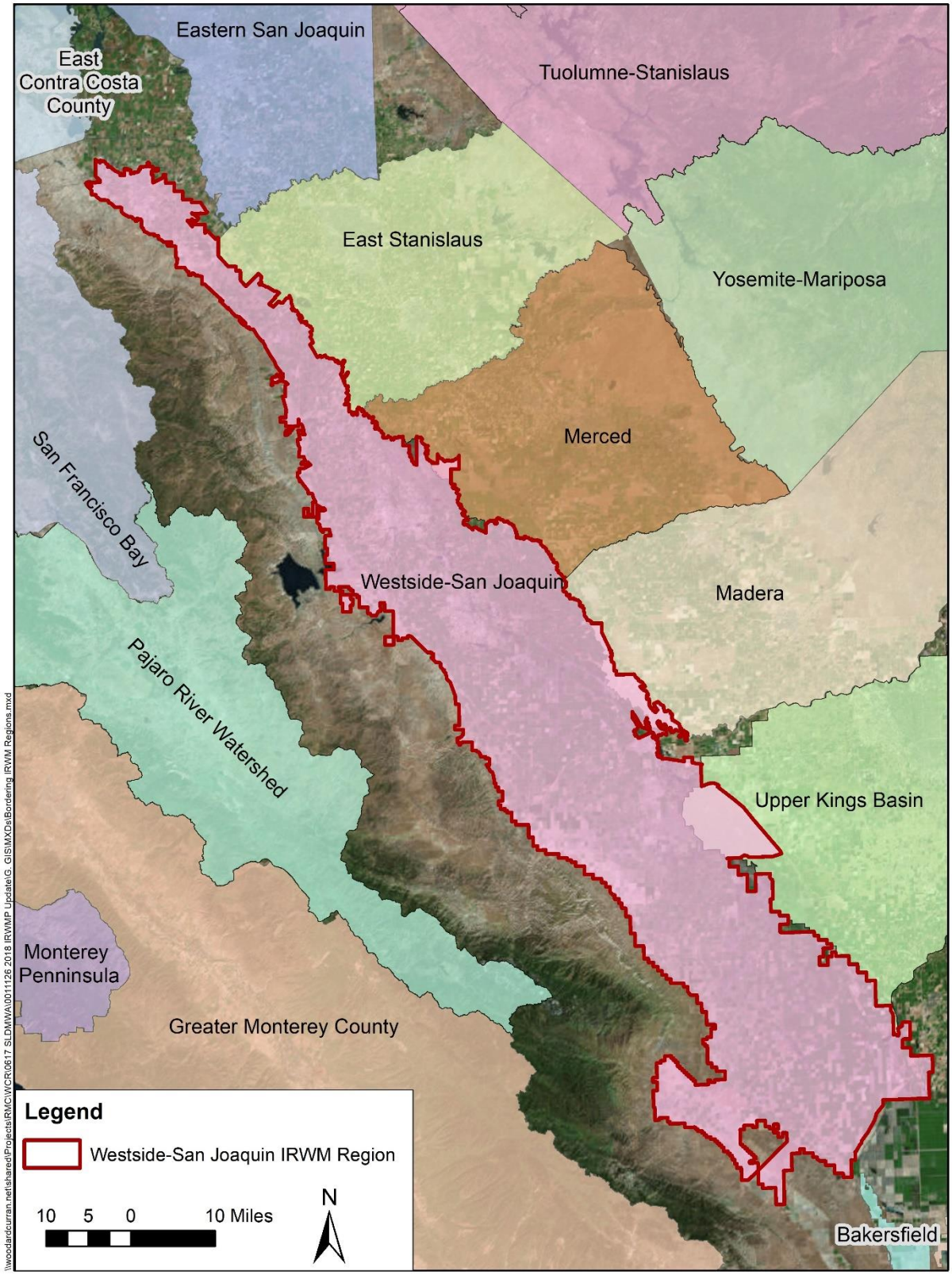


Figure 1-3: Neighboring IRWM Regions

There are no water management conflicts with the adjacent IRWM Regions, but the Regions do have shared issues and conflicts as they both lie within the Central Valley and are seeing diminished surface water supplies due to State and federal regulatory restrictions, resultant declining groundwater levels, and water supply impacts as a result of climate change and drought. The regions also share groundwater management issues. These shared issues result in great opportunities to identify efficiencies, joint projects, and collaborative efforts in the future.

Coordination with Local, State and Federal Agencies

SLDMWA has a long history of collaborative participation with local, State, and federal agencies in working through statewide and regional water resource management planning efforts. SLDMWA was a leader in the development of the Bay-Delta Accord, to which it was a signatory, as well as the Framework for Action, Record of Decision (ROD), and creation of the Bay-Delta Authority (which oversees the implementation of the CALFED Bay-Delta Program). Locally, SLDMWA has worked with San Joaquin Valley Drainage Authority and the Westside San Joaquin River Watershed Coalition on the Irrigated Lands Regulatory Program (ILRP) and on multiple water use efficiency and water quality improvement programs. The WSJ Region also participates in funding programs that require coordination with State agencies. For example, the Region is currently participating in the DAC Involvement program, which involves coordination with the California Department of Water Resources (DWR). SLDMWA is also involved with the preparation of the Northern &-Central Delta Mendota Region Groundwater Sustainability Plan (GSP) and coordination of a basin-wide GSP under SGMA. This effort requires coordination with DWR in addition to a range of local entities, such as the City of Patterson, Department of Fish and Wildlife, Fresno County, Merced County, Stanislaus County, Oro Loma WD, and Widren WD.

Beyond being a participant in shaping the vision of resource management in the State, SLDMWA has worked cooperatively with federal and State regulatory agencies to develop policies, standards, and implementation guidelines on many legislated and regulated actions. These efforts have required collaboration with the Department of the Interior (DOI), USBR, U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration (NOAA), DWR, the California Department of Fish and Wildlife (CDFW), the State Water Resources Control Board (SWRCB), the Central Valley Regional Water Quality Control Board (CVRWQCB), among others.

As projects in the WSJ IRWMP are implemented, many of the agencies previously mentioned, as well as others, will likely play some role through one or all of the stages of development including feasibility studies, design, environmental review, funding, permitting, construction, and operation. The level of participation will be project-specific; however, a high degree of cooperation is generally necessary in order to ensure the success of any given effort. As projects develop, project proponents and SLDMWA will seek input from and respond to the queries of governmental agencies relative to the effort as needed.

SLDMWA recognizes the importance of coordinating with State and federal agencies and plans to continue ongoing communication and coordination to successfully manage water resources and implement projects in the WSJ IRWM Region.

1.5 WSJ IRWMP Adoption, Interim Changes, and Future Updates

The 2019 WSJ IRWMP was finalized in January 2019. Upon completion, SLDMWA adopted the IRWMP at a public Board meeting in accordance with Section 6066 of the Government Code. Additionally, the following project proponents and/or stakeholders are expected to adopt the Plan in early 2019 at public meetings of their respective governing boards: Del Puerto Water District, West Stanislaus Irrigation

District, Westlands Water District, and San Joaquin River Exchange Contractors Water Authority. Appendix B contains the notices of intent to adopt and the adopting resolutions.

SLDMWA has historically updated the WSJ IRWMP no less than every five years and plans to continue this pattern in the future in order to ensure that the Plan addresses current day conditions and issues. The WSJ IRWMP project list itself will be housed in an interactive online database referred to as Opti, further discussed in Chapter 6, which allows for continuous update of projects. Formal Calls for Projects will occur prior to new funding solicitations and during IRWMP updates. The project list housed in the online database is considered the official WSJ IRWMP project list and is meant to be a living list that can be continually updated. This will not require SLDMWA to adopt the project list or WSJ IRWMP again, so long as the projects are vetted by working group. As has repeatedly been the case, coordination with stakeholders will occur and, depending upon the complexity or duration of a particular issue, it is possible a steering/technical committee or Ad-hoc Working Group will be involved.

Chapter 2 Region Description

2.1 IRWM Regional Boundary

The WSJ IRWM planning region is generally defined as the sum of the areas served by the SLDMWA's 28 member agencies and lying within the San Joaquin Valley (Figure 1-1). The Region is bounded to the east by the San Joaquin River and to the west by the Coast Range. The region, which encompasses approximately 2,000 square miles of land on the western side of the San Joaquin Valley, serves a multitude of interests through agricultural, municipal, industrial, and habitat management endeavors. SLDMWA's 28 member agencies (listed in Table 1-1) are located within the western San Joaquin Valley from the City of Tracy in the north to Kettleman City in the south.

SLDMWA is responsible for the O&M of certain South-of-Delta facilities, including the DMC, the C.W. Bill Jones Pumping Plant, the O'Neill Pumping and Generating Plant, the San Luis Drain, the Tracy Fish Facility, the Delta Cross Channel, DMC/California Aqueduct Intertie, Mendota Pool, Kesterson Reservoir, and fish release sites.

Two member agencies, San Benito County WD and Santa Clara Valley WD, lie outside of the WSJ Region and participate in the Pajaro Valley IRWM planning effort, in addition to the WSJ IRWM planning effort. One other member agency, Byron Bethany ID (in Contra Costa, Alameda, and San Joaquin Counties) is both adjacent to and within the Region. Another member agency, Turner Island WD (in Merced County), lies outside, but adjacent to, the official Region boundaries.

In 2018, the WSJ Region boundary was updated in order to include new communities and member agencies that expressed interest in joining the Region. The boundary was adjusted to include the service area of Pleasant Valley WD (a SLDMWA member agency), Stratford ID, Empire West Side ID, and the Cities of Avenal, Stratford, and Mendota (all DACs) and nearby lands. None of the areas added to the WSJ Region were previously covered by an IRWM Region. The boundary update was vetted through multiple discussions with the stakeholder Working Group during the 2019 WSJ IRWMP Update. A majority of the boundary change neighbors Westlands Water District and adds nearby DACs which will benefit from the Disadvantaged Community Involvement Program. After recommendation by the Working Group to adjust the boundary, the SLDMWA Interim Executive Director and Senior Civil Engineer confirmed approval of the boundary change directly with the Westlands Water District Deputy General Manager of Resources. Information regarding the boundary change was submitted to DWR as part of the Region Acceptance Process in September 2018. DWR approved the boundary change in early 2019.

Great diversity exists in the WSJ Region through a spectrum of issues ranging from resource management responsibilities and the problems that arise from resource usage to socio-economic status, cultural background, ethnicity, and development. While this diversity poses challenges, it also creates opportunities for the integration of water management. Of the many features shared by the Region, perhaps none is more important than the desire to venture for improvement and mutual benefit of overall water resources planning and management. The Region has a long history of collaborating on local, regional, state, and federal matters. This willingness to work cooperatively to solve local problems with regional solutions resulted in the development of the WSJ IRWM Region and provides it with a unique foundation from which to develop and implement plans and projects that generate broad benefit. In addition to shared water management objectives, the Region also has common issues such as chronic water supply shortages, unreliable conveyance capability, and reliance upon imported water to meet the majority of their water supply needs. Generally, the shared issues and conflicts of the Region include:

- Water supply reliability

- Water quality (drinking water, groundwater and surface water quality/Total Maximum Daily Loads [TMDLs])
- Surface and groundwater quality protection
- Groundwater overdraft
- Land management relative to water resources (i.e. Irrigated Lands Regulatory Program)
- Protection and enhancement of aquatic, riparian, and watershed resources
- Water-related needs for DACs (i.e., providing clean, reliable, and safe water supply for DACs)
- Need for recreational space and enhancement of livability
- Flood protection
- Climate change impacts that may exacerbate many of the issues listed above

These shared issues, and the associated Regional Objectives, create the potential for meeting the Region's needs through a series of integrated solutions. These issues, and the associated Region Objectives, are described in Chapter 3, Goals and Objectives. The following sections describe the WSJ Region and help to describe why it has been successful as an IRWM planning region.

Internal and External Boundaries

Counties

The WSJ Region stretches from the City of Tracy in San Joaquin County at the north, to Highway 41 and Kettleman City in Kings County to the south. The Region includes portions of San Joaquin, Stanislaus, Merced, Madera, Fresno, and Kings County, as shown in Figure 2-1.

Neighboring IRWM Regions

To the east of the WSJ IRWM Region are the East Stanislaus, Merced, Madera, and the Upper Kings IRWM Regions. There are no adjacent regions to the north, south, or west of the Region. Coordination among these neighboring regions is described in Section 1.4.

Member Agencies and Central Valley Project (CVP) Divisions

The CVP, central to planning efforts within the WSJ Region, was conceived, designed and constructed to create greater economic development in California and help alleviate water shortages and flooding in the Central Valley. The first legislation authorizing development of the CVP was passed in 1935, and at least 15 acts of Congress have authorized additional development. Initial project features included Shasta Dam for flood control, navigation and water storage, and a canal system to deliver water from Lake Shasta and the Delta to the northern San Joaquin Valley.

SLDMWA member agencies are grouped into five Divisions. A list of SLDMWA member agencies, segregated by SLDMWA Divisions, is provided in Appendix C. (Note that SLDMWA Divisions and CVP Divisions may differ slightly.) Within the CVP are the Delta Division and the San Luis Unit, both of which are located in western San Joaquin Valley. The Delta Division includes portions of San Joaquin, Stanislaus, Merced, and Fresno Counties and the service areas of certain DMC CVP contractors (USBR, 2016). The Delta Division transports water through the central portion of the Central Valley with the Delta Cross Channel, Contra Costa Canal, C.W. Bill Jones Pumping Plant, Tracy Fish Collection Facility, Intertie, and DMC.

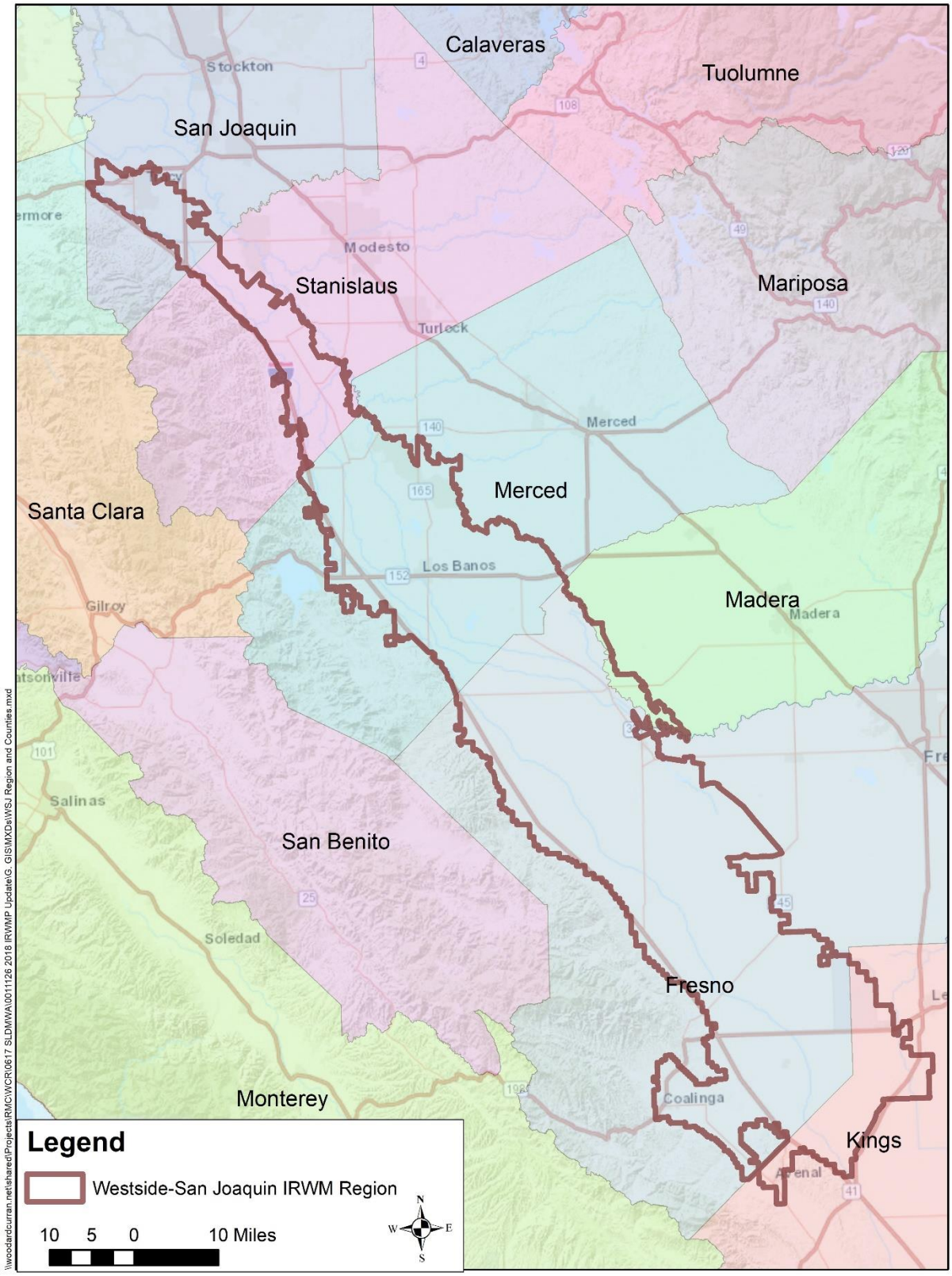


Figure 2-1: Westside-San Joaquin IRWM Region Counties

The San Luis Unit includes the western portions of Fresno, Kings and Merced Counties. The San Luis Unit is part of both the federal CVP and California SWP and is jointly operated by USBR and DWR. The federal portion of the facilities furnishes approximately 1.25 million AF of water to approximately 600,000 acres in the western portions of Fresno, Kings, and Merced Counties. The joint federal-state facilities include O'Neill Dam and Forebay, San Luis Dam and Reservoir, William R. Gianelli Pumping-Generating Plant, Dos Amigos Pumping Plant, Los Banos and Little Panoche Reservoirs, and the San Luis Canal from O'Neill Forebay to Kettleman City. The federal-only portion of the San Luis Unit includes the O'Neill Pumping Plant and Intake Canal, Coalinga Canal, Pleasant Valley Pumping Plant, and the San Luis Drain.

Facilities within the WSJ Region are described in greater detail in the following sections.

Watersheds

The WSJ Region lies in the Middle San Joaquin-Lower Merced Lower Stanislaus watershed, the Middle San Joaquin-Lower Chowchilla watershed, and the Tulare-Buena Vista Lakes Watershed (see Figure 2-2). Historically, the San Joaquin River basin was a large floodplain of the San Joaquin River that supported vast expanses of permanent and seasonal marshes, lakes, and riparian areas. Almost 70 percent of the basin has been converted to irrigated agriculture, with wetland acreage estimated to have been reduced to approximately 120,300 acres. In combination with the adjacent uplands, rangeland and other agriculture the wetland complex is referred to as the Grassland (Ecological Area) and consists of approximately (240,000) acres. This area includes 160,000 acres of private and public refuge habitat areas. Approximately 135,000 acres across 14 refuges south of the delta were identified under the Central Valley Project Improvement Act of 1992 to be provided adequate and reliable water supply by 2003 (full Level 4). Despite this congressional mandate to the Secretary of the Interior, full Level 4 water supply has only been delivered twice on a schedule the habitat requires. These critical areas support millions of birds and other species annually, provide ground water recharge to the over drafted and subsiding basin, improve water quality, and provide flood control and relief.

The San Joaquin Valley is part of a large, northwest-to-southeast-trending asymmetric trough of the Central Valley, which has been filled with up to six vertical miles of sediment. This sediment includes both marine and continental deposits ranging in age from Jurassic to Holocene. The San Joaquin Valley lies between the Coast Range Mountains on the west and the Sierra Nevada on the east, and extends northwestward from the San Emigdo and Tehachapi Mountains to the Delta near the City of Stockton. The San Joaquin Valley is 250 miles long and 50 to 60 miles wide. The relatively flat alluvial floor is interrupted occasionally by low hills. Foothills adjacent on the west are composed of folded and faulted beds of mainly marine shale in the north and sandstone and shale in the south.

The San Joaquin Valley floor is divided into several geomorphic land types, including dissected uplands, low alluvial fans and plains, river floodplains and channels, and overflow lands and lake bottoms. Alluvial plains cover most of the valley floor and comprise some of the most intensely developed agricultural lands in the San Joaquin Valley. In general, alluvial sediments of the western and southern parts of the San Joaquin Valley tend to have lower permeability than east side deposits.

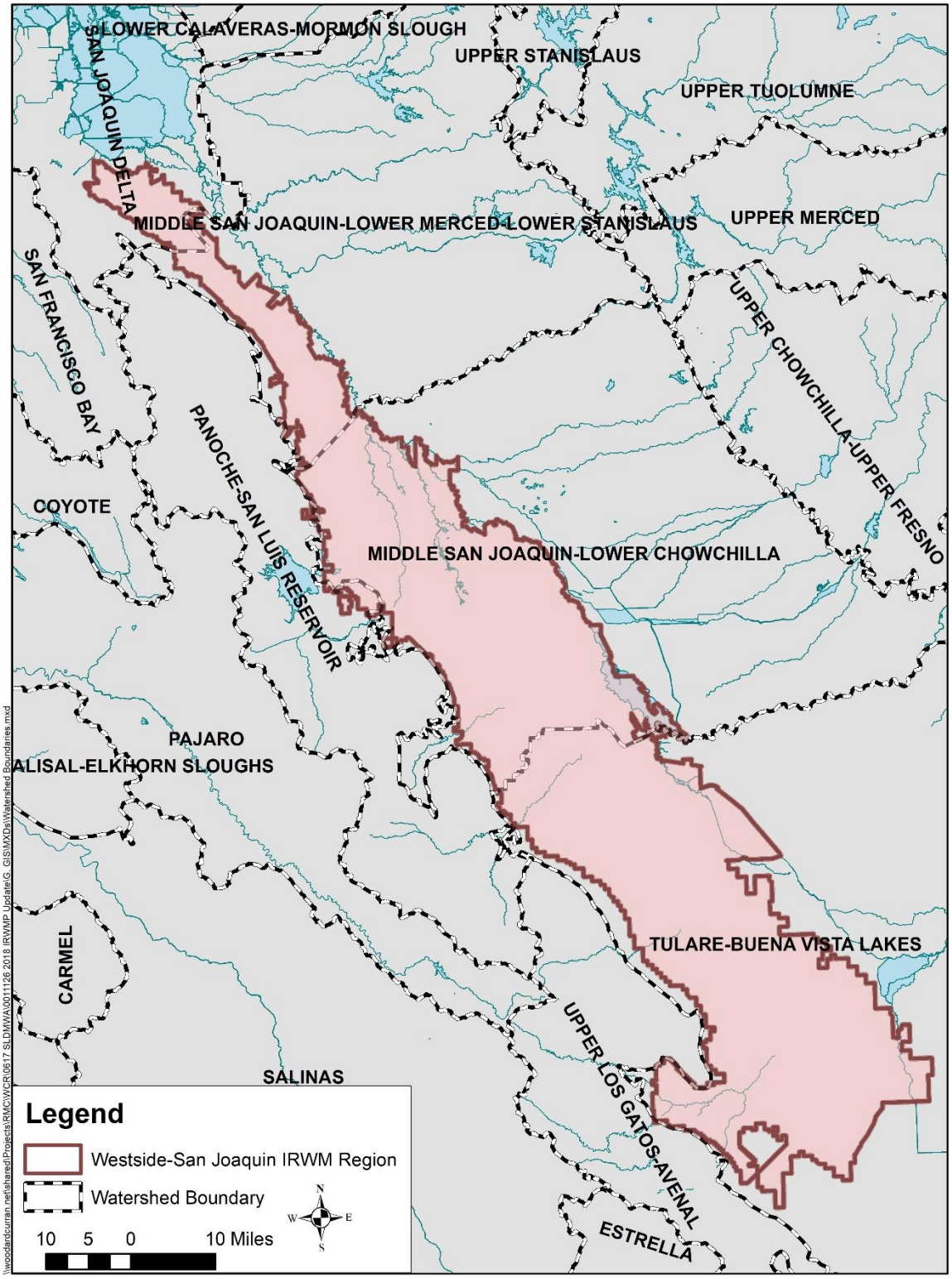


Figure 2-2: Regional Watersheds

Major Water-Related Infrastructure

Within the WSJ Region lies an extensive series of water systems relied upon by multiple water agencies, cities, and water users. The major water related infrastructure in the Region includes the facilities required to deliver the CVP supplies to the member agencies. SLDMWA operates and maintains the Delta Cross Channel, the C.W. Bill Jones Pumping Plant, the DMC, O'Neill Pumping-Generating Plant, San Luis Drain, DMC/California Aqueduct Intertie, and the Tracy Fish Collection Facility. Figure 2-3 shows major water-related infrastructure in the Region.

Delta Cross Channel

The Delta Cross Channel, located near Walnut Grove, diverts water from the Sacramento River into Snodgrass Slough, and is critical in controlling salinity as part of the CVP, Delta Division. From the Slough, the water flows through natural channels for about 50 miles to the vicinity of the C.W. Bill Jones Pumping Plant. The Delta Cross Channel is designed to divert approximately 3,500 cfs of water.

C.W. "Bill" Jones Pumping Plant

The WSJ Region receives water pumped from the Delta by the C.W. "Bill" Jones Pumping Plant and conveyed in the DMC by gravity. The pumping plant is located about 12 miles northwest of Tracy, and is essential to agricultural, urban, and wildlife water deliveries to parts of the Delta Division and the San Luis Division and San Felipe Unit of the CVP. Six pumps, each powered by a 22,500-horsepower electric motor, lift the Delta water about 200 feet from the intake through discharge pipes about one mile to the DMC. Power to operate the pumps is generated by CVP facilities. Total capacity of the plant is approximately 5,200 cfs, with each unit have a pumping capacity between 850 cfs and 1,050 cfs.

Delta-Mendota Canal (DMC)

The DMC, a 116.6-mile long canal completed in 1951, carries water southeasterly from the C.W. "Bill" Jones Pumping Plant to the Mendota Pool in the San Joaquin River (30 miles west of Fresno) to be used for irrigation of land along the west side of the San Joaquin Valley and to replace San Joaquin River water historically delivered to the San Joaquin River Exchange Contractors Water Authority. Initially, the conveyance capacity was 4,600 cfs, decreasing to 3,211 cfs at the terminus. Today, the DMC and associated facilities are essential to providing irrigation, M&I, and refuge supplies as part of the San Luis Unit, San Felipe Division, and the CVP Delta Division.

DMC/California Aqueduct Intertie

The Intertie connects the DMC and the California Aqueduct via two 108-inch diameter pipes with a pumping capacity of 467 cfs. The connection is approximately 500 feet long and helps to address DMC reduced conveyance conditions that had restricted use of the C.W. "Bill" Jones pumping Plant to less than its design capacity (e.g., subsidence and siltation). The Intertie also provides redundancy in the CVP and SWP distribution systems. The Intertie allows for the maintenance and repair of CVP and SWP Delta export and conveyance facilities with less interruption to service. For example, during summer 2018, a portion of the California Aqueduct was out of service for a repair, and the Intertie was used to help move SWP supplies to San Luis Reservoir.

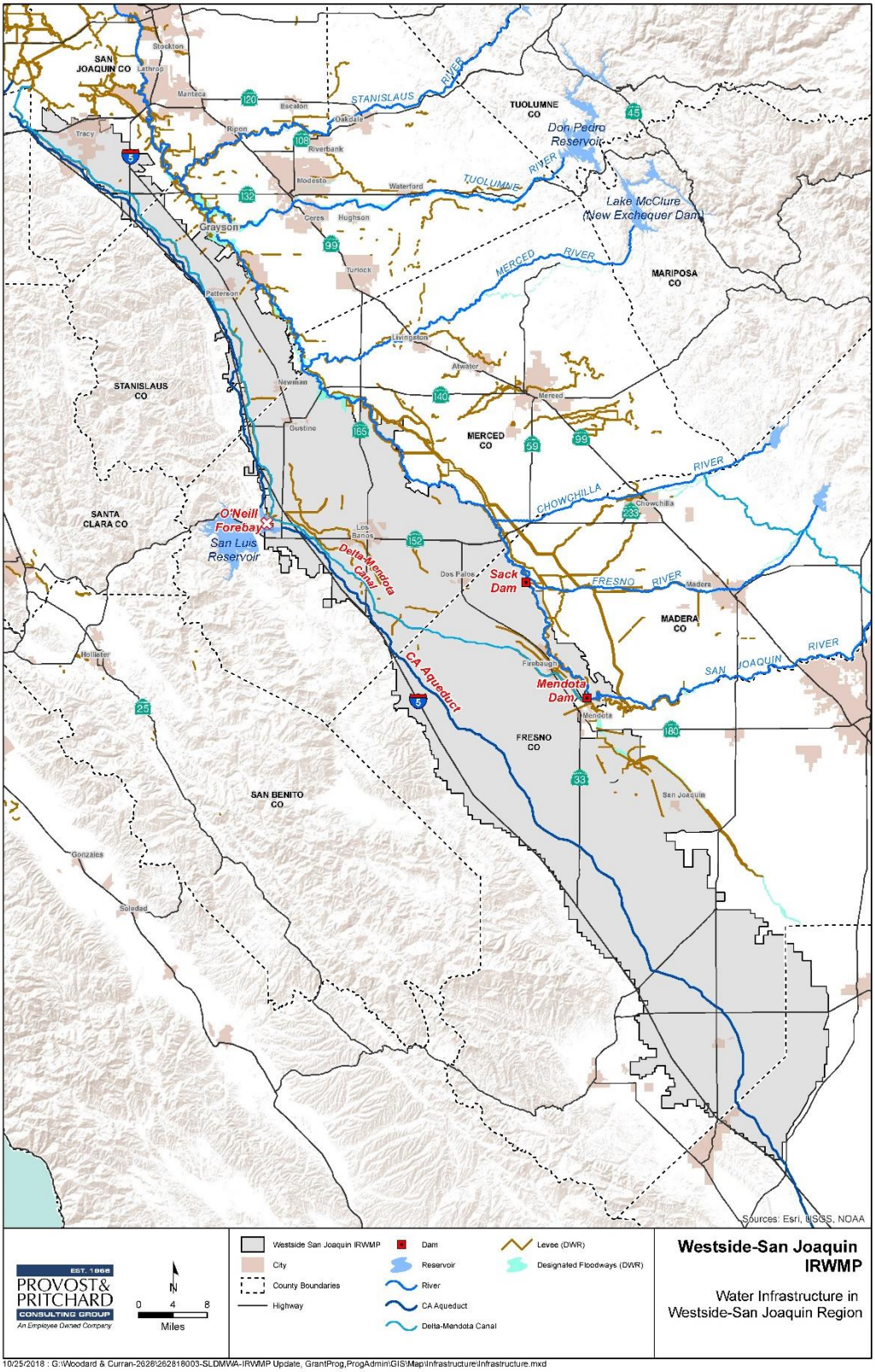


Figure 2-3: Major Water-Related Infrastructure in the WSJ Region

O'Neill Pumping-Generating Plant

The O'Neill Pumping Plant, located at Mile 70, about 12 miles west of Los Banos, lifts water between 45 and 53 feet from the DMC into the O'Neill Forebay. This plant is essential in delivering water to the O'Neill Forebay, San Luis, and San Felipe Units of the CVP. The Plant was completed in 1968 and consists of an intake channel leading off the DMC and six pumping-generating units, each of which can discharge about 650 cfs and has a rating of 6,000 horsepower. When operating as turbines/generators, each unit can generate about 4,000 kilowatts.

San Luis Drain

The San Luis Drain, partially completed in 1974, was designed to convey and dispose of subsurface irrigation return flows from the San Luis Unit service area in order to ensure that drain waters are prevented from entering the San Joaquin River. It is part of the San Luis Unit, West San Joaquin Division of the CVP. It is a concrete lined channel with a design capacity of 300 cfs. Currently, the San Luis Drain is no longer used with exception of a section used by the Grassland Basin Drainage Project.

Tracy Fish Collection Facility

The Tracy Fish Collection Facility, located approximately 2.5 miles upstream of the C.W. "Bill" Jones Pumping Plant, intercepts fish from the Old River upstream of the pumping plant, which is vital to the preservation of various Delta species by allowing them to return to the main delta channel and resume their journey to the ocean. This facility is part of the CVP, Delta Division. The USBR continues O&M of this facility, while SLDMWA has a service contract to provide emergency assistance upon request.

Flood Management

In general, the Region slopes toward the San Joaquin River, with steeper slopes along the western boundary (near the Coast Range), tapering off closer to the San Joaquin River. There has not been significant flooding in recent years, although severe rain events in 1997/98 and in 2005 threatened to flood some of the communities adjacent to the San Joaquin River (specifically the City of Firebaugh and the City of Mendota) and produced some localized flooding of farmland caused by runoff impoundment by elevated canal banks. Based on the recent historical events, the primary threat of flooding to urban areas will be for those along (and immediately adjacent to) the San Joaquin River. Areas within the 100-year floodplain within the WSJ Region are relatively minimal, as shown in Figure 2-4.

The flood management system in the San Joaquin Valley includes reservoirs to regulate snowmelt from elevations greater than 5,000 feet, bypasses at lower elevations, and levees that line major rivers.

Major Land Use Divisions

The WSJ Region consists mostly of agricultural land use types (see Figure 2-5). Typical land uses in the Region are described in the following sections. The primary land use planning entities in the Region include the Counties, as well as the Cities of Tracy, Patterson, Los Banos, Firebaugh, Newman, Gustine, Mendota, Coalinga, Huron, and Dos Palos, as shown in Figure 2-6.

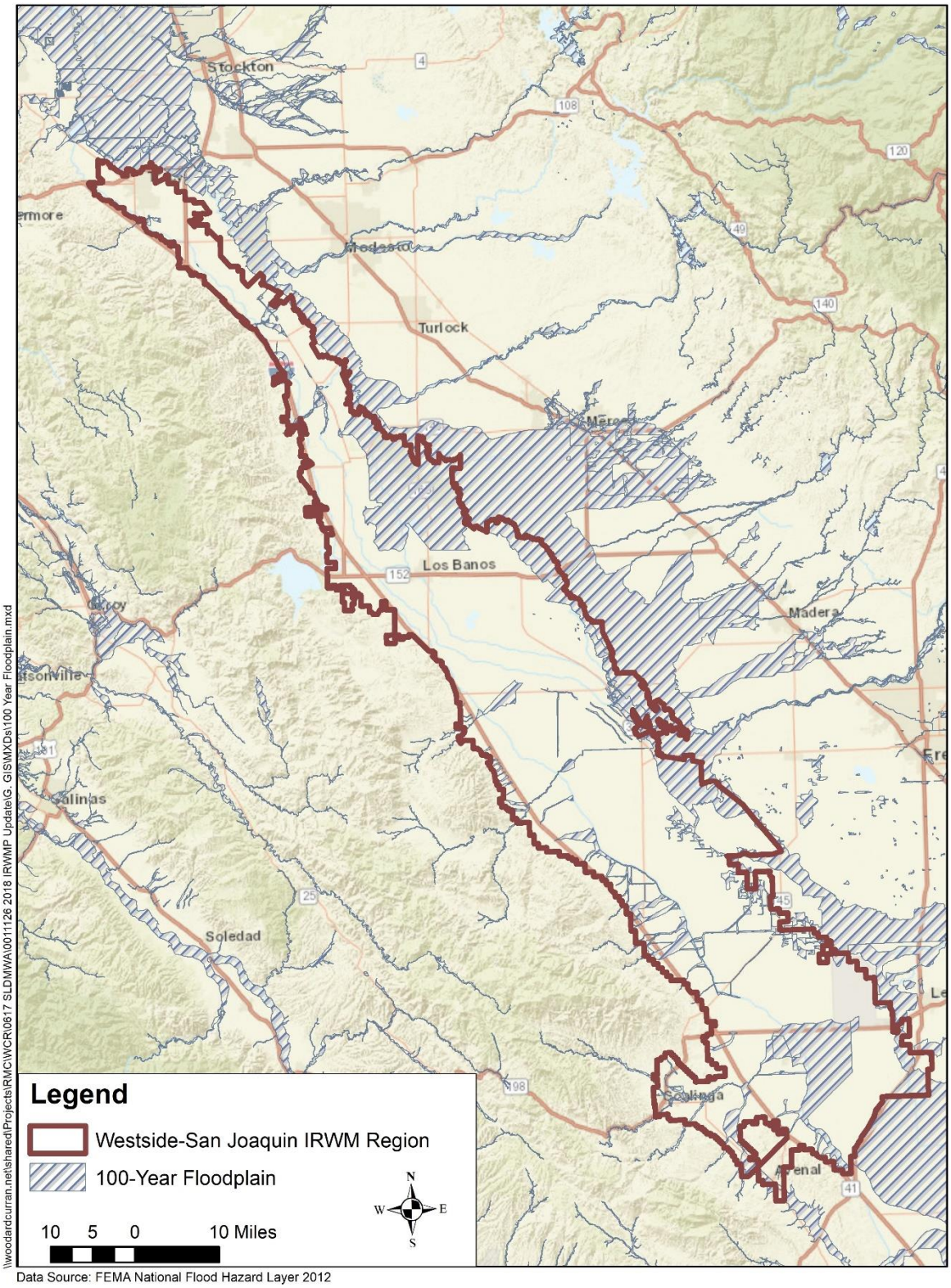


Figure 2-4: 100-Year Floodplain

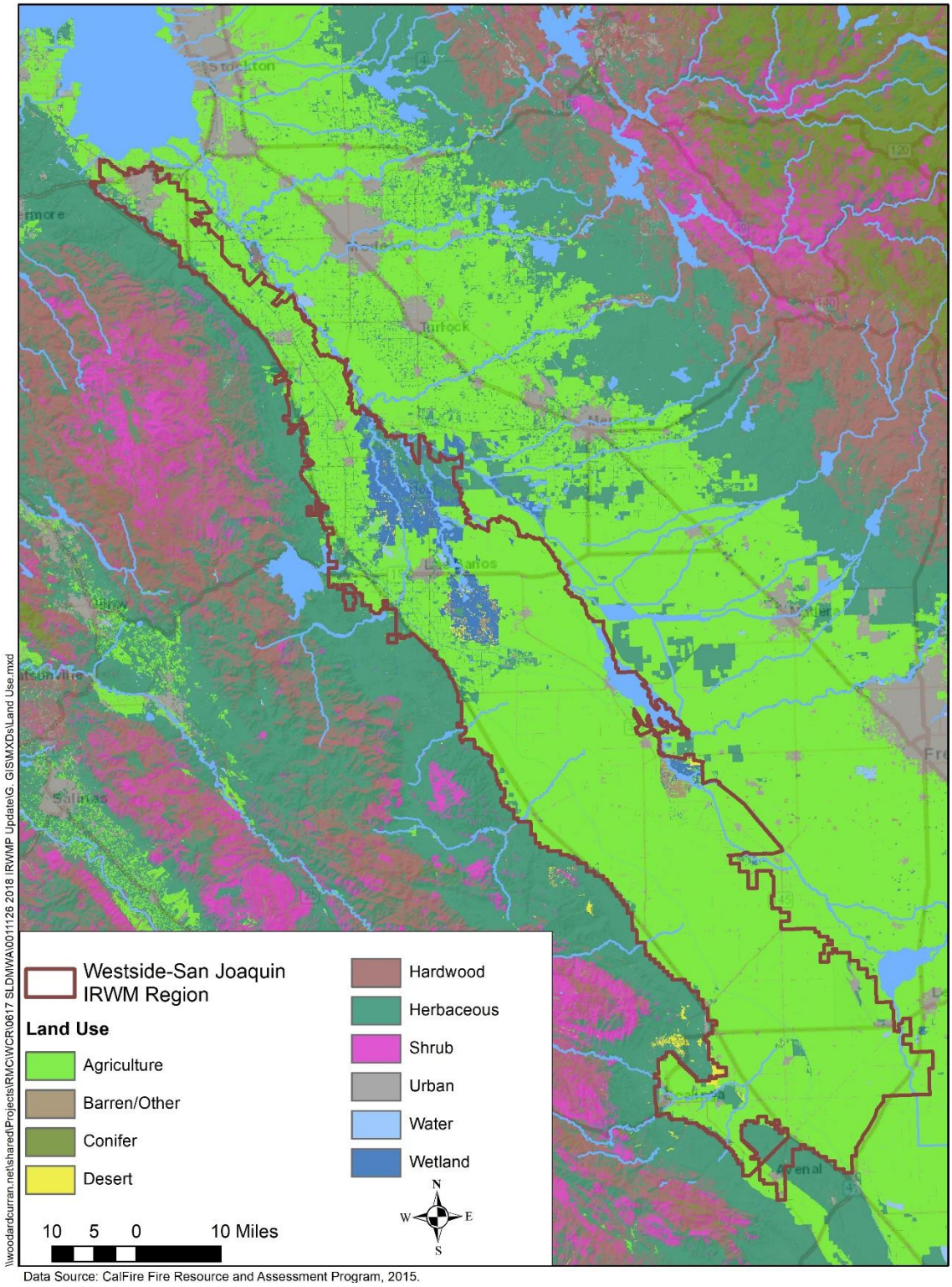


Figure 2-5: Land Cover

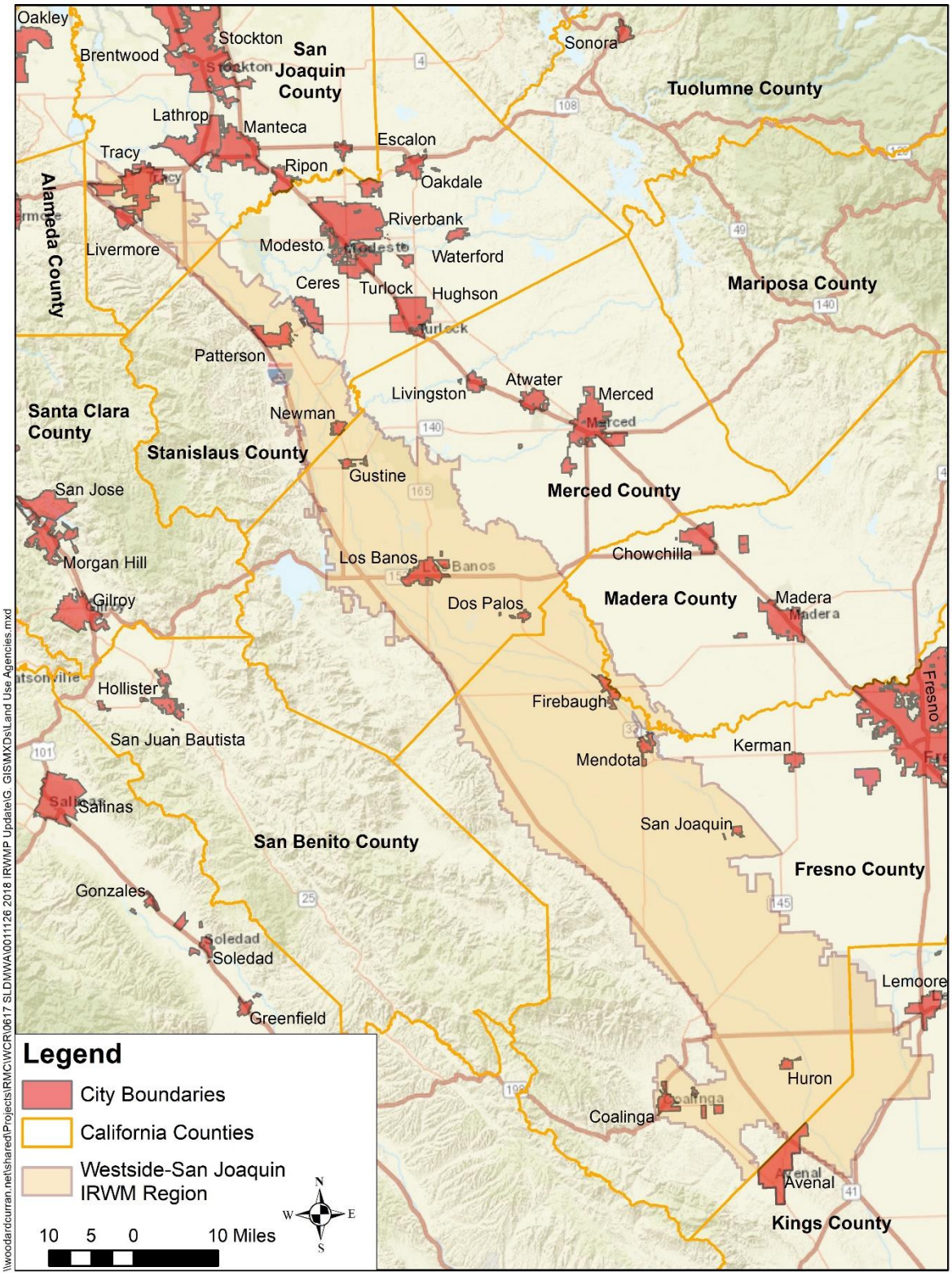


Figure 2-6: San Joaquin and Stanislaus Counties Land Use Planning Entities

Grassland and Unknown Rangeland

Grasslands in the Central Valley were originally dominated by native perennial grasses such as needlegrass and alkali sacaton. Currently, grassland vegetation is characterized by a predominance of annual or perennial grasses in an area with few or no trees and shrubs. Annual grasses found in grassland vegetation include wild oats, soft chess, ripgut grass, medusa head, wild barley, red brome, and slender fescue. Perennial grasses found in grassland vegetation are purple needlegrass, Idaho fescue, and California oatgrass. Forbs commonly encountered in grassland vegetation include long-beaked filaree, redstem filaree, dove weed, clovers, Mariposa lilies, popcornflower, and California poppy. Vernal pools found in small depressions with an underlying impermeable layer are isolated wetlands within grassland vegetation.

Rangeland communities are composed of similar grasses, grass-like plants, forbs, or shrubs, which are grazed by livestock. Forbs commonly encountered in grassland vegetation include long-beaked filaree, redstem filaree, dove weed, clovers, Mariposa lily, popcornflower, and California poppy. Most of the grasslands in California are dominated by naturalized annual grasses with perennial grasses existing in relict prairie communities or on sites with soil or water conditions unfavorable for annual grasses, such as on serpentine. Grassland vegetation occurs from sea level to about 3,900 feet in elevation. Grassland communities as a whole have relatively high species diversity when compared to other California plant communities.

Grassland habitats are important foraging areas for black-shouldered kite, red-tailed hawk, Swainson's hawk, northern harrier, American kestrel, yellow-billed magpie, loggerhead shrike, savannah sparrow, American pipit, mourning dove, Brewer's blackbird, red-winged blackbird, and a variety of swallows. Birds such as killdeer, ring-necked pheasant, western kingbird, western meadowlark, and horned lark nest in grassland habitats. Grasslands also provide important foraging habitat for the coyote and badger because this habitat supports large populations of small prey species, such as the deer mouse, California vole, pocket gopher, and California ground squirrel. Common reptiles and amphibians of grassland habitats include western fence lizard, common kingsnake, western rattlesnake, gopher snake, common garter snake, western toad, and western spadefoot toad.

Shrub and Brush and Mixed Rangeland

Most of the rangelands in the United States are west of an irregular north-south line that runs from the Dakotas through Oklahoma and Texas. Rangelands are classified into three basic types: shrub and brush rangeland, mixed rangeland and herbaceous rangeland.

The shrub and brush rangeland is dominated by woody vegetation and is typically found in arid and semiarid regions such as the San Luis Unit. Mixed rangelands are ecosystems where more than one-third of the land supports a mixture of herbaceous species and shrub or brush rangeland species.

Herbaceous rangelands are dominated by naturally occurring grasses and forbs as well as some areas that have been modified to include grasses and forbs as their principal cover. Rangelands are, by definition, areas where a variety of commercial livestock are actively maintained. Within the rangeland community, a number of herbivorous animals such as grasshoppers, jackrabbits, and kangaroo rats compete with livestock for forage.

Agricultural Habitat

Although natural communities provide the highest value for wildlife, many of these historic natural habitats have been largely replaced by agricultural habitats with varying degrees of benefits to wildlife.

Two agricultural types occur in the area: cropland and pasture, and orchards and vineyards. The intensive management of agricultural lands, including soil preparation activities, crop rotation, grazing, and the use of chemicals, effectively reduces the value of these habitats for wildlife. However, many wildlife species have adapted, to some degree, to particular crop types and now use them for foraging and nesting. Orchards, vineyards, and cotton fields generally provide relatively low-quality wildlife habitat because the frequent disturbance results in limited foraging opportunities and a general lack of cover. Pasture and row crops provide a moderate-quality habitat with some limited cover and foraging opportunities.

Cropland and Pasture

Pasture habitat can consist of both irrigated and unirrigated lands dominated by perennial grasses and various legumes. The composition and height of the vegetation, which varies with management practices, also affects the wildlife species composition and relative abundance. In Southern California, Bermuda grass is the dominant plant species seeded in pastures, while in Northern California, ryegrasses, fescues, clovers, and trefoils are preferred.

Irrigated pastures may offer some species habitats that are similar to those of both seasonal wetlands and unirrigated pastures. The use of these pastures for grazing, however, reduces the overall habitat quality for ground-nesting wildlife and effectively reduces the value of the habitat. Irrigated pastures provide both foraging and roosting opportunities for many shorebirds and wading birds, including black-bellied plover, killdeer, long-billed curlew, and white-faced ibis. Non-irrigated pastures, if lightly grazed, can provide forage for seed-eating birds and small mammals. Ground-nesting birds, such as ring-necked pheasant, waterfowl, and western meadowlark, can nest in pastures if adequate vegetation is present. Small mammals occupying pasture habitat include California voles, Botta's pocket gophers, and California ground squirrels. Raptors including red-tailed hawks, white-tailed kites, and prairie falcons prey upon the available rodents. In areas where alfalfa or wild oats have been recently harvested, the large rodent populations can provide high-quality foraging habitat for raptors.

The habitat value in cropland is essentially regulated by the crop production cycle. Most crops in California are annual species and are managed with a crop rotation system. During the year, several different crops may be produced on a given parcel of land. Many species of rodents and birds have adapted to croplands, which often requires that the species be controlled to prevent extensive crop losses. This may require intensive management and often the use of various pesticides. Rodent species that are known to forage in row crops include the California vole, deer mouse, and the California ground squirrel. These rodent populations are preyed upon by Swainson's hawks, red-tailed hawks, and black-shouldered kites.

Orchards and Vineyards

Orchard-vineyard habitat consists of cultivated fruit or nut-bearing trees or grapevines. Orchards are typically open, single-species, tree-dominated habitats and are planted in a uniform pattern and intensively managed. Understory vegetation is usually sparse; however, in some areas, grasses or forbs are allowed to grow between vineyard and orchard rows to reduce erosion. In vineyards, the rows under the vines are often sprayed with herbicides to prevent the growth of herbaceous plants.

Wildlife species associated with vineyards include the deer mouse, California quail, opossum, raccoon, mourning dove, and black-tailed hare. Nut crops provide food for American crows, scrub jay, northern flicker, Lewis' woodpecker, and California ground squirrel. Fruit crops provide additional food supplies for yellow-billed magpies, American robin, northern mockingbird, black-headed grosbeak, California quail, gray squirrel, raccoon, and mule deer. Loss of fruit to grazers often results in species management programs designed to force these species away from the orchards.

Row Crops

Row crops include tomatoes, broccoli, and melons, among many others. Intensive management and pesticide use limit the use of row crops by wildlife. Rodent species that forage in row crops include the California vole, deer mouse, and California ground squirrel. These rodent populations are preyed upon by Swainson's hawks, red-tailed hawks, and white-tailed kites.

Grain Crops

Grain crops include barley, wheat, corn, and oats. Many grain crops are planted in fall and harvested in spring. They are intensively managed, and chemicals are often used to control pests and diseases. This management strategy reduces the value of these crops to wildlife. However, the young green shoots of these crops provide important foraging opportunities for such species as greater white-fronted geese, tundra swans, wild pigs, and tule elk. Other species, including red-winged blackbirds, Brewer's blackbirds, ring-necked pheasants, waterfowl, and western harvest mice, feed on the seeds produced by these crops.

Rice

Cultivated rice in the Central Valley has some of the attributes found in seasonal wetlands. However, the intensive management of this habitat reduces many of the benefits found in natural wetlands. Flooded rice fields provide nesting and foraging habitat for waterfowl and shorebirds. Rice provides important forage for many wildlife species. After harvest, waterfowl (e.g., mallards and Canada geese), sandhill cranes, California voles, and deer mice feed upon the waste grain. Raptors, including northern harrier, white-tailed kite, and ferruginous hawk, feed upon rodents in this habitat. Irrigation ditches used to flood rice fields often contain dense cattail vegetation and provide habitat for wildlife species, such as the Virginia rail, American bittern, snowy egret, marsh wren, common yellowthroat, and song sparrow.

Cotton

Cotton is of limited value to wildlife because of the intensive management of this crop and the use of chemicals to control pests and disease. Mourning doves and house mice are found in this crop type. During irrigation, when vegetation is short and sparse, additional wildlife, including killdeer, American pipit, and horned lark, may be attracted.

Deciduous Forest

Deciduous forests are composed of trees that lose their leaves in the winter. These include species such as the various California oaks and California buckeye; the interior live oak, which is not deciduous, is also found in deciduous forests. Valley oak woodlands are found in the Sacramento and San Joaquin Valleys and usually occur below elevations of 2,000 feet. The deciduous forest plant species often provide a substantial amount of food to associated animals. The forest itself also provides a large amount of three-dimensional habitat. Wildlife associated with deciduous forests includes a wide variety of birds, small rodents, deer, raccoons, various insects, foxes, bobcats, black bears, or even wolves.

Idle or Retired Farmland

Lands of this category are similar to abandoned farmlands in the ruderal or unknown rangeland category, but with less time out of agricultural production. Similarly, the habitat value of these lands may vary with land management practices.

2.2 Quality and Quantity of Water Resources

Water supplies within the WSJ Region include CVP water, groundwater, local surface water including recycled water, and water transferred from outside the region. These are described in the following sections.

CVP Supplies

Three of the four San Luis Unit member agencies (excluding Pleasant Valley WD), each of the Delta Division contractors, and several Wildlife Areas/Refuges in the proximity of the DMC use CVP water; it is the primary source of water for the WSJ Region. SLDMWA member agencies are listed by division in Appendix C. Pleasant Valley WD (a member of the San Luis Unit) does not receive CVP water. In addition there are four Wildlife Management Areas in the vicinity that are managed as uplands and do not receive CVP water: the Little Panoche, Lower Cottonwood Creek, O'Neill Forebay, and Upper Cottonwood Creek Wildlife Management Areas (USBR, 2005). The Upper and Lower Cottonwood Creek Wildlife Management Areas are located adjacent to San Luis Reservoir. The O'Neill Forebay Wildlife Management Area is located adjacent to its namesake. The Little Panoche Wildlife Management Area is located on Little Panoche Creek in the hills approximately 10 miles southwest of the Eagle Field WD.

While water quality is generally not an issue with CVP water supplies, periodically, there are taste and odor problems resulting from algae blooms in the Delta (EKI, 2016). Significant water quality problems could occur a result of levee failures, toxic spills, and/or salinity issues in the Delta.

In addition to ongoing drought conditions, CVP water supply to the Region has decreased significantly primarily due to:

- SWRCB water quality standards for the Bay-Delta; Decision-1485 and Decision-1641;
- CVPIA implementation;
- State and Federal ESA provisions and related court decisions;
- Clean Water Act provisions.

Historical CVP allocations for South of Delta agricultural contractors are shown in Figure 2-7.

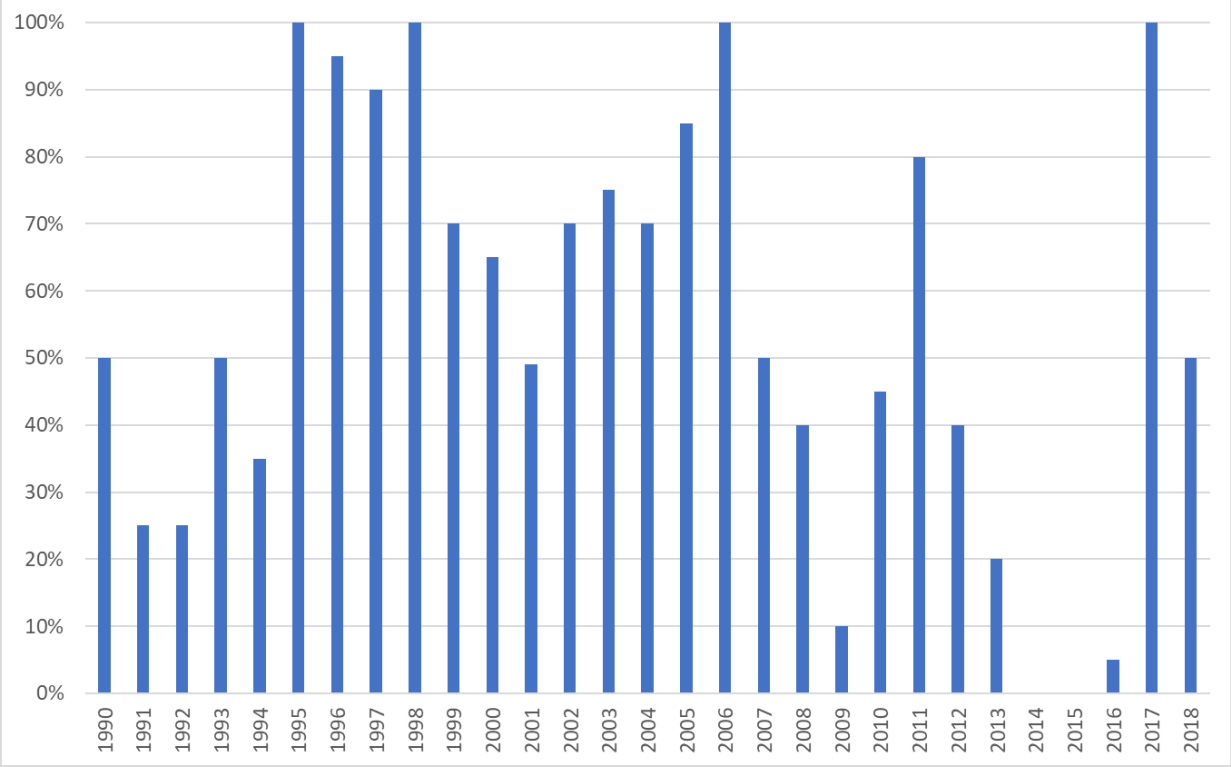


Figure 2-7: CVP Allocations 1990-2017 for South of Delta Agricultural Contractors (USBR, 2018)

Water Quality Control Plan and D-1485

In 1978, the SWRCB released Water Rights Decision 1485. The decision set flow and water quality objectives for the protection of beneficial uses in and from the Delta and required the SWP and CVP to meet those standards as water rights conditions for the projects. The objectives were based on the premise that beneficial uses would be protected at a level equal to the protection received had the CVP and SWP never been constructed.

In 1986, the California Court of Appeal issued a decision authorizing the SWRCB to modify water right permits to implement Delta water quality standards and to develop standards to protect fish and wildlife. These standards, however, could not be established solely to protect Delta water users from the impacts of the SWP and CVP. Consequently, in 1987, the SWRCB began a formal proceeding to reconsider the D-1485 standards, establish new standards if needed, and develop a program of implementation.

In the same year as the Court of Appeal decision, USBR and the State of California executed a new Coordinated Operations Agreement (COA) that sets the responsibility of the CVP and SWP for applicable Delta water quality standards. The COA provides the basis for CVP and SWP operations to ensure an equitable share of water supply for each project, while guaranteeing that the systems operate more efficiently during droughts than if they were to operate independently.

Water Quality Control Plan and D-1641

After a great deal of controversy between the U.S. Environmental Protection Agency (USEPA) and the State of California in the early 1990's, the historic Bay-Delta Accord was signed in 1994. The following year, the SWRCB adopted a new Water Quality Control Plan (WQCP) based on the Accord.

In December 1999, the SWRCB issued D-1641. That decision assigned interim responsibility to the CVP and SWP to meet the flow and water quality objectives in the WQCP. The decision also approved certain agreements involving the responsibility of the CVP and SWP towards certain other water right holders for meeting those objectives. Phase 8 of the Bay-Delta water right hearings was intended to address the responsibilities of remaining water-right holders in meeting the objectives in the 1995 WQCP. The CVP, SWP, and the remaining upstream water right holders reached an agreement on Phase 8 in late December 2002 to stay the SWRCB's Phase 8 proceedings. To meet the CVP's obligation assigned under D-1641, more CVP water is needed than the amounts of water previously required to meet the standards under D-1485.

The SWRCB is in the process of updating the WQCP. To date, work has occurred on two phases. Phase 1 includes changes to the flow objectives and salinity objectives in the San Joaquin River and its tributaries. Phase 2 sets objectives for Sacramento River and Delta tributary inflows, Delta outflows, coldwater habitat and interior flows. The SWRCB is expected to adopt the Phase 1 amendments in late 2018 (SWRCB, 2018). As of fall 2018, the SWRCB was in the process of preparing proposed changes for Phase 2 of the WQCP update as well as a supporting draft Staff Report. Once final objectives have been adopted for Phases 1 and 2, a Phase 3 is planned to implement these changes. A fourth Phase involves developing flow objectives and implementation plans for high-priority tributaries to the Delta that do not currently have flow objectives.

CVPIA Provisions Affecting CVP Water Supply

A number of key CVPIA provisions directly affect water supply availability for agricultural and M&I water users in the WSJ Region including:

- Section 3404(a), which precludes the issuance of any new short term, temporary, or long term CVP contracts for any purpose other than fish and wildlife.
- Section 3406(b)(2), which authorizes and directs the dedication of up to 800 thousand AF (TAF) of CVP water for environmental purposes.
- Section 3406(b)(23), which addresses restoration efforts for the Trinity River Division (TRD).
- Section 3406(d), which requires firm CVP water supplies amounting to 480 TAF to be delivered to federal, state and some private wildlife refuges.

Section 3404(a) precludes the issuance of any new CVP contracts until after completion of the many and varied goals of the CVPIA. Pursuant to Section 3406(b)(2), Interior has been dedicating and managing CVP water since 1993, the first water year following passage of the CVPIA. Since enactment of the statute, Interior has pursued ways to utilize (b)(2) water in conjunction with modification of CVP operations and water acquisitions to meet the goals of the CVPIA.

Section 3406(b)(23) of the CVPIA requires Interior to complete a flow study and make recommendations regarding increased flows in the Trinity River to restore fisheries. Increased flow need was developed in the Trinity River Flow Evaluation Study and recommended in the Trinity River Mainstream Fishery Restoration Draft EIS/EIR. Interior adopted on December 19, 2000 the Trinity River Mainstream Fishery Restoration Program ROD. Pursuant to the ROD, Interior implements a Program that seeks to increase Chinook salmon production primarily by making annual instream flow releases from the CVP's TRD that range from 369,000 AF of water in critically dry years to 815,000 AF in extremely wet years. The increased flow releases from the TRD reduce the amount of CVP water that can be diverted into the Sacramento River and thence from the Delta for irrigation, M&I, and wildlife refuge deliveries to South-of-Delta agricultural contractors.

Section 3406(d) of the CVPIA requires firm water supplies to be delivered to federal, state and some private wildlife refuges, as defined in the CVPIA. This supply is referred to as "Level 4" as outlined in the Refuge Water Supply Report and the San Joaquin Basin Action Plan, and is greater than the amount of CVP water previously delivered to the refuges. The CVPIA requires water sources of suitable quality, at a level of reliability greater than that for agricultural water service contractors. Because CVP water has been supplied to the refuges to meet CVPIA requirements, the ability of the CVP to deliver water to its agricultural service and M&I contractors has declined.

The CVPIA also includes several provisions to increase agricultural and M&I water costs. Important provisions include restoration fees, tiered water pricing, and conservation requirements.

Endangered Species Act

The ESA has reduced water supplies in the WSJ Region. The 1989 listing of the Sacramento winter-run Chinook salmon as a "threatened" species was the first listing to affect the CVP. In 1994, this listing was upgraded to "endangered". Management actions intended to protect this species have required structural and operational changes to maintain flows and lower water temperatures below Shasta Dam. Because a supply of cold water must be maintained in Lake Shasta for downstream temperature control, less water is available for agricultural and M&I water supply. Additional ESA listings include the Delta Smelt in 1993, Central Valley Steelhead trout in 1998, and the spring run Chinook salmon in 1999.

In order to minimize take of listed species, the CVP and SWP diversions from the Delta at the federal Jones Pumping Plant and the Banks Pumping Plant have been reduced and sometimes curtailed altogether, especially for Delta Smelt and winter-run Chinook salmon. The 1994 Bay-Delta Accord and the CALFED ROD, discussed below, established principles for water management to minimize and eventually mitigate the effect of ESA provisions on water supply.

In 2008 and 2009, the USFWS and National Marine Fisheries Service (NMFS) released Biological Opinions (BOs) on the status of Delta smelt (in 2008) and salmon and steelhead (in 2009). The BOs were released by NMFS as a consequence of litigation addressing endangered species requirements, and resulted in additional substantial reductions in CVP and SWP from the Delta, affecting the water supplies of many of the CVP contractors in the WSJ Region. In August 2016, the Bureau of Reclamation requested reinitiation of ESA Section 7 consultation on long-term operations of the Central Valley Project and State Water Project with the USFWS and NMFS. This consultation is underway.

Surface Water

While CVP supplies provide the majority of surface water supplies in the WSJ Region, some member agencies also have access to surface water supplies from the San Joaquin River and Kings River. For example, Patterson ID holds pre-1914 water rights for diversion from the San Joaquin River, while West Stanislaus ID holds junior rights for appropriation of 190,000 AFY. Banta-Carbona ID (approximately 123,000 AFY), Grasslands WD and Turner Island WD (approximately 10,500 AFY) also hold rights for diversions from the San Joaquin River. James Irrigation District and Tranquillity Irrigation District have access to surface water supplies from the Kings River.

Surface water quality in the WSJ Region is variable, but is typically better than the quality in the DMC. Maintaining stormwater quality is key to maintaining surface water quality in nearby rivers. Waters at high elevations that originate as snowmelt typically are of excellent quality, but irrigation drainage and waste discharges that run into the San Joaquin River on the valley floor can degrade the water quality. Dissolved salts and nutrients in agricultural return flows, as well as residual pesticides and herbicides, and seepage from percolation ponds can impact water quality in the river. Additionally, areas with agriculture

and cattle grazing, water can have elevated levels of nutrients, pathogens, and sediment. Urban runoff from industrial sites and roadways carrying pollutants such as petroleum hydrocarbons, metals and sediment that can also impact surface water quality. Arsenic exceedances have occurred at several surface water monitoring locations in the Region; arsenic appears to be naturally elevated in some locations in the San Joaquin Valley due to weathering processes (Summers Engineering, Inc., 2018). Water quality and flow monitoring is conducted to track water quality and associated parameters. The San Joaquin Valley Drainage Authority monitors surface water discharges in order to assist growers in compliance with Waste Discharge Requirements in the Western San Joaquin River Watershed.

Groundwater

The WSJ Region primarily overlies three groundwater subbasins within the San Joaquin Valley Groundwater Basin. These include the southern portion of the Tracy Subbasin, and the majority of both the Delta-Mendota Subbasin and the Westside Subbasin (Figure 2-8). A small portion of the WSJ Region overlies the Kings Subbasin.

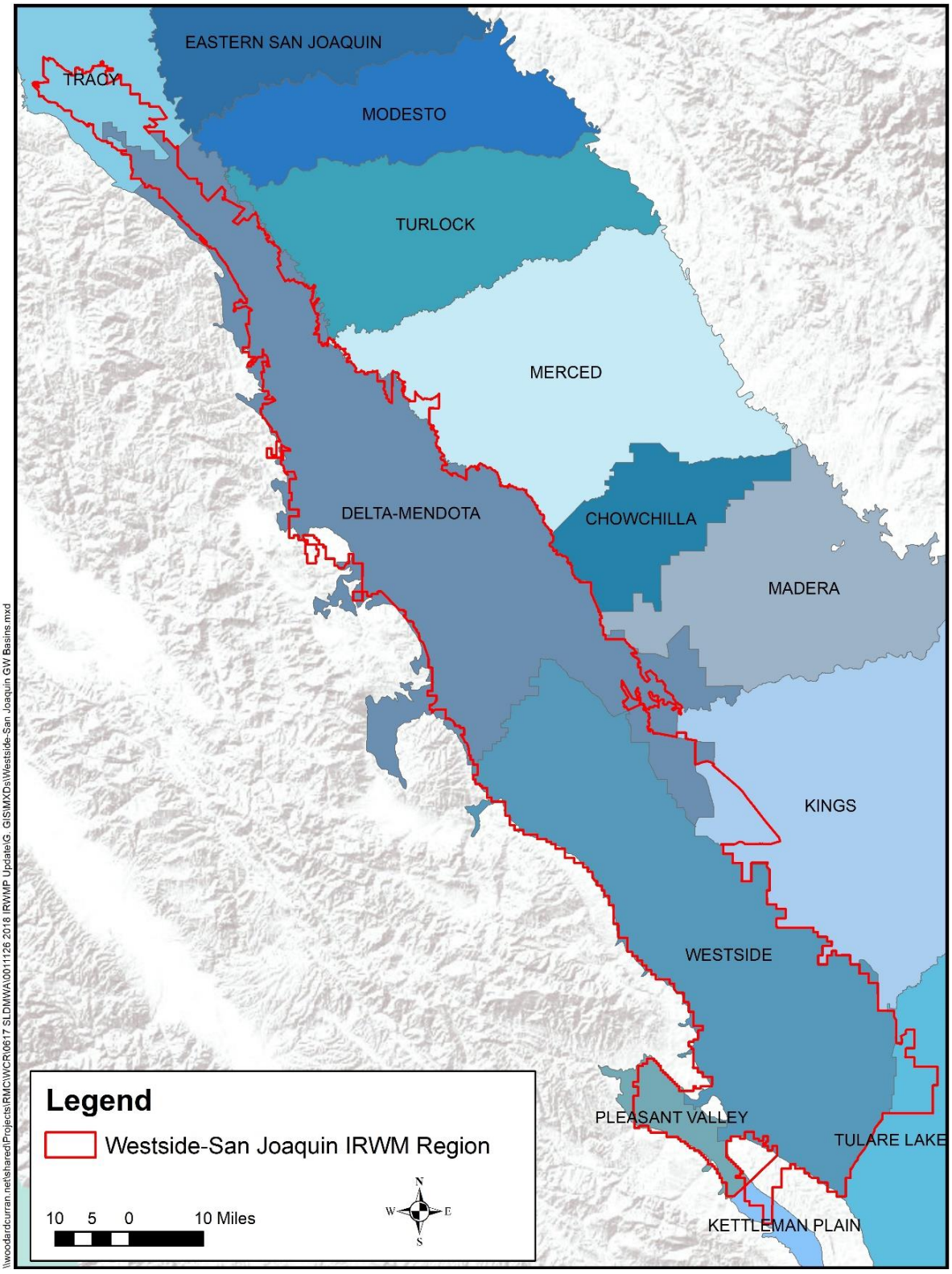


Figure 2-8: Groundwater Basins

Groundwater levels in the Region have been declining due to the long-term overdraft conditions caused by overpumping. Groundwater extraction in the Delta-Mendota, Tracy, and Westside Subbasins is limited as a supply option due to varying water quality conditions. To protect the long-term sustainability of groundwater resources, pumping has been significantly reduced in past years, allowing the groundwater subbasins to recover to some extent. Groundwater quality varies by subbasin and depth, also affecting water supply availability in the Region. In general, groundwater in the Region has high levels of TDS (Total Dissolved Solids). Groundwater pumped by the City of Tracy meets California Primary Drinking Water Standards (i.e. Maximum Contaminant Levels [MCLs]), but specific conductance and sulfate have consistently been above the California Secondary Recommended MCLs. Additionally, quality-impacting constituents such as nitrate, arsenic, chromium, boron and chloride have elevated levels, but comply with MCLs (EKI, 2016). In the Patterson area, salt levels are high and could eventually reach concentrations that would require treatment. In response to the elevated salt concentrations and associated taste concerns, many customers have installed salt-regenerative water softeners, which have resulted in significant salt loading to the City's wastewater treatment plant. The City has begun installing deeper wells, below the Corcoran Clay, to provide protection from source water contaminants and capture water with lower salinity. In 2008, the City approved a non-potable water program that is currently being used to irrigate public and commercial landscaping using the lower quality groundwater, helping to match quality to use and reduce demands on the high quality, potable groundwater supply. The infrastructure for the program is being designed and constructed to convey recycled water in the future for non-potable use (RMC, 2016). Los Banos has had to remove one well from service due to uranium concentrations exceeding the Primary MCL. Another well was put on standby in 2010 due to arsenic levels but became active again in 2012 (Provost & Pritchard, 2016a). Water quality and quantity within the subbasins underlying the WSJ Region are described in more detail beginning on page 2-22.

Sustainable Groundwater Management

In November 2009, the California State Legislature amended the Water Code with Senate Bill (SB) x7-6, which mandates a statewide groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations across California. In accordance with this amendment, DWR developed the California Statewide Groundwater Elevation Monitoring (CASGEM) program, which established locally-managed groundwater elevation monitoring in all of California's alluvial groundwater basins. The CASGEM program also include a Groundwater Basin Prioritization, a statewide ranking of groundwater basin importance incorporating criteria such as groundwater reliance and water quality to help evaluate the need for additional monitoring. Table 2-1 shows the determined prioritization of the Tracy, Delta-Mendota, Westside, and Kings Subbasins as of June 2014.

Table 2-1: Groundwater Basin Priority

Subbasin	Overall Basin Priority
Tracy	Medium
Delta-Mendota	High
Westside	High
Kings	High

In September 2014, Governor Jerry Brown signed a three-bill package known as SGMA (CA Assembly, 2014c). SGMA outlines a process and procedures for achieving groundwater sustainability, and establishes

a new structure for managing California's groundwater resources at a local level by local agencies. As part of SGMA implementation, DWR required local agencies in high and medium priority groundwater basins to form Groundwater Sustainability Agencies (GSAs) by June 30, 2017. These GSAs are the entities charged with implementation of SGMA and groundwater basin compliance. As of September 2018, it appears that the majority of the Delta-Mendota Subbasin will be covered by three GSAs or coordinating GSAs: the Northern Region GSAs, Central Region GSAs, and San Joaquin River Exchange Contractors Water Authority GSAs. Other GSAs covering portions of the Delta-Mendota Subbasin include the Grassland GSA, Aliso Water District GSA, Farmers Water District GSA, and Fresno County Management Areas A and B. The Westside Subbasin will be covered by a single GSA, Westlands Water District. The Tracy Subbasin will be covered by numerous GSAs. Additional detail on SGMA coordination is included in Section 11.1. Once established, the GSAs will be responsible for developing and implementing GSPs to achieve basin sustainability by the year 2040. GSPs must include measurable objectives and sustainability goals and together must cover the entire groundwater basin.

Subbasins

Tracy Subbasin

Review of hydrographs for the Tracy Subbasin indicate that, except for seasonal variation resulting from recharge and pumping, the majority of water levels in wells have remained relatively stable over at least the last 10 years (DWR unpublished data; San Joaquin County Flood Control unpublished data). Based on monitoring well data from the last 15 years, water levels from the semi-confined aquifer above the Corcoran Clay have been relatively stable with no long-term trend or significant seasonal fluctuations. Within the lower confined zone of the Tulare Formation, water levels show some seasonal variability. Since 2005, decreased pumping from City-owned wells have led to increasing water levels across the Tulare Formation (EKI, 2016). There are no published groundwater storage values for the entire basin; however, there are estimates that groundwater storage capacity for the Tracy-Patterson Storage Unit is 4,040,000 AF. This storage unit includes the southern portion of the Tracy Subbasin, from approximately one-mile north of Tracy to the San Joaquin-Stanislaus County line. Since the Tracy Subbasin comprises roughly one third of the Tracy-Patterson Storage Unit, it can be inferred that the approximate storage capacity of the southern portion of the Tracy Subbasin is on the order of 1,300,00 AF.

Areas of poor water quality exist throughout the subbasin, including areas of elevated chloride along the western side of the subbasin, in the vicinity of the City of Tracy, and along the San Joaquin River. Areas of elevated nitrate occur in the northwestern part of the subbasin and in the vicinity of the City of Tracy. Areas of elevated boron occur over a large portion of the subbasin from south of Tracy and extending to the northwest side of the subbasin (DWR, 2006a).

Under SGMA, the Tracy Subbasin has been categorized as a medium-priority basin, and is required to prepare a GSP by January 31, 2022. Forthcoming work to comply with SGMA will yield a full picture of water supply and quality within the Subbasin.

Delta-Mendota Subbasin

The Delta-Mendota Subbasin includes portions of San Joaquin, Stanislaus, Merced, Fresno, and Madera Counties. In February 2016, SLDMWA submitted requests to DWR to revise the boundary of the Delta-Mendota Subbasin. The requests included three modifications to align the subbasin boundaries with water district boundaries in order to clarify and support regional groundwater planning efforts. In December 2016, DWR issued an interim update to its Bulletin 118 series and posted the approved revised basin boundaries. The new boundary is displayed in Figure 2-8. The northern boundary of the Delta-

Mendota Subbasin begins just south of the City of Tracy. The eastern boundary generally follows the San Joaquin River and Fresno Slough. The southern boundary is near the small town of San Joaquin. The subbasin is bounded on the west by the Tertiary and older marine sediments of the Coast Ranges.

Average annual precipitation is nine to eleven inches, increasing northwards. Groundwater flow was historically northwestward, parallel to the San Joaquin River. Recent data, however, shows flows to the north and east, toward the San Joaquin River. Based on current and historical groundwater elevation maps, groundwater barriers do not appear to exist in the subbasin.

Changes in groundwater levels are based on annual water level measurements by DWR and cooperators. Water level changes were evaluated by quarter and computed through a custom DWR computer program using geostatistics (kriging). On average, the subbasin water level has increased by 2.2 feet from 1970 through 2000 with fluctuations over that time period. Estimations of the total storage capacity of the subbasin and the amount of water in storage as of 1995 were calculated using an estimated specific yield of 11.8 percent and water levels collected by DWR and cooperators. According to these calculations, the total storage capacity of this subbasin is estimated to be 30,400,000 AF to a depth of 300 feet and 81,800,000 AF to the base of fresh groundwater. These same calculations give an estimate of 26,600,000 AF of groundwater to a depth of 300 feet stored in this subbasin as of 1995. Under, SGMA, the applicable GSAs are working to establish water budgets for the subbasin, which will help direct future groundwater management.

The groundwater in this subbasin is characterized by mixed sulfate to bicarbonate types in the northern and central portion with areas of sodium chloride and sodium sulfate waters in the central and southern portion. TDS values range from 400 to 1,600 mg/L in the northern portion of the subbasin, and from 730 to 6,000 mg/L in the southern portion of the subbasin. The California Department of Public Health (CDPH), which monitored Title 22 water quality standards through 2014, reports TDS values in 44 public supply wells to range from 210 to 1,750 mg/L, with an average value of 770 mg/L. A typical range of water quality in wells is 700-1,000 mg/L. Shallow, saline groundwater occurs within about 10 feet of the ground surface over a large portion of the subbasin. There are also localized areas of high iron, fluoride, nitrate, and boron in the subbasin (DWR, 2006b). SGMA work will also include characterization of groundwater quality and any issues impacting groundwater sustainability.

Westside Subbasin

The Westside Subbasin predominantly underlies the Westlands WD service area. The subbasin generally coincides with the Westlands WD boundaries on the north, east, and south. To the west, the subbasin is bounded by the Coast Range foothills. The subbasin is bordered to the north and northeast by the Delta-Mendota Groundwater Subbasin, and on the east and southeast by the Kings and Tulare Lake Groundwater Subbasins. Average annual precipitation varies across the subbasin from 7 inches in the south to 9 inches in the north.

Westlands WD is currently developing a GSP, which will provide an updated characterization of groundwater storage and quality. The following descriptions are based on DWR's 2003 Bulletin 118, and will be updated as appropriate when further information from the GSP. Historically, groundwater levels were generally at their lowest levels in this subbasin in the late 1960s, prior to importation of surface water. When the CVP began delivering surface water to the San Luis Unit in 1967-68, groundwater levels gradually increased to a maximum elevation by around 1987-88, falling briefly during the 1976-77 drought. Water levels began dropping again during the 1987-92 drought with water levels showing the effects until 1994. Through a series of wet years, after the drought, 1998 water levels recovered nearly to 1987-88 levels.

Estimated groundwater storage capacity for this subbasin is 10,940,000 AF in the zone ranging from around 10 to 200 feet in the Mendota-Huron storage unit. This is over an area of 626,000 acres and assumes a specific yield varying from 8.0 to 9.6 percent. Most of this storage occurs in the upper aquifer. Using an average thickness of 675 feet (ground surface to top of Corcoran Clay) and a specific yield of 9 percent over an area of 600,000 acres, the estimated storage capacity of the upper aquifer is approximately 36,500,000 AF. Westlands WD is currently in the process of developing a GSP for the subbasin, which will address groundwater storage and provide updated estimates of storage capacity.

Groundwater in the upper aquifer is typically high in calcium and magnesium sulfate. Groundwater below 300 feet and above the Corcoran Clay shows a tendency of decreased dissolved solids with increased depth. Most of the groundwater of the lower aquifer is of the sodium-sulfate type. The difference in quality between the upper and lower aquifers is that the lower confined zone contains less dissolved solids. Groundwater in western Fresno County can have an upper TDS range between 2,000 and 3,000 mg/L; CDPH data indicate an average TDS of 520 mg/L in the subbasin with a range from 220 mg/L to 1,300 mg/L based on the analyses of six Title 22 monitoring wells (DWR, 2006c). (Note the SWRCB Division of Drinking Water now regulates public drinking water systems in place of CDPH.) Other studies indicated dissolved solids in shallow groundwater can be greater than 10,000 mg/L at some locations in the lower fan areas. One sample had a TDS of 35,000 mg/L. High TDS is a key groundwater impairment in this subbasin. Additionally, groundwater in certain areas contains selenium and boron that may affect usability (DWR, 2006c). In addition to addressing groundwater storage, the GSP for the Westside Subbasin will include discussion of water quality and its impacts on water supply and overall groundwater sustainability.

Kings Subbasin

A small portion of the western section of the Kings Subbasin is also included in the Region. The western boundary of the Kings Subbasin is the eastern boundaries of the Delta-Mendota and Westside Subbasins. Unconsolidated continental deposits make up the majority of the groundwater aquifer system within the subbasin. In the northwestern part of the subbasin, the groundwater is sodium chloride type. Pesticides have posed a significant water quality challenge in the subbasin, but have been concentrated on the eastern side and are therefore outside the boundaries of the WSJ Region.

According to Bulletin 118 (DWR, 2006d), groundwater in storage in Kings Subbasin was about 93 million AF in 1961. Since then, however, groundwater pumping in excess of the long-term sustainable yield has led to a steady, gradual decline in groundwater levels. The general movement of groundwater in the Kings Subbasin is from the northeast to the southwest direction. However, pumping depression zones resulting from overdraft conditions have altered the flow directions towards the depression areas. A major depression area, with groundwater levels lower than 75 feet below sea level, is located in the western half of Kings Subbasin (WRIME, 2007).

Groundwater Contamination in the Region

In 2014, the California Assembly passed Assembly Bill (AB) 1249, mandating that IRWM regions include information in their plans about nitrate, arsenic, perchlorate, and hexavalent chromium contamination in groundwater (CA Assembly, 2014a). This section addresses that requirement.

In 2017, the U.S. Geological Survey (USGS) released a study of groundwater quality in the Western San Joaquin Valley, specifically the Delta-Mendota Subbasin and Westside Subbasin. The study evaluated monitoring data for constituents including nitrate, arsenic, perchlorate, and hexavalent chromium. Perchlorate was found at moderate concentrations in about 15% of groundwater resources used for public drinking water (USGS, 2017). Hexavalent chromium exceeded the MCL in about 25% of

groundwater resources and arsenic exceeded the MCL in 10% (USGS, 2017). A 2015 study found similar results, reporting that hexavalent chromium concentrations exceeded the MCL in approximately 11% of samples from wells along the west side of the Central Valley (Izbicki et al., 2015). High concentrations of hexavalent chromium likely result from high levels of chromium in source rock which eroded to form aquifers in the area (Izbicki et al., 2015). Irrigation return can also mobilize chromium from unsaturated zones (Izbicki et al., 2015).

In 2010, the City of Los Banos took two wells out of service due to detections of arsenic (Provost & Pritchard, 2016a). In 2007, one of the City of Patterson's wells tested high in nitrates, and the well was converted to a water source for the non-potable system (RMC, 2016). The City of Patterson is currently conducting a Feasibility Study to assess the alternatives available to meet the hexavalent chromium MCL. The alternatives for evaluation will also include a consideration of nitrate treatment options, as nitrate reduction has been identified as a long-term water quality improvement goal in the City's Water Master Plan (RMC, 2016).

In the Tracy Subbasin, nitrate, arsenic, and chromium are present in the groundwater at levels that are elevated but in compliance with MCLs. Elevated nitrate levels occur primarily in the northwestern portion of the Tracy Subbasin (which lies outside the boundary of the IRWM Region) and near the City of Tracy. Arsenic levels are higher in the Zone A Aquifer (the shallow aquifer located directly beneath the Corcoran Clay) than in the deeper zones. Patterns of groundwater extraction in Tracy do not appear to be negatively impacting groundwater quality (EKI, 2016).

Work occurring under SGMA will provide an improved picture of water quality within the Region and may also identify actions to address potential or existing contamination.

Recycled and Reclaimed Water

The WSJ Region and the participating IRWM planning agencies recognize the value of recycled water and plan to maximize the use of this resource. The wastewater facilities within the Region include the Santa Nella WD Eastside Wastewater Treatment Plant, Coalinga Wastewater Treatment Plant, and the Cities of Patterson and Tracy Wastewater Treatment Plants. While generally not producing recycled water at this time, these facilities may be capable of producing tertiary-treated Title 22 recycled water for beneficial use throughout the Region.

Currently, Merced County is working on increasing its use of reclaimed water, especially for agricultural uses. Farmers are encouraged to efficiently use water and to adopt reclaimed water methods. It is also targeting production facilities with high water use and prohibiting them from overusing water unless they adopt the use of recycled or reclaimed water.

To address this under-utilized source of water, multiple recycled and reclaimed water projects have been included in this WSJ IRWMP. In particular, the NVRRWP, being implemented by Del Puerto WD and the Cities of Modesto and Turlock (located in the East Stanislaus IRWM Region), will deliver up to 26,000 AFY of recycled water to Del Puerto WD agricultural users by early 2019, when the second component of the project is completed. The Modesto portion of the project was completed in July 2018, and the Turlock portion began construction in late 2018. The project began delivering recycled water to Del Puerto WD agricultural customers in 2018. Additionally, both Patterson ID and San Luis WD have put forth projects to capture and recirculate agricultural tail water back into the irrigation systems, and the City of Patterson expanded its non-potable water irrigation system, matching water quality to water demand needs and reducing demands on potable supplies. The recycled and reclaimed water produced by these projects has augmented the currently unreliable CVP supplies in the area.

2.3 Water Supplies and Demands

The most recent water supply gap analysis for the Region was conducted in 1999 as part of the *2003 Westside Integrated Resources Management Plan*. That analysis is included in this section, along with more recent water supply and demand information from individual cities within the Region. The Cities of Tracy, Patterson, Newman, and Los Banos have each prepared a 2015 Urban Water Management Plan (UWMP) in compliance with the Urban Water Management Planning Act. The law requires water suppliers who provide water to more than 3,000 customers or supply more than 3,000 AFY to prepare and adopt an UWMP every five years. Water supplies and demands for each city are described in this section. Additionally, eleven agricultural water suppliers within the WSJ Region have prepared Agricultural Water Management Plans (AWMPs) in compliance with SB x7-7, passed in 2009. This legislation requires agricultural water suppliers that provide water to greater than 25,000 irrigated acres to adopt and submit AWMPs with specific content to DWR and to implement efficient water management practices. Supplies and demands from those plans have also been referenced in this section. Additional water suppliers exist in the region; however, due to availability of information, only those with UWMPs or AWMPs are discussed here.

Westside Water Supply Gap Analysis

The Westside Water Supply Gap Analysis*,* completed for and presented in the *2003 Westside Integrated Resources Management Plan,* was developed using USBR guidelines (Stoddard & Associates, 1999; SLDMWA, 2003). The Supply Gap Analysis calculated potential water use and projected water supply for 1999 and 2025, with a focus on CVP export contractors who have had their water supplies adversely affected by the ESA, CVPIA, D-1485, D-1641, and other state and federal regulations. Although this source has not been updated since the Region's first IRWMP, it remains relevant to the IRWMP as part of the overall water supply picture for the Region. Total potential agricultural water use was estimated at 2.64 million AF for 1999 and 2.36 million AF in 2025, a decrease of 283 TAF. The decrease in potential agricultural water use was due primarily to the projected increase in on-farm water use efficiency. Municipal use of CVP agricultural water was projected to increase, from 6,176 AF in 1999 to 12,672 AF over that same period of time.

Table 2-2: Summary of CVP Agricultural Water Supply Gap at Various CVP Allocations, TAF

	100% Allocation		59% Allocation [1]		25% Allocation [1]	
	1999	2025	1999	2025	1999	2025
Surface Water	190	190	190	190	190	190
Groundwater	244	244	244	244	244	244
CVP [2]	1,835	1,829	1,100	1,096	479	478
Total Supply	**2,269**	**2,263**	**1,534**	**1,530**	**913**	**912**
Potential Use	**2,643**	**2,360**	**2,643**	**2,360**	**2,643**	**2,360**
Agricultural Gap	374	97	1,109	830	1,730	1,448
Gap from the Municipal Use of Agricultural Water [3]	0	0	1	2	3	6
Total Agricultural Contract Gap	**374**	**97**	**1,110**	**832**	**1,733**	**1,454**

1. CALSIM simulations estimate that contractors will receive about 59 percent allocation on a long-term average and 25 percent to 27 percent during a multi-year critical dry period.
2. Included in the total CVP supply is water from Westside Water Rights Settlement Contracts totaling 40,813 AF. This water is assumed to be reduced 25 percent when agricultural service contracts are reduced 55 percent or more.
3. The gap resulting from the municipal use of agricultural water is calculated separately because shortage provisions are equal to M&I service contracts.

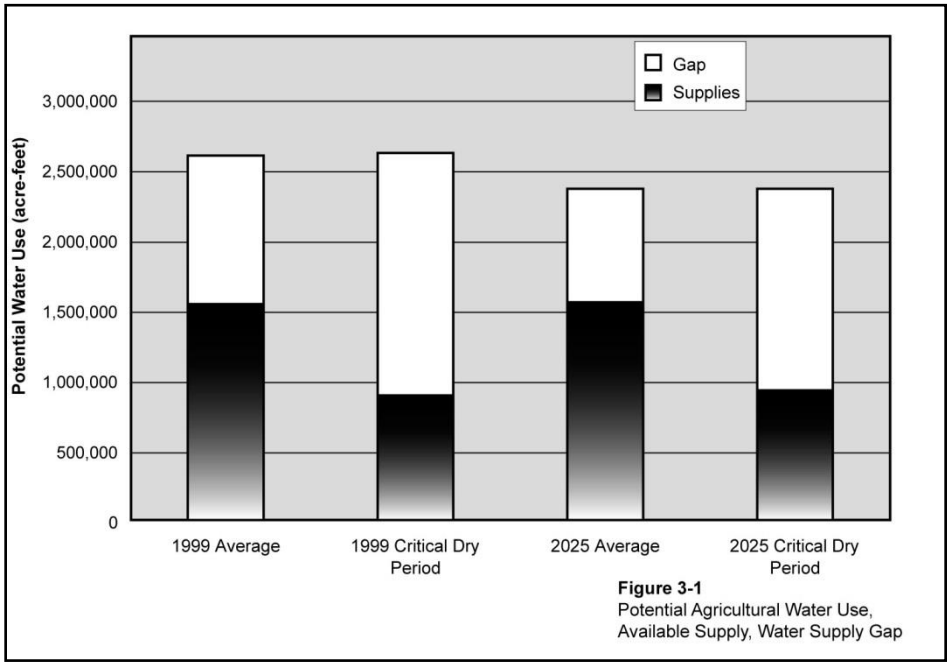


Figure 2-9: Potential Agricultural Water Use, Available Supply, Water Supply Gap

For the purposes of the 2019 WSJ IRWMP update, it is believed that the water supply gap for a 20-year planning horizon (2014-2039) is similar to the gaps shown through 2025. It is likely that the gap has changed as a result of increased regional water demands, a move towards permanent cropping, and more

limited water supplies, particularly resulting from the 2008 and 2009 BOs released by NMFS. The BOs resulted in substantial reductions in project water deliveries from the Delta, affecting the water supplies of many of the CVP contractors in the WSJ Region.

The water supply gap analysis has not been updated since completion of the 2003 Plan. The Region recognizes that many years have passed since the analysis and that it would be beneficial to update the water supply gap analysis for inclusion in a future WSJ IRWMP update (for example, following development of the Delta-Mendota and Westside GSPs). This has been noted in the Data Management section as well in Chapter 8, Data Management.

City of Tracy

The City of Tracy is located at the northern tip of the WSJ Region, within the boundaries of San Joaquin County. In 2015, the population was estimated to be 85,296. The City obtains water from both surface and groundwater sources. Surface water is imported from two wholesale providers: (1.) USBR, which supplies the City with CVP water via the DMC; and (2.) the South San Joaquin ID, which supplies Stanislaus River water. The City's groundwater resources are extracted from the Tracy Subbasin. Between 2011 and 2015, over 96% of the City's water production was sourced from surface supplies (EKI, 2016).

The City currently provides water to 24,500 metered service connections to residents within its city limits and portions of its sphere of influence. The majority of water demands stem from single-family residential accounts. From 2005 to 2015, the City's population increased by 9%. Tracy's proximity to the San Francisco Bay Area and Silicon Valley has attracted an influx of home buyers in recent years, and this growth is expected to continue. The highest growth is expected to occur in the industrial sector, where potable water demand is projected to increase by more than 200% (EKI, 2016). Table 2-3 shows the projected water demands from 2020 to 2040.

Table 2-3: City of Tracy Projected Water Demands

	2020	2025	2030	2035	2040
Total Water Demand (AF)	20,185	22,023	23,861	25,699	27,537

Source: EKI, 2016

The City anticipates that it can meet these increasing water demands through its existing sources. In the event of surface water supply shortage, the City plans on tapping into its groundwater reserves. The City currently only withdraws approximately 2,500 AFY of its 9,000 AFY allocation from the Tracy Subbasin. In the case of a surface water supply shortage, the City is prepared to temporarily increase groundwater extraction dramatically. In accordance with its Groundwater Management Policy, the City has the ability to increase production up to 22,000 AFY in a given year (EKI, 2016).

City of Patterson

The City of Patterson, located approximately 25 miles southeast of the City of Tracy, covers approximately 11.9 square miles of Stanislaus County. Its service area is a mix of residential, commercial, and industrial lands embedded in an agricultural valley. Agriculture is the primary economic driver in the area. Currently, groundwater from the Delta-Mendota Subbasin is the sole source of water supply (RMC, 2016).

As of 2015, there were 21,000 residents served through approximately 6,300 metered connections. Approximately 65% of water demand in the City can be attributed to single-family residential accounts. Recent population growth has been countered by local water conservation programs, so water

consumption has not significantly increased with population. The City of Patterson anticipates continued population growth and increasing water demands across all sectors (RMC, 2016). Table 2-4 shows projected potable, raw, and recycled water demands through 2040.

Table 2-4: City of Patterson Projected Water Demands

	2015	2020	2025	2030	2035	2040
Potable and Raw Water	3,216	6,376	8,058	9,020	9,982	10,944
Recycled Water Demand	0	0	214	429	643	857
Total Water Demand (AF)	**3,216**	**6,376**	**8,272**	**9,448**	**10,625**	**11,801**

Source: RMC, 2016

While current water supplies are limited to raw and treated groundwater, the City of Patterson has indicated a preferred future water supply portfolio that includes additional groundwater pumping, recycled water use, stormwater capture and recharge, and additional conservation. In 2008, the City approved a non-potable water program to use lower quality, fit-for-purpose water for irrigation of public and commercial landscaping. The non-potable system currently uses lower quality groundwater, but is being designed and constructed to receive recycled/reclaimed water in the future. As can be seen in Table 2-4, the City anticipates implementing a recycled water program by the year 2025 (RMC, 2016).

City of Newman

The City of Newman encompasses approximately 5.9 square miles in Stanislaus County, near the boundary to Merced County. The City was incorporated in 1908, but has recently experienced significant population growth as people living in more expensive regions move to the Central Valley. As of 2010, there were 10,224 people living in Newman, a 50% increase from the year 2000 (Gouveia, 2016).

Newman obtains its entire water supply from groundwater pumped from the underlying Delta-Mendota Subbasin. Single and multi-family residential connections account for the majority of water demand in the City. As the population continues to grow, demands are anticipated to increase accordingly. Table 2-5 shows projected water supplies and demand from 2020 to 2040. The City estimates that groundwater supplies are sufficient to meet all water demands through year 2040, even under multiple dry year conditions (Gouveia, 2016).

Table 2-5: City of Newman Projected Water Supplies and Demand

	2020	2025	2030	2035	2040
Supply totals	1,133	1,257	1,402	1,557	1,727
Demand totals	1,133	1,257	1,402	1,557	1,727
Difference	0	0	0	0	0

Source: Gouveia, 2016

City of Los Banos

The City of Los Banos is situated on the western side of Merced County, overlying the Delta-Mendota Subbasin. Of the 37,145 residents, the majority rely on the City of Los Banos Public Water System for water. Agricultural services, retail trade, and government are the City's largest industries. Population growth slowed from 2011 to 2015, but a growing new enterprise industry is imposing additional demand on water resources. It is assumed, for future water demand calculations, that population will grow at approximately four percent per year (Provost & Pritchard, 2016a).

Los Banos currently relies solely on groundwater for its water supply needs, extracting all of its supplies from the Delta-Mendota Subbasin via 13 active wells. Groundwater constituents in the subbasin have the potential to reduce the desirability and affordability of groundwater, and may limit the availability of water meeting Domestic Water Quality Standards. The City is therefore investigating acquisition of a surface water supply. In the meantime, the City is assuming that an adequate supply of groundwater is available to meet local water needs through 2040, as long as the City continues investing in necessary groundwater treatment. Table 2-6 shows the City's projected demands through 2040, along with their anticipated groundwater supplies to meet their needs (Provost & Pritchard, 2016a).

Table 2-6: City of Los Banos Projected Water Supplies and Demand

	2020	2025	2030	2035	2040
Supply totals	8,138	9,949	12,163	14,876	18,178
Demand totals	8,138	9,949	12,163	14,876	18,178
Difference	0	0	0	0	0

Source: Provost & Pritchard, 2016a

West Stanislaus ID

The West Stanislaus ID comprises 20,155 irrigated acres near the San Joaquin River National Wildlife Refuge. The West Stanislaus ID receives CVP water as well as local surface water from the San Joaquin River. Four District-owned groundwater wells provide additional irrigation water along with some privately-owned wells throughout the District (West Stanislaus ID, 2014).

The primary crops grown in the West Stanislaus ID are almonds, dry beans, cannery tomatoes, alfalfa, walnuts, apricots, corn, wheat, melons, grapes, and oats. In 2011, the District received 8,361 AF of CVP water and 60,472 AF of local surface water. Groundwater recharge occurs through applied irrigation, rainfall, and seepage from local streams and conveyance systems. This recharge provides an important groundwater supply source for entities in the area, including the City of Patterson and the Communities of Westley and Grayson (West Stanislaus ID, 2014).

Patterson ID

Patterson ID is located in Stanislaus County, east of the City of Patterson and west of the San Joaquin River. Patterson ID has a rich history in Stanislaus County dating back to the cession of California to the United States. The land currently within the Boundaries of the District was originally a 13,340-acre Mexican Land Grant called Rancho Del Puerto that was issued in 1844. In 1866, the land was sold to John Patterson of New York, Patterson Irrigation District's namesake. In 1908, through his heirs, Patterson's land became the Patterson Ranch Company to develop the land for farming. On February 10, 1909 the Patterson Ranch Company posted a public Notice of Appropriation at the point of diversion and recorded such notices in the office of the Stanislaus County recorder. The water right secured at the time was for a

quantity of fifteen thousand inches measured under a four-inch pressure, equivalent to 400 cfs. On April 12, 1955, the Patterson Water District was formed and the water rights of the Patterson Water Company were transferred to the Patterson Water District., ultimately becoming Patterson ID in 1998. In 1967, the district entered into a contract with the United States Bureau of Reclamation for water service from the DMC of the CVP. This contract included an allotment of 16,500 acre-feet of Project Water, in addition to 6,000 acre-feet of replacement water due to the interference of the construction of the CVP. Over time as the city of Patterson grew, PID size decreased, currently PID serves 12,660 acres of land that grow diverse crops from cactus to almonds to alfalfa. In 2010, Patterson ID received 36,768 AF of surface water (including federal and local surface water) and 8,190 AF of groundwater (5,040 AF pumped by the District and 3,150 by growers).

James ID

Lands within the James ID were originally part of a 72,000-acre patent received by the pioneer Jefferson G. James in 1858. In the 1910s, the Reclamation District constructed two channels through the James ID to make a continuous connection from the Kings River to the San Joaquin River. The James ID currently serves water to 60 farms on 23,874 irrigated acres of agricultural land located near the City of San Joaquin, southeast of the City of Mendota. Like Patterson ID, James ID is experiencing gradual shrinking of lands due to urban encroachment (Provost & Pritchard, 2016b).

The primary crops grown on James ID agricultural lands include cotton, alfalfa seed/hay, pistachios, almonds, tomatoes, grapes, and onions. Recently, there has been a trend in conversion from annual to permanent crops, averaging about 1,000 acres per year. The James ID allocates water to growers based on irrigated acreage. The District's Groundwater Management Plan outlines a policy that allows growers to transfer water to other users within or outside of the District. The District has made it a priority to encourage these transactions in order to maximize the utility of its water supply (Provost & Pritchard, 2016b).

The James ID receives surface water from two sources: (1.) San Joaquin River water via Fresno Slough, and (2.) CVP water. The District normally receives 9,700 AFY from the Fresno Slough in normal and wet years, and 7,600 AFY in dry years. James ID's contract with the CVP grants them up to 35,300 AFY of water. Between 2005 and 2014, the District received an average of 13,706 AFY, or only 39% of their contract amount. The District also owns 64 groundwater production wells, which it generally uses as a secondary source after all available surface water supplies have been allocated. In 2014, the District used 6,488 AF of surface water and 65,509 AF of groundwater. Several efforts have been made to optimize conjunctive use of surface and groundwater, particularly through groundwater recharge projects (Provost & Pritchard, 2016b).

Banta-Carbona ID

The Banta-Carbona ID covers 15,883 acres, 14,696 of which were irrigated agricultural lands in 2013. The District lies just east of the California Coast Range in San Joaquin County. In 2013, 46,333 AF of water from the San Joaquin River was used to irrigate these fields. A small portion of the water, about 417 AF, came from federal sources in 2013. The 2013 water rate in the District was $33/AF with a standard semi-annual charge of $14 for use. Though primarily an agricultural supplier, the District does supply a small amount of M&I water for Pre-1914 San Joaquin River water rights (Banta-Carbona ID, 2013).

The Banta-Carbona service area was once covered in a series of shallow sloughs, which since have been drained and leveled for agricultural use. Because of this origin, soils in the area generally have substantial clay and silt content. In 2013, more than 50% of all the irrigated land was growing almonds, tomatoes,

and alfalfa (Banta-Carbona ID, 2013). The AWMP predicts minimal land use changes between 2013 and 2018 because an economic downturn in the region has greatly slowed housing development (Banta-Carbona ID, 2013).

Central California ID

Central California ID is a relatively large district in the center of the WSJ Region. There are 5 different wildlife refuges within the service area of the District that cover approximately 45,000 acres in total. There are 141,821 acres of irrigated land within the District. To irrigate this land, the District was allocated 509,899 AF of water in 2011 for agricultural use from federal water projects. 23,872 AF of groundwater was pumped in that year to supplement the federal supply. Groundwater is typically pumped between the months of April and October from District wells. While water is billed at a flat rate outside of these months, between April and October, the rate structure switches to a tiered pricing scheme (Central California ID, 2014).

Primary crops in the Central California ID include alfalfa, cotton, and corn (double crop). Oats (double crop), tomatoes, and orchards also make up a significant portion of the crops. Fields are irrigated using furrow/flood irrigation predominantly according to the most recent AWMP (Central California ID, 2014).

In 2014, the distribution system in the District was largely made up of unlined canals. No canals are piped in the district, but there is an extensive system of private canals whose characteristics are not documented (Central California ID, 2014).

Columbia Canal Company

The privately held Columbia Canal Company was originally formed in 1926 to manage the San Joaquin River riparian water rights held by landowners in this portion of Madera County. The Company distributes water to 45 different farms with 15,403 acres of irrigated land under a "Contract for Exchange of Waters" that has been negotiated with USBR. 59,000 AF in annual deliveries is provided under the contract in wet years and 45,000 AF in dry years. However, these amounts do not meet demand even in wet years. Farmers therefore supplement their supply by pumping groundwater from the Madera Groundwater Basin (Columbia Canal Company, 2012).

Between 2000 and 2011, the cropping pattern has changed dramatically from majority row crops to orchards. In 2011 orchards made up 74% of the agricultural product of the Company's service area, up from 9% in 2000. This has also caused a change in irrigation methods away from gravity and sprinkler irrigation toward micro-irrigation (Columbia Canal Company, 2012).

The coarse soils in the Company's service area led to significant canal seepage loss issues. For this reason, a campaign to line all of the 61 miles of canal began in the late 1990s. By 2012, about 80% of the canals were lined (Columbia Canal Company, 2012).

Del Puerto WD

Del Puerto WD serves 31,528 acres of irrigated lands with agricultural water on the western edge of the San Joaquin Valley, paralleling the Delta Mendota Canal. In 2015, the majority of Del Puerto WD's water supply was derived from banked water (27,292 AF), while the rest came from District groundwater pumping (12,855 AF) and the CVP (12,148 AF). Del Puerto WD's full CVP allocation is 140,000 AFY; however, there has been a general downward trend in the allocation percentage, with allocations as low as zero percent allocation in recent years (2014 and 2015). Private groundwater pumping is estimated to be approximately 62,000 AF annually. The District, in partnership with the Cities of Modesto and Turlock, is in the process of constructing the NVRRWP, which is anticipated to generate approximately an extra

59,000AFY of recycled water by buildout. This will provide a much-needed reliable source of supply for the District who has struggled with contract allocation shortages for years (Del Puerto WD, 2017).

Sprinkler irrigation is the dominant form of application on fields that are predominantly almonds as of 2015. Apricots, tomatoes, beans, wheat, and walnuts are also grown but make up a much smaller portion of the acreage (Del Puerto WD, 2017).

Firebaugh Canal WD

Firebaugh Canal WD lies in the southern half of the WSJ Region in Fresno County. In 2011, the District had 21,761 irrigated acres and received 85,232 AF of federal agricultural water. The District also used 3,088 re-used tailwater and 3,005 AF of District groundwater to supplement demand. Cotton, alfalfa, tomatoes, trees, and melons are the primary crops grown on the 97 farms in the District. Most of the water is distributed onto fields using low volume drip irrigation (Firebaugh Canal WD, 2014).

Because the District relies almost completely on surface water, summer month flow shortages pose the only real restrictions to water use in the District. High concentrations of clay in the soils make subsidence and slow percolation potential concerns for the District if they look to expand their capacity by supplementing supply with groundwater pumping or groundwater recharge (Firebaugh Canal WD, 2014).

Panoche WD

With 37,436 irrigated acres, Panoche WD lies in the southern section of the WSJ Region. Water supplies for the 61 farms in the District come from two principal sources: federal agricultural water and transferred water from surrounding suppliers. The District received 46,827 AF in 2012, the majority of its supply, from the DMC and the San Luis Canal. That same year, the District also obtained 19,009 AF in transferred water to meet demand. In years in which federal supplies are low, the District receives water from Central California ID. Allocations in the district are prorated among farmers based on how much acreage each water user has. A tiered rate system promotes water conservation among water users. Drip irrigation dominates the irrigated acreage (Panoche WD, 2014).

Poorly drained soils with tile drainage systems have put limitations on the agricultural production in the District. Additionally, water quality issues such as boron content and salinity have limited the reuse of shallow groundwater. Drainage water is managed carefully by the District. As part of the Panoche Drainage District, all farmers are mandated to sequester all tailwater on each operation in order to achieve regional drainage reduction goals. All drainage water is recycled back into the delivery system to maintain low TDS and boron concentrations in the blended mix (Panoche WD, 2014).

San Luis WD

Located near the City of Los Banos on the western side of the San Joaquin Valley, San Luis WD was formed in 1951 and as of 2012 had a total acreage of 64,502. 31,000 of those acres are irrigated. Approximately 5,347 of that acreage is federally owned for CVP project facilities, habitat, and parks. In water year 2011, the District received 809 AF in federal water for urban use and 20,788 AF in federal water for agricultural use. Because of shortages from federal sources, the District relies heavily on transferred water. Transferred water in fact made up the majority of its supply with 58,849 AF in the 2011 water year. With a rate structure based on water usage, the average water charge in the District is more than $175 per AF. Water prices have been steadily increasing, causing the number of acres of fallowed land to subsequently increase as water is transferred to higher value land (Provost & Pritchard, 2012).

Over the decades, there has also been a shift toward permanent crops away from row crops. Almonds now make up almost two-thirds of the crops grown in the San Luis WD. Because of this shift, current irrigation practices are predominantly drip and micro-irrigation (Provost & Pritchard, 2012).

Westlands WD

The largest district in the WSJ Region, Westlands WD lies in the southern section with a service area of 614,000 acres. 568,000 of those acres are irrigated. In 2016, there were 700 different water users in the District and more than 1,000 miles of pipeline through the District to distribute water to those water users. Water transfers are a crucial element of the Westlands WD supply, both between other districts and between water users within the District. In 2011, surface water supplies totaled 1,041,566 AF, with 983,306 AF coming from federal sources and 121,951 AF from water transfers. Groundwater use totaled 44,773 AF (Westlands WD, 2012).

In most years, the District's water users produce over 60 different crop varieties. In 2011, cotton, tomatoes, and almonds made up the largest portion of crops in the District. Since the District encompasses 614,000 acres, soil characteristics and groundwater quality vary throughout the District. The District has identified favorable recharge areas in the western area of the District. Based on current groundwater pumping practices, the majority of the land in the District pumps groundwater and is not limited by water quality concerns in the Lower Aquifer.

2.4 Social and Cultural Makeup

This section describes the social and cultural characteristics of the WSJ IRWM planning region.

Cultural Resources

The service areas of the Delta Division and San Luis Unit contractors include primarily valley and lower foothill lands located within the central and southern San Joaquin Valley, along the western margin of the valley, at the interface of the valley, and at the lower reaches of the Diablo and Temblor Ranges of the Central Coast Ranges. This area contains a variety, but limited number of water sources and resource zones. Prehistoric use and occupation focused on these features, particularly around the confluences of streams and within the ecotones created at the interface of foothill and valley lands. Drainages and associated natural levees and benches were moderately to intensively utilized, while uplands were visited for oak and other resources on a more seasonal basis.

Much of this area has been affected by ranching for over 100 years and by agriculture during the past 50 to 100 years. The most recent impacts derive primarily from the construction of water distribution facilities, major transportation routes (Interstate 5 in particular), and agricultural equipment and storage buildings.

Cultural History in the Region

Interior California was initially visited by Anglo-American fur trappers, Russian scientists, and Spanish-Mexican expeditions during the early part of the nineteenth century. These early explorations were followed by a rapid escalation of European-American activities, which culminated in the massive influx fostered by the discovery of gold at Coloma in 1848. The influx of miners and others during the Gold Rush set in motion a series of major changes to the natural and cultural landscape of California that would never be reversed.

Early Spanish expeditions arrived from Bay Area missions as early as 1804, penetrating the northwestern San Joaquin Valley (Cook, 1976). By the mid-1820s, hundreds of fur trappers were annually traversing the

valley on behalf of the Hudson's Bay Company (Maloney, 1945). By the late 1830s and early 1840s, several small permanent European-American settlements had emerged in the Central Valley and adjacent foothill lands, including ranchos in the interior Coast Range.

With the discovery of gold in the Sierra Nevada, large numbers of European-Americans, Hispanics, and Chinese arrived in and traveled through the Central Valley. The mining communities' demand for hard commodities led quickly to the expansion of ranching and agriculture throughout the valley and logging within the foothill and higher elevation zones of the Sierra Nevada. Stable, larger populations arose and permanent communities slowly emerged in the Central Valley at this time, particularly along major transportation corridors. Of particular importance was the transformation brought about by construction of railroad lines.

The Southern Pacific and Central Pacific Railroads and a host of smaller interurban lines to the north around the City of Stockton began intensive projects in the late 1860s. By the turn of the century, nearly 3,000 miles of lines connected the cities of Modesto and Stockton with points south and north. Many cities in the Central Valley were laid out as isolated railroad towns in the 1870s and 1880s by the Southern Pacific Railroad, which not only built and settled, but also continued to nurture the infant cities until settlement was successful. The Southern Pacific main line proceeds through or adjacent to the service areas of the Delta Division, and traverses the Central Valley a short distance east of the service areas of the San Luis Unit.

Intensive agricultural development soon followed, since railroads provided the means for product to be transported to a much larger market. Agricultural land conversion began long before the development of water supply projects. By the end of the nineteenth century, a substantial portion of the valley was being intensively cultivated, with increasing mechanization through all of the twentieth century and substantial expansion of cultivated acreage with the arrival of water from the CVP.

Current Inventory of Cultural Resources

A total of 156 archaeological and historic sites are currently documented within the service areas of the Delta Division and San Luis Unit contractors. These include sites that contain exclusively prehistoric material, sites with only historic material, and sites with mixed prehistoric and historic components and structures. Prehistoric sites are represented by habitation areas (village sites) in which both habitation and special-use activity areas are represented; mortuary sites, usually associated with habitation sites; specialized food-procurement and food-processing sites including milling areas; and other site types representing a variety of specialized activities. Historic sites are represented by a range of types, including buildings and structures dating to the nineteenth through mid-twentieth centuries; historic transportation features; water distribution systems; occupation sites and homesteads with associated features such as refuse disposal sites, privy pits, barns, and sheds; historic disposal sites associated with historic communities; and ranch complexes. Some of these prehistoric and historic sites have been determined eligible for inclusion on the National Register of Historic Places (NRHP) through consultation between a federal agency and the State Historic Preservation Office. Others remain unevaluated in relation to NRHP eligibility criteria.

In addition to formally recorded sites, it is clear that a large number of both prehistoric and historic sites remain undiscovered within the Region simply because, for many areas, especially undeveloped ranch and farm lands, a formal archaeological inventory survey has never been undertaken. In addition, the DMC itself is now a historic site subject to National Historic Preservation Act.

Regional Economic Issues and Trends

The western San Joaquin Valley is a highly agricultural region. There are no large cities or industries in the Region to provide an alternative economic base. The economy of this region is predominately driven by agricultural production and therefore, the availability of CVP agricultural water is an essential element to the economic health of the region. Smaller amounts of CVP water are used for M&I purposes and refuge water supply.

Economic Characteristics of the Westside-San Joaquin Region

Depending on water supply conditions, about 800,000 acres are partially or solely irrigated with CVP water. Other economic base industries include travel on the Interstate-5 (I-5) corridor, some petroleum extraction and tourism. Wetlands benefit the local economies by attracting hunters, naturalists, and bird-watchers.

M&I water use, which is a small share of total water use in the region, occurs primarily within the cities. The largest M&I use areas based on 2015 population estimates from the U.S. Census Bureau are the cities of Tracy (population 87,075), Patterson (population 21,498), and Los Banos (population 37,457) (U.S. Census Bureau, 2015). Tracy has recently grown at a rapid pace, becoming a suburb for commuters to the Bay Area.

All cities and towns within or adjacent to the WSJ Region have economies greatly dependent on agricultural production. These towns include San Joaquin, Tranquillity, Mendota, Firebaugh, Tracy, Patterson, Grayson, Dos Palos, Los Banos, Santa Nella, Newman, Gustine, Crows Landing, Westley, Vernalis, Stratford, and Avenal. All of these communities are strongly affected by the reliability of CVP agricultural water. Some of them are dependent upon agricultural water from the CVP for M&I use, and most have experienced dramatic rates of growth and urbanization over the last decade.

Disadvantaged Communities within the WSJ Region

A DAC, according to Prop 1 (CA Assembly, 2014b), is a community with a Median Household Income (MHI) less than 80% of the California statewide MHI. DWR compiled U.S. Census Bureau's American Community Survey (ACS) data from 2012 to 2016. This data was used in GIS to identify DACs within the WSJ Region. California's statewide MHI is $63,783 and thus, a community with an MHI less than or equal to $51,026 is considered a DAC. Based on these criteria, 93% of the geographic area of the WSJ Region is considered disadvantaged. Furthermore, a community with an MHI of less than 60% of the California statewide MHI, meaning an MHI of less than or equal to $38,270, is considered a severely disadvantaged community (SDAC). According the U.S. Census ACS 2012-2016 data, there are a number of SDACs throughout the Region, most of which are clustered in the southern portion. See Figure 2-10 for a map of the DACs and SDACs throughout the Region. Incorporated areas or Census-Designated Places (CDPs) that are categorized as DACs or SDACs based on DWR's compiled data are listed in Table 2-7.

The WSJ Region is also home to a large Hispanic or Latino population, which is greatly dependent upon production agriculture as a source of employment. At the county level, the percentage of Hispanic population runs from a low of 40.8% in San Joaquin County to a high of 58.2% in Merced County, according to U.S. Census Bureau estimates from 2015 (U.S. Census, 2015). However, Hispanic populations on the west side of the Valley are usually the majority in a given area and can be much higher percentages of the population. Improving water supply reliability and quality, and otherwise enhancing the conditions for production agriculture in this Region, will expand source of employment opportunities for these disadvantaged populations.

Note that according to the U.S. DOI Indian Affairs, as of January 2017 there are no listed federally recognized tribes within the Region (Mosley, 2017).

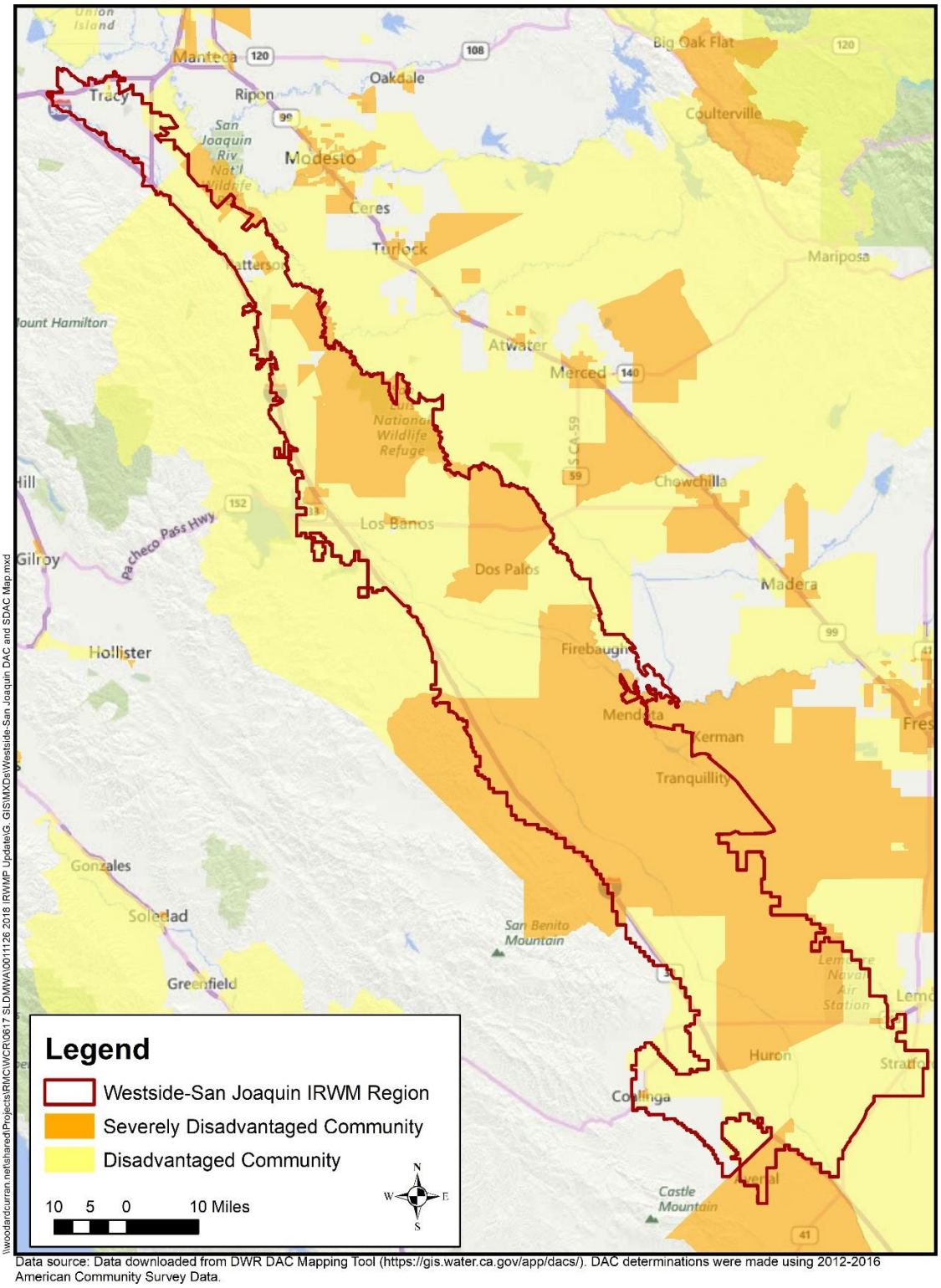


Figure 2-10: Disadvantaged and Severely Disadvantaged Communities in the Region

Table 2-7: DACs in the WSJ Region

Census-Designated Place[1]	Population	Median Household Income
Avenal	13,590	$35,103
Cantua Creek CDP	434	$32,368
Crows Landing CDP	255	$26,786
Dos Palos CDP	5,103	$36,509
Dos Palos Y	206	$16,656
Firebaugh	8,176	$36,181
Grayson CDP	990	$29,787
Gustine	5,684	$37,770
Huron	6,821	$25,321
Lemoore Station CDP	6,544	$42,750
Los Banos	37,012	$45,751
Mendota	11,394	$26,094
San Joaquin	4,011	$24,234
Santa Nella CDP	1,965	$27,778
South Dos Palos CDP	2,568	$41,992
Stratford CDP	1,041	$24,167
Three Rocks CDP	258	$35,789
Tranquillity CDP	724	$30,441
Westley CDP	707	$23,375
Westside CDP	269	$41,563

[1]Text in bold indicates SDACs
Data source: Data downloaded from DWR DAC Mapping Tool (https://gis.water.ca.gov/app/dacs/). DAC determinations were made by DWR using 2012-2016 American Community Survey Data.

Economically Distressed Areas within the WSJ Region

An economically distressed area (EDA), as defined in Prop 1, is a "municipality with a population of 20,000 persons or less, a rural county, or a reasonably isolated and divisible segment of a larger municipality where the segment of the population is 10,000 persons or less, with an annual MHI that is less than 85% of the statewide MHI, and with one or more of the following conditions as determined by the department:

1. Financial hardship
2. Unemployment rate at least two percent higher than the statewide average
3. Low population density" (CA Assembly, 2014b).

U.S. Census GIS data provided by DWR was used to identify EDAs in the WSJ Region (DWR, n.d.).

For this analysis, a municipality within the Region qualified as an EDA if it had a population less than 20,000 and an MHI less than or equal to $54,216 (85% of the CA MHI). The entire Region exhibits average unemployment rates at least two percent higher than the statewide average, and portions of the Region have a low population density (100 people or fewer per square mile). Based on these criteria, 94% of the geographic area of the WSJ Region is considered economically distressed. See Figure 2-11 for a map of the EDAs in the Region.

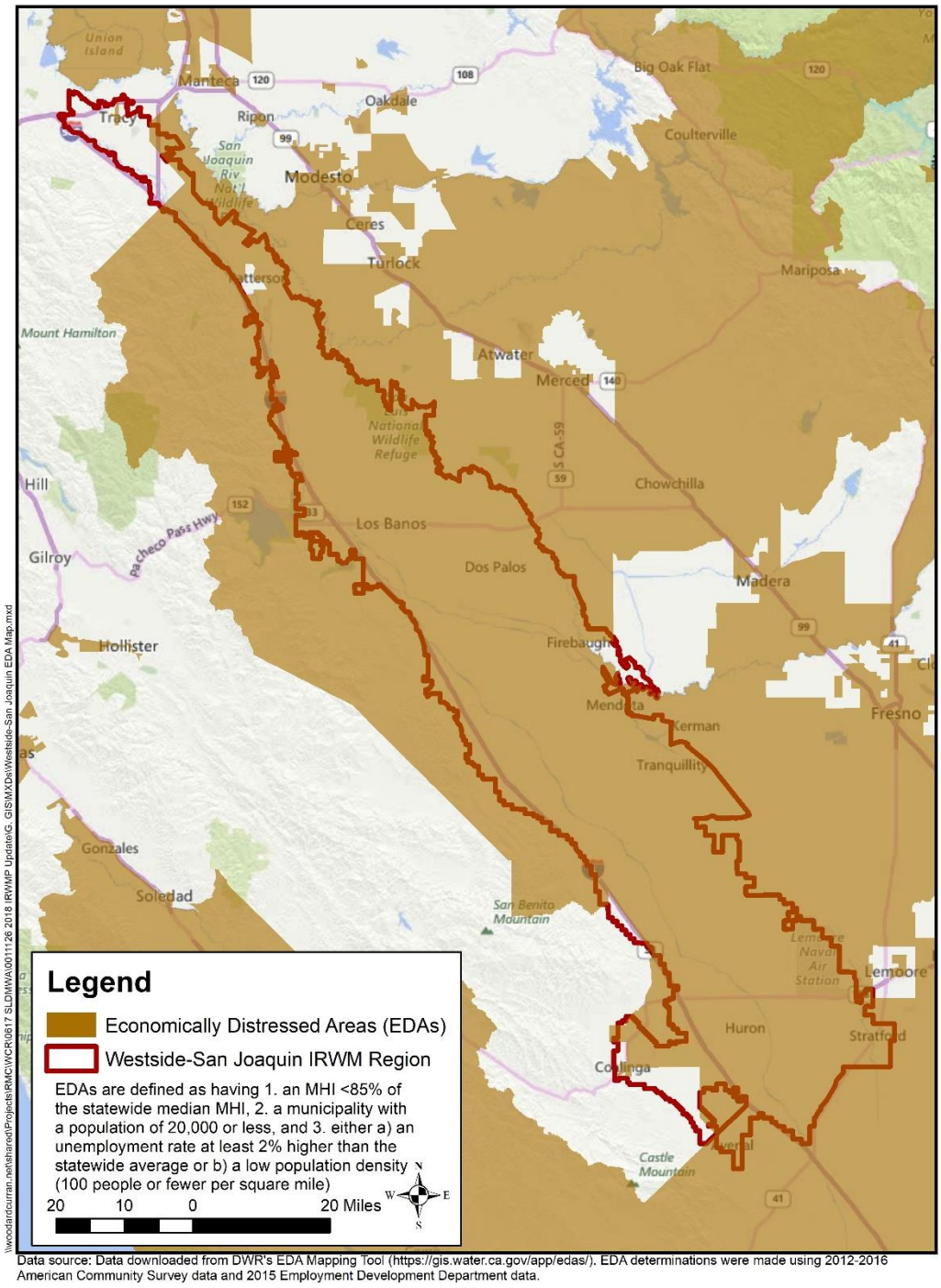


Figure 2-11: Economically Distressed Areas in the Region

2.5 Climate Change Impacts

Climate change is an important consideration for sustainable water management in the WSJ Region. Based on the climate change vulnerability assessment discussed in Chapter 13, water supply, water quality, flood management, and ecosystem habitats are all vulnerable to changing climatic conditions. Increasing

temperatures, changing precipitation and snowmelt patterns, and intensified storm events are expected to pose challenges for water management.

The Region is highly dependent on surface flows and snowpack in the Sierras, both of which are vulnerable to predicted climate change conditions, including increased evapotranspiration and temperatures and decreased precipitation. Warmer conditions expected due to climate change are likely to increase evapotranspiration, which in turn increases crop water demands. Climate change projections also indicate that rainfall may be less frequent but include more intense storm events, which would impact streamflow and surface water supply. Longer and potentially more frequent droughts may exacerbate water supply vulnerability. Earlier snowmelt may change the balance of local water storage, introducing the Region to both supply shortage and flood management challenges. Wildfires, low flow durations, and increases in storm intensity are expected to degrade water quality in local surface waters, which will also negatively impact aquatic and riparian ecosystems.

Water suppliers within the Region are anticipating increased evapotranspiration rates, extended landscaping growing seasons, and additional peak demands (Gouveia, 2016). Chapter 13 discusses the climate change vulnerability assessment for the Region in more depth.

2.6 Dependency on the Sacramento-San Joaquin Delta

Because the WSJ Region was formed based primarily on the SLDMWA member agency boundaries, and as SLDMWA was formed to manage flows from the Delta, the Region is heavily dependent upon the Delta for its water supplies through CVP and exchange contracts. A primary objective of the Region is to improve South-of-Delta water supply reliability in the Region. Due to shortages in CVP supplies and overall unreliability due to environmental factors, drought, and potential climate change impacts, it will be imperative for the Region to reduce its dependence on the Delta through the diversification of water supplies, implementation of recycled water projects, and long-term water supply planning that considers reliability and climate change impacts.

Chapter 3 Goals and Objectives

The WSJ IRWMP serves as a blueprint that will guide water resource management in the context of solving regional issues and conflicts. Since the first regional planning effort in 2001, triggered by the need to respond to diminishing supplies from the CVP due to implementation of the ESA, Clean Water Act, and CVPIA, issues and conflicts within the WSJ Region have evolved and currently include:

- Water supply reliability
- Drinking water quality
- Surface and groundwater quality protection
- Groundwater overdraft
- Protection and enhancement of aquatic, riparian, and watershed resources
- Water-related needs for DACs
- Need for recreational space and enhancement of outdoor areas for human use
- Flood protection
- Shallow water and drainage
- Climate change impacts that may exacerbate many of the issues listed above

These issues are consistent with CWC 10540(c), also listed in the 2016 Prop 1 Guidelines on page 49. Any Plan attempting to address these issues needs to be flexible and capable of reacting to the ever-changing regulatory climate. Recent and ongoing issues to be considered include implementation of the CVPIA, water quality regulations and 'fixes' in the Delta, and ESA provisions and resulting BOs. All of these issues have significantly reduced CVP water supply and reliability in the Region. This Plan needs to remain responsive to the progressive needs and imaginations of the local and regional stakeholders.

SLDMWA, serving in its leadership role for the region and acting as the RWMG, has coordinated the evolution of planning documents and the regional objectives since 2001. That evolution has been iterative and driven by stakeholder participation, and has resulted in this Plan's **overarching goal** to:

> *Provide a more reliable water supply, protect agricultural, municipal, and environmental water uses, and meet community needs, including those of disadvantaged communities, by improving water supply sustainability, water quality, and drainage.*

3.1 Region's Objectives

All of the projects incorporated in this Plan originated locally and, through the open participation forums sponsored by SLDMWA and other organizations, often evolved into Regional solutions. This approach to problem solving is typical within the Region.

Regional objectives have been developed in much the same way as these regional solutions. Often, while SLDMWA working groups or committees are considering a matter at hand, divisional representatives share local experiences and ideas resulting in a collaborative process. In hearing local perspectives, dialogues begin to coalesce around common problems and/or conflicts, divisional representatives begin contemplating how a project in San Joaquin County may alleviate a problem in Kings County. As a project evolves, the dialog passes from the informal committees to formal Water Agency Committees and ultimately the Board. If an action is adopted, then the discourse expands to other Regional and non-regional entities as appropriate. The inverse is also true, wherein the flow of ideas may emanate from outside the SLDMWA through various conduits of communication, and which may result in the adoption

of projects or objectives of external genesis. In this fashion, self-identified regional conflicts and challenges are identified and used as the platform from which the Regional objectives have been developed. Regional objectives are assessed frequently and iteratively by SLDMWA and stakeholders, which fosters robust projects capable of adjusting as Regional priorities change. As a result, the Plan reflects a diverse knit of mutually beneficial solutions.

As previously noted, the region's issues and conflicts play a critical role in the process of developing a comprehensive list of objectives. For the 2019 WSJ IRWMP Update, the Region's overarching goal and specific objectives were updated and prioritized by the Working Group and SLDMWA's Water Resources Committee at meetings in spring 2018. The needs of the region have resulted in the development of the following objectives:

Objective A: Provide for more reliable water supply south of the Delta

Objective B: Improve regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts

Objective C: Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation

Objective D: Provide potential for environmental and habitat improvement, including wetlands

Objective E: Promote projects that meet the needs of disadvantaged communities

Objective F: Promote and enhance water conservation, water use efficiency, and sustainable water use

Objective G: Promote and enhance water recycling

Objective H: Maximize utility of Regional aquifers while improving sustainability

Objective I: Minimize risk of loss of life, infrastructure, and resources caused by significant storm events by utilizing uncontrolled flow beneficially

Objective J: Capture stormwater for higher beneficial use whenever practicable

Objective K: Develop Regional solutions that protect and enhance the quality of water supply, particularly in disadvantaged communities that are unable to meet water quality standards

Objective L: Consider recreational potential in project development

Objective M: Minimize energy consumption and associated greenhouse gas (GHG) emissions, including use of renewable energy when appropriate

Objective N: Promote projects that increase operational flexibilities and supply management tools

The regional objectives will be accomplished by implementing resource management strategies and are well aligned with Statewide Priorities, as demonstrated in Table 3-1. Most of the objectives directly and/or indirectly support one of the Statewide Priorities.

In addition, during this 2019 IRWMP Update, new items related to climate change were considered during development of the objectives. These included, but were not limited to:

- Adapting to changes in the amount, intensity, timing, quality and variability of runoff and recharge
- The effects of sea level rise on water supply conditions (indirectly via the Delta)

- Energy consumption and associated GHG emissions
- The California Air Resources Board (CARB) and AB32 Scoping Plan
- Carbon sequestration and renewable energy

Table 3-2 shows the relationship between these items and the Region's objectives. The required climate change considerations (as delineated in the 2016 IRWM Program Guidelines) are addressed within the Plan's Objectives.

The plan objectives include clear specificity, allowing the Region to establish targets to meet during implementation and metrics by which to measure the degree of accomplishment of the multiple objectives and the Region's overarching goal. Table 3-3 includes some potential metrics for each of the objectives. The metrics will be used not only to monitor the Region's progress after projects are implemented, but also to evaluate alternative projects in terms of their forecasted performance before investments are made.

Table 3-1: Alignment of Plan Objectives with Statewide Priorities

Plan Objective	Related Statewide Priority									
	Make Conservation a California Way of Life	Increase Regional Self-Reliance and Integrated Water Management Across All Levels of Government	Achieve the Co-Equal Goals for the Delta	Protect and Restore Important Ecosystems	Manage and Prepare for Dry Periods	Expand Water Storage Capacity and Improve Groundwater Management	Provide Safe Water for All Communities	Increase Flood Protection	Increase Operational and Regulatory Efficiency (directed toward State & federal agencies)	Identify Sustainable and Integrated Financing Opportunities (directed toward State agencies & legislature)
Objective A: Provide for more reliable water supply south of the Delta	●	●	●		●	●			●	
Objective B: Improve regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts		●			●	●			●	
Objective C: Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation				●						
Objective D: Provide potential for environmental and habitat improvement, including wetlands				●				●		
Objective E: Promote projects that meet the needs of disadvantaged communities							●			
Objective F: Promote and enhance water conservation, water use efficiency, and sustainable water use	●									
Objective G:Promote and enhance water recycling					●					
Objective H: Maximize utility of Regional aquifers while improving sustainability		●				●				
Objective I: Minimize risk of loss of life, infrastructure, and resources caused by significant storm events by utilizing uncontrolled flow beneficially								●		
Objective J: Capture stormwater for higher beneficial use whenever practicable					●	●		●		
Objective K: Develop Regional solutions that protect and enhance the quality of water supply, particularly in disadvantaged communities that are unable to meet water quality standards		●					●			

Plan Objective	Related Statewide Priority									
	Make Conservation a California Way of Life	Increase Regional Self-Reliance and Integrated Water Management Across All Levels of Government	Achieve the Co-Equal Goals for the Delta	Protect and Restore Important Ecosystems	Manage and Prepare for Dry Periods	Expand Water Storage Capacity and Improve Groundwater Management	Provide Safe Water for All Communities	Increase Flood Protection	Increase Operational and Regulatory Efficiency (directed toward State & federal agencies)	Identify Sustainable and Integrated Financing Opportunities (directed toward State agencies & legislature)
Objective L: Consider recreational potential in project development	●									
Objective M: Minimize energy consumption and associated GHG emissions, including use of renewable energy when appropriate	●								●	
Objective N: Promote projects that increase operational flexibilities and supply management tools					●				●	

Table 3-2: Alignment of Plan Objectives with Required Climate Change Considerations

Plan Objective	Related Climate Change Consideration				
	Address adapting to changes in the amount, intensity, timing, quality and variability of runoff and recharge	Consider the effects of sea level rise on water supply conditions (indirectly via the Delta)	Reduce energy consumption and associated greenhouse gas (GHG) emissions	Consider strategies from CARB and AB32 Scoping Plan[1]	Consider options for carbon sequestration and renewable energy
Objective A: Provide for more reliable water supply south of the Delta	●	●		●	
Objective B: Improve regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts			●	●	●
Objective C: Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation					●
Objective D: Provide potential for environmental and habitat improvement, including wetlands					●
Objective E: Promote projects that meet the needs of disadvantaged communities		●			
Objective F: Promote and enhance water conservation, water use efficiency, and sustainable water use			●	●	●
Objective G: Promote and enhance water recycling				●	
Objective H: Maximize utility of Regional aquifers while improving sustainability	●		●	●	●
Objective I: Minimize risk of loss of life, infrastructure, and resources caused by significant storm events by utilizing uncontrolled flow beneficially	●				
Objective J: Capture stormwater for higher beneficial use whenever practicable	●			●	
Objective K: Develop Regional solutions that protect and enhance the quality of water supply, particularly in disadvantaged communities that are unable to meet water quality standards				●	

Plan Objective	Related Climate Change Consideration				
	Address adapting to changes in the amount, intensity, timing, quality and variability of runoff and recharge	Consider the effects of sea level rise on water supply conditions (indirectly via the Delta)	Reduce energy consumption and associated greenhouse gas (GHG) emissions	Consider strategies from CARB and AB32 Scoping Plan[1]	Consider options for carbon sequestration and renewable energy
Objective L: Consider recreational potential in project development					
Objective M: Minimize energy consumption and associated GHG emissions, including use of renewable energy when appropriate			●	●	●
Objective N: Promote projects that increase operational flexibilities and supply management tools	●		●		

[1]The five water-related GHG emissions reduction strategies identified in the CARB AB 32 Climate Change Scoping Plan are: water use efficiency, water recycling, water system energy efficiency, reuse of urban runoff, and increasing renewable energy production.

Table 3-3: Potential Metrics for Plan Objectives

Plan Objective	Potential Metric(s)
Objective A: Provide for more reliable water supply south of the Delta	Size and frequency of shortages, long term average allocations
Objective B: Improve regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts	Urban water use (gallons per capita per day); volume of recycled water produced or used; number of coordinated water supply efforts undertaken, or volume of water produced via such efforts
Objective C: Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation	Acreage of restored habitat; number of species potentially benefited by restoration measures
Objective D: Provide potential for environmental and habitat improvement, including wetlands	Acreage of restored habitat; acreage of protected habitat; number of species potentially benefited by restoration and protection measures; acreage of wetlands beneficially impacted by projects
Objective E: Promote projects that meet the needs of disadvantaged communities	Benefit provided to disadvantaged community (e.g., number of flood events avoided, improvement in water quality, volume of water supplied)
Objective F: Promote and enhance water conservation, water use efficiency, and sustainable water use	Ag demand reduction; urban demand reduction
Objective G: Promote and enhance water recycling	Average daily (or annual) recycled water supply
Objective H: Maximize utility of Regional aquifers while improving sustainability	Groundwater levels; running average of annual groundwater use compared to use targets from basin management or GSP / GSA Sustainability Criteria
Objective I: Minimize risk of loss of life, infrastructure, and resources caused by significant storm events by utilizing uncontrolled flow beneficially	Number of flood events with impacts to infrastructure; number of flood events with economic disruption; Loss of life due to flood events
Objective J: Capture stormwater for higher beneficial use whenever practicable	Pollutant loading to receiving waters; annual volume of beneficially used stormwater
Objective K: Develop Regional solutions that protect and enhance the quality of water supply, particularly in disadvantaged communities that are unable to meet water quality standards	Pollutant loading to receiving waters; Number of regional projects with direct or indirect water quality objectives
Objective L: Consider recreational potential in project development	Number of sites with multi-purpose and recreational projects; total area with recreational space from project implementation
Objective M: Minimize energy consumption and associated GHG emissions, including use of renewable energy when appropriate	Energy savings in kWh per year; percentage of energy from renewable sources
Objective N: Promote projects that increase operational flexibilities and supply management tools	Number of projects implemented; volume of water supply provided by a flexible method

3.2 Regional Priorities

The Region assigned their Objectives to letters A through N in order of priority, placing particular importance on water supply reliability. Prioritization of the objectives was also taken into account during project prioritization through the application of a weighting schema (Section 6.2). The Region also recognizes that projects that are effective in targeting any of the objectives established will be beneficial and therefore important to accomplishing the overall regional goal.

Chapter 4 Resource Management Strategies

Resource Management Strategies (RMSs) is the term used in the 2013 California Water Plan (CWP) Updates to refer to a diverse set of strategies (projects, programs and policies) to meet the water-related resource management needs of local agencies and governments throughout California. The WSJ Region has considered all of these RMSs, many of which are already applied in the Region, as tools to meet the regional objectives described in Chapter 3. The RMSs that are relevant to the Region in terms of its hydrologic, geologic, topographic and climatic characteristics, as well as its economic activities and water uses, are more likely to help the Region meet its overarching goal and specific objectives. These RMSs have been included in this IRWMP and are listed in Table 4-1.

The following sections present a summary of the RMSs and their applicability to achieving the Region's objectives, along with specific references to projects, policies or programs that are already in place in the region or that are being considered as part of this Plan. The sections also include climate change considerations associated with each strategy. Many of the RMSs have the potential to help the Region implement climate change adaptation strategies and mitigate climate change impacts. The Regional Objectives' relation to the RMSs is shown in Table 4-2.

Table 4-1: RMS Applicable to WSJ IRWMP

RMS	Considered in the WSJ IRWMP	RMS	Considered in the WSJ IRWMP
Agricultural Water Use Efficiency	●	Matching Quality to Use	●
Urban Water Use Efficiency	●	Pollution Prevention	●
Conveyance – Delta	●	Salt and Salinity Management	●
Conveyance – Regional/Local	●	Urban Stormwater Runoff Management	●
System Reoperation	●	Agricultural Land Stewardship	●
Water Transfers	●	Economic Incentives (Loans, Grants, and Water Pricing)	●
Conjunctive Management and Groundwater	●	Ecosystem Restoration	●
Desalination – Brackish & Seawater	●	Forest Management	●
Precipitation Enhancement	●	Land Use Planning and Management	●
Recycled Municipal Water	●	Recharge Area Protection	●
Surface Storage – CALFED	●	Water-Dependent Recreation	●
Surface Storage – Regional/Local	●	Watershed Management	●
Drinking Water Treatment and Distribution	●	Flood Management	●
Groundwater / Aquifer Remediation	●	Outreach and Engagement	●
Sediment Management	●	Water and Culture	●
Other Strategies (crop idling, dew vaporization, irrigated land retirement, rainfed agriculture, waterbag transport)	●		

Table 4-2: Alignment of Plan Objectives with Resource Management Strategies

Plan Objective	RMS																												
	Ag Water Use Efficiency	Urban Water Use Efficiency	Conveyance - Delta	Conveyance – Regional/Local	System Reoperation	Water Transfers	Conjunctive Management/	Desalination – Brackish and Seawater	Precipitation Enhancement	Recycled Water	Surface Storage - CALFED	Surface Storage – Regional/Local	Drinking Water Treat and Distribute	Groundwater Remediation	Sediment Management	Other Strategies (crop idling, etc.)	Matching Quality to Use	Pollution Prevention	Salinity Management	Urban Runoff Management	Ag Lands Stewardship	Economic Incentives	Ecosystem Restoration	Forest Management	Land Use Plan and Management	Recharge Area Protection	Water-Dependent Recreation	Watershed Management	Flood Management	Outreach	Water and Culture
Objective A: Provide for more reliable water supply south of the Delta	●	●	●	●	●	●	●			●	●	●					●					●								●
Objective B: Improve regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts	●	●		●	●	●	●	●		●		●	●	●				●		●	●	●			●	●		●	●	●	
Objective C: Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation															●			●	●	●	●		●	●	●			●		●	●
Objective D: Provide potential for environmental and habitat improvement, including wetlands						●	●			●					●	●		●	●	●	●		●	●	●	●	●	●	●	●	●
Objective E: Promote projects that meet the needs of disadvantaged communities							●			●			●	●				●		●	●				●				●	●	●
Objective F: Promote and enhance water conservation, water use efficiency, and sustainable water use	●	●														●	●					●			●					●	●
Objective G: Promote and enhance water recycling							●			●				●		●	●		●			●								●	●
Objective H: Maximize utility of Regional aquifers while improving sustainability	●	●					●	●					●	●			●	●	●						●	●		●		●	●
Objective I: Minimize risk of loss of life, infrastructure, and resources caused by significant storm events by utilizing uncontrolled flow beneficially							●					●				●				●			●		●	●		●	●		
Objective J: Capture stormwater for higher beneficial use whenever practicable							●		●			●			●	●	●	●		●		●	●	●	●	●		●	●		

Plan Objective	RMS																												
	Ag Water Use Efficiency	Urban Water Use Efficiency	Conveyance - Delta	Conveyance – Regional/Local	System Reoperation	Water Transfers	Conjunctive Management/	Desalination – Brackish and Seawater	Precipitation Enhancement	Recycled Water	Surface Storage - CALFED	Surface Storage – Regional/Local	Drinking Water Treat and Distribute	Groundwater Remediation	Sediment Management	Other Strategies (crop idling, etc.)	Matching Quality to Use	Pollution Prevention	Salinity Management	Urban Runoff Management	Ag Lands Stewardship	Economic Incentives	Ecosystem Restoration	Forest Management	Land Use Plan and Management	Recharge Area Protection	Water-Dependent Recreation	Watershed Management	Flood Management	Outreach	Water and Culture
Objective K: Develop Regional solutions that protect and enhance the quality of water supply, particularly in disadvantaged communities that are unable to meet water quality standards								●		●				●	●	●	●	●	●	●			●	●	●	●		●		●	
Objective L: Consider recreational potential in project development																											●			●	●
Objective M: Minimize energy consumption and associated GHG emissions, including use of renewable energy when appropriate																●							●								●
Objective N: Promote projects that increase operational flexibilities and supply management tools				●	●	●	●			●							●			●					●	●		●			

The WSJ IRWMP includes a collection of projects, aligned with the RMSs, intended to support progress toward achieving the objectives of the Region. The breadth of Regional objectives is such that they cannot be accomplished through implementation of a single strategy. A portfolio of strategies and projects has been considered in the planning process and is described in Chapter 6, Project Solicitation and Prioritization. The following sections describe RMSs in the context of the WSJ Region and this WSJ IRWMP.

4.1 Climate Change Considerations for the Region

Chapter 13, Climate Change, presents a climate change vulnerability assessment of the WSJ Region and overall climate change considerations. In describing the RMSs and their applicability to projects identified to achieve the Region's objectives, climate change impacts and responses need to be considered on an RMS-specific basis. Projects that aligned with a specific RMS may be impacted in their ability to perform or respond under future conditions, as compared to current conditions, as a result of climate change. Some projects, programs and policies have the ability to help the Region mitigate climate change impacts and/or provide resiliency in the face of climate change through the application of multiple RMSs. These considerations will be listed in the following RMS sections.

The WSJ Region extends from the northern end of the San Joaquin Valley to the south, covering an extensive portion of the western side of the valley. Therefore, the effects of climate change on the Region are, for the most part, dictated by its impacts to many of the west-slope Sierra Nevada watersheds. These impacts vary by watershed, but generally include:

- An increase in atmospheric temperature with potential increases in water demands.
- Vulnerable surface supply due to decreased snowpack in the Sierra Nevada and shifts in timing of seasonal runoff.
- Surface water quality impacts due to potential extended periods of low flows.
- Potential for more severe droughts.
- Flood management challenges due to earlier springtime runoff and potentially heavier storm events.
- Habitat vulnerability due to potentially more severe droughts, seasonal changes in flows, extended periods of low flows, increased water temperatures and potentially higher risk of fires.

These general vulnerability elements, described in more detail and specificity in the climate change section of this document, are discussed in the RMS sections below, as applicable.

4.2 Agricultural Water Use Efficiency

This strategy is based on applying efficient water management practices in the agricultural sector to obtain the same agricultural output for a reduced water input, or to increase productivity while still achieving water savings. Three categories of actions to achieve agricultural water use efficiency include hardware improvements (on-farm irrigation systems and water supply delivery systems), water management strategies to reduce evapotranspiration and optimize irrigation practices, and agricultural technology such as plant breeding, fertilizers and genetically modified crops.

This RMS is highly applicable to the WSJ Region since a significant amount of water use in the region is for agricultural uses and given requirements established under the CVPIA and in California SBx7-7 as part of the Agricultural Water Management Planning Act. Agricultural water use efficiency Best Management Practices (BMPs) are currently applied and will be further applied where consistent with water use goals.

An important consideration regarding the integration of strategies is that agricultural applied water is a source of recharge to the underlying groundwater basins in some areas. A reduction in applied irrigation may reduce groundwater recharge with potential implications on groundwater strategies; however, the nature and magnitude of these effects will be location-specific.

Related to climate change and relevant to this RMS is the fact that warmer temperatures and increased atmospheric concentrations of CO_2 increase evapotranspiration and crop water demand. Therefore, agricultural water efficiency is part of a group of potential adaptation measures. Adaptation measures related to storage may be necessary due to the potential reductions in flow during peak growing months, coupled with the demand hardening resulting from water efficiency. In terms of climate change mitigation, water use efficiency is generally correlated to a lower energy footprint, which can result in lower GHG emissions in areas where energy generation is based on fossil fuels.

4.3 Urban Water Use Efficiency

Urban Water Use Efficiency has contributed to significant progress in managing water demands in California and in the urban areas of the WSJ Region. This RMS is relevant in the WSJ IRWMP as a continuation of existing and past efforts related to outreach, implementation of BMPs, updating plumbing code requirements, implementation of new technologies, metering and other techniques that result in more efficient water use for residential, commercial, industrial and institutional settings.

This RMS is applied throughout the Region's urban areas. The RMS scope of implementation is significant and will help the region's water providers to achieve goals established in SBx7-7 and will contribute to drought preparedness and reduce energy use and associated GHG emissions. Water conservation through urban water use efficiency is a valuable climate change adaptation strategy when dealing with impacts related to potentially extended droughts, and reduced and more uncertain supplies.

4.4 Conveyance – Delta

Surface water conveyance in California consists of natural water courses (e.g. rivers and streams) and facilities (e.g. ditches, canals, and pipelines). The Sacramento-San Joaquin River Delta (Delta) is primarily a natural feature that serves a critical role in water conveyance for the San Francisco Bay Area, Central Valley, and Southern California. In addition to its natural features, it includes artificial channels and constructed islands protected by levees that convey water by gravity. Many conveyance facilities are associated with the Delta, including pumping stations, pipelines, and canals to pump the water to the various urban and agricultural users throughout California. Important facilities of the SWP and the federal CVP that move water from the Delta throughout the state run through the WSJ Region.

Conveyance-Delta strategies identified in the 2013 CWP include:

- Establishing performance metrics that record quantities of water deliveries for agricultural and urban users.
- Utilizing Delta Vision Task Force and BDCP recommendations to increase operational flexibility and conveyance reliability to benefit water supply and aquatic ecosystems.
- Developing strategies that maintain channel capacity in the Delta.

One of the primary purposes of creating SLDMWA was to establish an entity responsible for O&M of certain CVP facilities. The SLDMWA also serves the information and representation needs of its member agencies by developing, providing and disseminating information to multiple parties (including legislative,

administrative, and judicial bodies) related to Delta exports, water supply, water quality, water development, surface water management and more. The SLDMWA is applying the Conveyance-Delta RMS simply through everyday operations, management, and coordination. Through a series of agreements with the USBR, SLDMWA is responsible for managing, operating, maintaining, and repairing these CVP facilities:

- Certain portions of the Delta Division, San Luis Unit, and West San Joaquin Division of the CVP
- C.W. "Bill" Jones Pumping Plant (formerly Tracy Pumping Plant), O'Neill Pumping/Generating Plant, Tracy O&M Facilities, the San Luis Drain, and the DMC Intertie
- Delta Cross Channel and gates, two fish release sites on the Delta, and the Tracy Water Management System, including its SCADA system
- DMC/California Aqueduct Intertie

Climate change-induced sea level rise may very well impact freshwater supplies and habitat in the Delta. Rising sea levels threaten to submerge levees and flood brackish water from San Francisco Bay into the Delta. Sea Level Rise will also require more delta outflow to maintain manageable levels of salinity near the export facilities. Applying the Conveyance – Delta RMS can help the Region mitigate and adapt to climate change impacts, including sea level rise, in the future.

4.5 Conveyance – Regional/Local

In addition to the Delta-related conveyance facilities previously described, the WSJ Region relies on several local and regional conveyance features, making this RMS relevant. Some entities within the Region rely on groundwater and use conveyance systems (i.e. pipelines or canals) to deliver water to their users. This RMS provides the clear benefit of connecting supply sources to demands, but it can also provide benefits related to flood management and consumptive and non-consumptive environmental uses. Additionally, conveyance facilities can be operated to provide water quality improvements, recreation, and flexibility in operations. Water and irrigation districts in the WSJ Region rely on local conveyance, and the Region will continue to rely on this RMS in the future.

Climate change impacts in the region can significantly impact existing conveyance operations in the Region due to changes in flow timing, altered precipitation patterns, and potential increased flooding. The implementation of projects related to this RMS will need to take into account, to the extent that is practical, the system-wide implications of climate change impacts in the Region's hydrology.

In terms of climate change mitigation, the benefits of this RMS need to be assessed on a project-by-project basis, but generally speaking, projects that result in more efficient conveyance from source to demands and reduce the energy footprint of the system have the potential to mitigate climate change.

4.6 System Reoperation

System reoperation relies on the modification of management and operation of facilities for water conveyance and supply in order to achieve specific benefits. System reoperation is typically triggered by the need to solve a specific issue. In some cases, system reoperation does not require any additional infrastructure, but in some other cases, some relatively minor investments are required to allow for the reoperation to take place. The WSJ Region is likely to benefit from this RMS particularly in light of climate change impacts that can alter hydrology and timing of flows.

4.7 Water Transfers

Water transfers are a market-based approach to water rights, where temporary or long-term change in the point of diversion, place of use, or purpose of use of water takes place. Transfers provide a means to obtain or store water with the purpose, in most cases, of increasing water supply and improving water supply reliability to meet demands. There are generally five main methods for making transfer water available:

1. Transfer water from storage that would otherwise have been carried over, expecting that the reservoir will refill in the subsequent years and thus cause loss of the water.
2. Groundwater substitution (pumping groundwater in lieu of using surface water).
3. Transferring previously-banked groundwater by pumping and directly transferring that water or by pumping previously-banked groundwater for local use and transferring surface water that would have been otherwise used locally.
4. Crop idling or crop shifting.
5. Implementing other water conservation/reuse efforts, such as preventing deep seepage from conveyance canals.

This RMS is included in the WSJ IRWMP and, as has been in the past and will be in the future, used to meet demands. Climate change considerations with transfers are significant in that, for the recipient of a transfer, the transferred water can improve reliability during extended droughts or low flow periods. The ability to transfer water, however, can be vulnerable to climate change also. Inflows to the Delta may be altered by climate change such that wheeling capacities for transfer water may be reduced. The mechanisms by which the water is made available for transfer (five strategies above) needs to be assessed in light of climate change impacts in the Region. Additionally, as climate change impacts are realized, water transfers may become less reliable and costlier.

4.8 Conjunctive Management and Groundwater

Conjunctive management, also referred to as conjunctive use, relies on the coordinated management of surface and groundwater resources in a region, applying a systems approach to water as a resource and increasing the reliability of water supplies as a whole. Groundwater storage must be available for conjunctive management to be applicable since aquifers serve as the storage element that will optimize the resource over time. Surface water is recharged into groundwater storage, and groundwater is later withdrawn through wells or discharged naturally into streamflow. Conjunctive management is already relied upon by water managers in the Region and will continue to be an important RMS.

Conjunctive management can become an effective climate change adaptation strategy given the forecasted reduction in snowpack and the change in the timing of streamflows, as it can be utilized to increase storage and therefore resiliency in the system. At the same time, existing conjunctive management operations need to consider climate change impacts in hydrology as they may be vulnerable without critical modifications. The availability of surface flows for conjunctive use may be impacted requiring reoperation or new facilities.

In terms of climate change mitigation, conjunctive management needs to be assessed on a project-by-project basis based on the system-wide energy footprint of the conjunctive use operation, as compared to alternatives without conjunctive management.

4.9 Desalination – Brackish and Seawater

Desalination has the potential to augment supply by removing salt from seawater or brackish groundwater. It is one of the few RMSs that can "create" new supply and it needs to be considered by the Region as an option to achieve the reliability objectives, assessing the benefits against the tradeoffs related to capital investment, energy requirements, technology requirements and waste brine management and disposal. In addition to development of new supply, desalination can be an effective way to address salt management issues. While desalination for new supply development is currently not considered as a strategy for the WSJ Region at this time, it may be in the future, as conditions change and climate change impacts occur.

In terms of climate change, desalination is an attractive adaptation strategy for coastal regions where ocean water can be desalted. For the WSJ Region, brackish groundwater desalination could be considered in the future as climate change impacts intensify as long as the source of the brackish water to be desalted can be characterized as independent of flows that are forecasted to be impacted by climate change.

In terms of climate change mitigation, desalination tends to be a less attractive alternative since current technologies still have a high energy footprint, likely higher than groundwater pumping and energy related to conveyance and treatment of surface and wastewater for non-potable recycling.

4.10 Precipitation Enhancement

Precipitation enhancement is commonly called "cloud seeding" and it relies on the injection of artificial substances (such as silver iodide or liquid propane) into clouds to enable snowflakes and raindrops to form more easily. There are State and Federal reporting requirements involved in the practice of cloud seeding (to DWR and NOAA), and several implementation considerations and concerns over potential impacts do exist. A detailed description of weather modification capabilities, position statements, and the status of the discipline can be found on *Guidelines for Cloud Seeding to Augment Precipitation* (American Society of Civil Engineers [ASCE], 2006). The WSJ Region is not currently involved in any precipitation enhancement efforts; however, this RMS could be beneficial to the Region in the future if the State continues to support it as a valuable RMS, especially as climate change impacts occur.

4.11 Recycled Municipal Water

Recycled water is an RMS commonly used in municipal areas to increase both quantity and reliability of water supplies. Recycled water often requires a higher level of treatment for wastewater than would be required for disposal or discharge, but can be an offset to certain demands where potable water use is not critical. Typically, this RMS is used for serving large irrigation demands in urban areas on institutional, commercial and industrial land uses. Recycled water is part of the overall water supply portfolio in the WSJ Region.

In terms of climate change, recycled water represents an effective adaptation measure, providing reliable supply where hydrology variability may be significant. It is particularly relevant as a strategy for climate change mitigation when applied as part of conjunctive management program. Regarding climate change mitigation, the recycled water energy footprint needs to be assessed in comparison with alternative supplies for non-potable demands. In some cases, the use of recycled water may require less energy than other supply sources, contributing to climate change mitigation through the reduction of GHG emissions.

4.12 Surface Storage – CALFED

This RMS is very specific to Regions where CALFED reservoirs can have an influence and positive impact. The CALFED surface storage reservoir efforts by DWR, USBR, and local water interests include the Shasta Lake Water Resources Investigation, North-of-the-Delta Offstream Storage (SITES Reservoir), In-Delta Storage Project, Los Vaqueros Reservoir Expansion, and the Upper San Joaquin River Basin Storage Investigation. This RMS is being considered since the Shasta and Friant Reservoirs are linked through the SLDMWA CVP contract supplies and the Authority is a partner with USBR in assessing the feasibility of these projects. Additionally, several SLDMWA member agencies are partnering in the storage investigations outside of the subbasins.

4.13 Surface Storage – Regional/Local

Surface storage has been an invaluable RMS in California for more than a century. Regional and local surface storage is and will be used in the WSJ Region. The Plan includes projects proposed by Del Puerto WD, Central California ID, West Stanislaus ID, and Patterson ID related to the construction of surface water reservoirs.

Surface storage introduces the possibility of integration with other RMS strategies, like conjunctive management, flood management and reoperation, and it provides benefits beyond water supply. Relative to climate change, storage will be an adaptation strategy that directly addresses one of the climate change forecasted impacts (lowering of storage through snowpack). For existing reservoirs, however, climate change impacts need to be evaluated to determine if reoperation measures are necessary to maximize benefits, given predicted pattern changes and timing in hydrology.

4.14 Drinking Water Treatment and Distribution

Drinking water treatment is essential to providing safe drinking water to users in the WSJ Region. Some water agencies in the Region operate water treatment and wellhead treatment facilities and will continue doing so through maintenance of existing water treatment and distribution facilities and the addition of new facilities, as necessary, to meet demands.

Climate change will potentially impact the operation of treatment facilities for surface water in that the quality of the sources may be modified by higher temperatures, triggering physicochemical changes in source water, and different flow patterns that may trigger changes in turbidity of surface water.

4.15 Groundwater and Aquifer Remediation

In many urban and rural areas in California, groundwater quality degradation has resulted from a wide range of anthropogenic activities and/or natural causes. Groundwater remediation is an RMS that relies on the removal of contaminants that affect the beneficial use of the groundwater. Groundwater can be remediated by passive methods (allowing contaminants to biologically or chemically degrade or disperse in-situ over time) or by active groundwater remediation (treating it in-situ or extracting to treat it). With wellhead treatment, this RMS can result in supplemental supply for non-potable or, in some cases, potable uses. The WSJ Region implements groundwater monitoring for groundwater levels and quality.

In terms of climate change, additional groundwater supplies resulting from groundwater remediation can increase the Region's reliability during forecasted extended droughts. An additional benefit of groundwater remediation, in some cases, is the creation of the opportunity to store surface supplies in

previously unavailable basins and subbasins (which would be linked to the Conjunctive Management RMS).

4.16 Matching Quality to Use

Water demands can be classified not only by the type of customer requiring the supply, but also by the type of use. Not all demands in the WSJ Region are potable, which makes this RMS relevant where water of lower-than-potable quality, such as recycled water, may be appropriate. The WSJ Region plans on expanding recycled water use (see *Recycled and Reclaimed Water* in Section 2.2), initiating storm water capture and reuse, and expanding the non-potable use of degraded aquifer supplies.

In terms of climate change, matching quality to use has the potential to contribute to the region's adaptive capacity since it can increase reliability by lowering the demand for high-quality sources. Supplying water that is fit for purpose also has the potential to lower energy requirements for treatment and distribution and the energy associated with that, which will contribute to climate change mitigation.

4.17 Pollution Prevention

Pollution prevention relies on eliminating or reducing pollutants at their source so that water quality in receiving waters is preserved through lowered pollutant loads. The mechanisms by which prevention is achieved include modification of production processes, use of non-toxic or less toxic substances, and implementation of efficient practices and conservation techniques and technologies that result in lower quantities of pollutants entering the environment. The benefit of pollution prevention is not only improved water quality, but also a reduction or avoidance of cost for treatment that would be required once pollution occurs. Pollution prevention measures are also enforced via the SWRCB's ILRP, which sets waste discharge requirements for growers. Regional coalitions work with their member growers to assist them in complying with requirements set by the CVRWQCB. The WSJ Region overlaps with the Westside San Joaquin River Watershed Coalition, Grassland Drainage Area, and Westlands Water Quality Coalition areas. Depending on their location, agricultural landowners may work with one of these Coalitions to comply with discharge requirements, thereby preventing pollution. The WSJ Region applies, and will continue to rely on, this RMS.

Pollution prevention practices and methods will be required as adaptation measures for some of the potential effects of climate change related to water quality. These include the likelihood of water quality issues exacerbated by higher temperatures, lower flows, and extended periods with low flows and pollutant loads resulting from runoff after wild fires.

4.18 Salt and Salinity Management

Salinity presents a threat to the Region's economy and in fact, to the entire California economy. Salinity impacts include, among other things, reduced crop production, reduction of farmable land (with associated lost jobs and community growth), loss of habitat, corrosion of equipment and deterioration of water quality to the point of reduction of potable supply. The Central Valley Salinity Alternatives for Long-term Sustainability initiative (CV-SALTS) is a collaborative effort initiated in 2006 by the Central Valley Salinity Coalition and its activities, initiatives, projects and programs are relevant and important to the WSJ Region. Some of the SLDMWA member agencies (and IRWM participating entities) also participate in CV-SALTS. Additional discussion of CV-SALTS is included in Section 11.1.

This RMS is critical for the Region, and the Westside Regional Drainage Plan is an example of a project where salinity management plays a central role. In terms of climate change considerations, salts are a conservative pollutant that is removed most commonly by processes requiring high energy inputs. It is unlikely that salt-management strategies will result in climate change mitigation, however once the salts are removed from water, that water can contribute to increases in water supply reliability.

4.19 Urban Runoff Management

Runoff in urban areas is the natural result of increased impervious surfaces, reduced opportunities for evapotranspiration and temporal storage, and the alteration of flow pathways that is triggered by urbanization. For past centuries, during wet weather, the approach for dealing with the large quantities of runoff has been to channel the flows and remove them as quickly as possible from the urban environment and structures. This results in a lost opportunity to utilize the water from precipitation for beneficial purposes. New practices in urban runoff management focus on a watershed-based approach through the implementation of BMPs and Low-Impact Development (LID) measures. With this approach, the BMPs and LID practices can reduce pollutant loading and the volumes of runoff. Urban runoff management will be increasingly important as climate change impacts water supply and quality. Climate change may increase the volume of low-quality urban runoff as higher-intensity storm events become more frequent. Urban runoff management techniques can help adapt to these climate change impacts.

4.20 Agricultural Land Stewardship

As stated in the CWP 2013 Update (DWR, 2013), agricultural land managers practice stewardship by conserving and improving land for food, fiber, and biofuel production, watershed functions, soil, air, energy, plants, animals, and other conservation purposes. By protecting functions such as groundwater recharge and flood control, this RMS can help the region adapt to climate change impacts (which may include impacts such as drought and increased flood risk). Agricultural land stewardship also protects open space and the traditional characteristics of rural communities, as well as open space within urban areas.

This RMS is closely linked to the watershed management RMS, sediment management RMS, outreach and engagement RMS and others. Thus, the California Department of Conservation administers the Watershed Coordinator Grant Program, supporting projects implementing integrated resource management where landowners build relationships and implement projects that include water conservation, erosion prevention, and public education for water quality, BMPs, science, and planning in watershed management.

The WSJ Region includes significant extensions of agricultural land and its economy relies on this RMS. This RMS will continue to be implemented in the future.

4.21 Economic Incentives (Loans, Grants, and Water Pricing)

Economic incentives are provided through financial and economic policies and strategies to influence water management through changes in water “consumer” behavior. Economic incentives can take the form of water rates, prices, loans and grants, fees, rebates, taxes, etc. They are designed to influence water use (quantity and timing), preference for sources of water supplies, and wastewater generation.

Like structural solutions and capital investments for water management, economic incentives usually come at a cost. One example of the cost of an incentive program is the cost of its creation and administration, including the costs of arranging bond funding or low interest rate financing.

This RMS will continue to be relied upon in the WSJ Region to promote efficient water practices in the urban and agricultural sectors. The region also pursues economic incentives from outside its boundaries in the form of grants for the implementation of projects.

The current and proposed regulations by CARB on a carbon market for California (cap-and-trade) have market-based compliance mechanisms for GHG emissions that may trigger opportunities and responsibilities in the WSJ Region.

4.22 Ecosystem Restoration

Ecosystem restoration improves the condition and sustainability of ecosystems in the region and in California. This RMS for the WSJ Region is applicable to aquatic, riparian, and floodplain ecosystems. In many instances, restoration projects are directly related to the availability of water in natural habitats so the restoration activities main component may require no additional facilities or capital investments and could be limited to simply satisfying an environmental demand.

An important climate change consideration is that forecasts indicate that preservation and restoration of key aquatic habitats may become even more difficult given changes in flow patterns, extended periods of low flows, extended droughts, higher water temperatures and lower water quality. The implementation of this RMS will therefore require coordination with other RMSs for a comprehensive approach.

4.23 Forest Management

The Region's water supplies originate from forest ecosystems in the Sierra Nevada and forest management can directly impact the water quantity and quality for this region. This RMS is therefore quite relevant for the WSJ Region but the implementation will need to occur outside the Region's boundaries and jurisdiction. This RMS is generally not applicable to the WSJ Region in terms of direct implementation.

4.24 Land Use Planning and Management

The Land Use Planning and Management RMS overlaps with many other RMSs including watershed management, agricultural land stewardship, flood management and others. This RMS can be very effective since land uses directly affect water supply needs, habitat and ecosystem impacts, and quality and quantity of stormwater. The Region will continue to apply this RMS as a mechanism to manage spatial aspects of economic activity, resource utilization and waste generation. The WSJ IRWMP takes into account transportation and land use plans in the region, as well as other planning efforts, and is an example of cross-sector and multi-stakeholder planning that can continue to integrate land use and water resources planning.

4.25 Recharge Area Protection

Protection of recharge areas has two primary dimensions: preserving the ability of an area to provide adequate recharge (quantity) and preventing pollutants from entering groundwater (quality). This RMS requires a number of actions to achieve these two primary objectives. This RMS will continue to play an important role in the WSJ Region.

Related to climate change, maintaining and enhancing recharge areas and groundwater basins are important adaptive strategies given the need for additional storage that will be required to deal with the forecasted climate change impacts in hydrology.

4.26 Water-Dependent Recreation

The WSJ Region has some opportunities for water-dependent recreation (mostly related to trails and hiking in riverine environments), and planners will continue to incorporate these opportunities as part of water projects. An example of a project that creates additional opportunities is the Pleasant Valley Groundwater Banking project where a portion of water purchased from contract supplies will be allocated annually to support a number of environmental and habitat protection and improvement initiatives. One hundred twenty acres of wetted area within the infiltration basin complex will create a temporary wetland and riparian habitat; with the basins flooded for up to six months a year (and possibly more in wet years), providing food, water, and habitat diversity for a variety of residential and migratory wildlife. Opportunities to combine trails and basin-side parks can be incorporated into that project, providing water-based recreational benefits.

As in the case of ecosystem preservation and restoration, an important climate change consideration is that forecasts indicate that sustaining water levels in areas that provide water-dependent recreation may become even more difficult given changes in flow patterns, extended periods of low flows, extended droughts and lower water quality. The implementation of this RMS will therefore require coordination with other RMSs for a comprehensive approach.

4.27 Sediment Management

Sediment management is a critical element of a larger strategy related to comprehensive watershed management. Sediment can be an asset in specific locations of the watershed where it is desired, and it can be undesirable in other areas where it can become a pollutant that can cloud waters and degrade habitat, form barriers for navigation, alter the geomorphology of the stream habitat, and directly and indirectly impact some species. It can also reduce hydraulic capacity of channels and storage capacity in reservoirs.

As climate change alters the patterns of runoff throughout California, sediment transport patterns are also likely to change. Therefore, sediment management will play a role in helping the Region adapt to climate change impacts.

Sediment management is an active RMS in the WSJ Region, and management and monitoring will continue to be a part of the water system management in the region. The long-term performance of some of the projects proposed in this WSJ IRWMP will depend, among other things, on effective sediment management practices.

4.28 Watershed Management

Watershed Management relies on plans, programs, projects and activities to maintain and sustain watershed functions and restore and enhance functions that may require specific action. Watershed management is inherently comprehensive, since the watershed integrates communities with the physical, chemical and biological processes that make up a river basin ecosystem. The urban and economic activities of the watershed are necessarily linked to the health and function of it as a natural environment.

This WSJ IRWMP is a watershed-based planning effort in the WSJ Region that integrates regional water management. The Region's objectives align with this RMS and with the State's IRWM Planning Guidelines.

An important climate change adaptation consideration is that the adaptive capacity of a watershed as a system will tend to be greater than the isolated adaptive capacity of an individual element of the watershed. Watershed-based approaches to adapt to climate change tend to be more successful than isolated approaches. Similarly, integration of economic activities and resource utilization will likely have better success when considering mitigation efforts.

4.29 Flood Management

Flood management as an RMS is unique to the other strategies in the CWP Update 2013 in that it contains multiple approaches within a single RMS. The 2013 CWP Update discusses a broader perspective of flood management that includes several approaches: nonstructural, restoration of natural floodplain functions, structural, and flood emergency management. This RMS is closely linked to the Watershed Management RMS but it also links to several others, including Surface Storage and Outreach and Engagement.

The Flood Management RMS would help achieve the Flood Protection goal identified by the WSJ Region. The Region includes specific objectives that are aligned with this RMS and are therefore incorporated into the WSJ IRWMP.

Flood management will be a crucial adaptation strategy in the face of climate change. As higher-intensity rainfall events become more frequent and snowmelt occurs earlier in the spring, increased flood risks emerge. Without proactive flood management strategies, climate change has the potential to increase flooding and flood damages.

4.30 Water and Culture and Outreach and Engagement

The 2013 update of the CWP includes Water and Culture and Outreach and Engagement as two additional RMSs to the 2009 CWP Update. They relate to fostering good water management outcomes by encouraging public groups and individuals to contribute insight to decision-makers when adopting water-wise practices, supporting activities that result in beneficial water management outcomes, promoting collaboration and interdisciplinary approaches to solving conflicts, and ensuring access to water management information and decision-making. Additionally, the engagement and outreach needs to consider the fact that there is great diversity about how water is perceived, valued, used, distributed, and regulated in California. Cultural values have an effect on water management decisions, uses and practices, and even regulations. Outreach and engagement efforts associated with the 2019 WSJ IRWMP update were supported by grant funding from DWR's DAC Involvement Program. In addition, as part of the DAC Involvement Program, a DAC Needs Assessment consisting of substantial outreach efforts will be conducted throughout the San Joaquin River Funding Area to identify major needs and concerns of DACs.

In the WSJ Region, with its significant agricultural sector, community and institutional stakeholders have a high level of engagement and are intensely aware of the critical role of water in the Region. These RMSs are, and will continue to be, a valuable resource to achieve the Region's objectives and overall goal.

4.31 Other Strategies

Other RMSs such as crop idling, fog collection, rainfed agriculture and waterbag transport are identified in the 2013 CWP. For the WSJ Region, unless all other RMSs have been exhausted, these strategies would not apply as they could have significant economic impacts. These strategies were not included in this WSJ

IRWMP when developing objectives or projects to achieve those objectives. Irrigated land retirement is a strategy that the Region often has to implement due to limited water supplies and as part of agricultural and irrigation management; however, it is not a preferred strategy as it has economic impacts to the Region.

Chapter 5 Integration

The IRWM planning process provides a structure for integration of projects in the WSJ Region, as well as for regular interaction of the agencies and stakeholders in the region. As described in Chapter 1, Governance, this structure consists of a decision-making process (including input from multiple committees, focused working groups, and stakeholders) which provides for interactions that facilitate integration across jurisdictional boundaries. These interactions also involve multiple agencies and stakeholders to help identify regional needs, articulate region-wide objectives, and select and prioritize projects that provide multiple benefits and are consistent with the Region's objectives.

At the project level, the WSJ IRWMP's overarching approach relies on the selection of individual projects. As a collective group, these projects provide measured progress toward meeting Regional objectives. No single project can meet all the objectives of the Region; therefore, the Plan identifies projects that can accrue Regional benefits when implemented together and projects that provide synergy in specific benefit areas. Integration can also increase cost effectiveness and improve mitigation of impacts during implementation.

The project review and evaluation process included integration and identification of project efficiencies in order to maximize benefits where possible. The project review process also considered the number of Regional objectives and RMSs a project addresses; therefore, projects integrating various objectives, RMSs, and objectives typically receive a higher ranking in the process. When projects integrate multiple RMSs, there is the opportunity to take advantage of synergies in water management.

It is also critical to consider interdependency, as it extends into the funding and political aspects of a project, since it can bring vital stakeholder support. For example, implementing managed aquifer recharge projects minimizes conflict over water supply and reduces pumping costs, which in turn fosters other opportunities. Thus, the interdependency of strategies at the sub-project level can foster integration of stakeholders' efforts at the Plan level and beyond.

The WSJ IRWM Region also practices resource integration, which refers to the combination of multiple agency resources to aid the regional planning effort. The WSJ IRWMP represents a coordinated effort by many water suppliers throughout the Region, facilitated by SLDMWA. The SLDMWA member agencies have a common reliance on the Delta-Mendota Canal, therefore the Region has opportunities to improve the water system and integrate multiple benefits for multiple agencies. The Region also uses an integrated data management system, Opti, to house project information for all IRWM projects. This system (further discussed in Chapter 8, Data Management) allows widespread sharing of project information and represents a combined effort by the member agencies.

Overall, the WSJ IRWM planning process creates opportunities for integration in terms of projects, stakeholders and institutions, and resources. Through IRWM planning, relationships have developed throughout the Region, as well as procedures and protocols that can be utilized by the participating entities.

Chapter 6 Project Solicitation and Prioritization

This chapter discusses:

- The process used to solicit projects for the WSJ IRWMP
- How the projects were reviewed for consistency with the IRWM Program and Regional objectives
- How the projects were evaluated with respect to integration
- How the projects were prioritized

The results of these activities are included in Appendix D of this plan. Finally, this chapter also includes the potential impacts and benefits of implementing this IRWMP and the projects identified within it.

6.1 Project Solicitation and Review

Solicitation

Project solicitation is the process by which agencies, organizations, and/or members of the public submit project concepts for inclusion in the IRWMP. To be considered for inclusion in the plan, projects must be described in sufficient detail to identify the need(s) being met, infrastructure to be constructed and operated, studies to be conducted (if applicable), and the impacts and benefits of the project. The projects can be in any stage of development, from conceptual to final design (i.e., ready to implement). There are many benefits to submitting a project for inclusion in the IRWMP, including raising local awareness of the potential project and its associated benefits, identifying potential project improvements and/or opportunities for integration, and positioning the project for potential State funding.

SLDMWA conducted project solicitations during previous IRWMP updates; these solicitation periods also served to prepare for funding opportunities through Prop 50 and Prop 84. For the 2019 WSJ IRWMP update, a Call for Projects was held from May 23, 2018, through July 12, 2018, with projects on the 2019 WSJ IRWMP update project list potentially eligible for the Prop 1 IRWM implementation grant solicitation. In order to facilitate project solicitation, a project information form, reviewed by SLDMWA and the Working Group, was prepared (a copy of the form is provided in Appendix D). This form served as the basis for developing Opti, the Region's online project submission system (located at http://irwm.rmcwater.com/wsj/). Opti also serves as a data management system for the Region's projects. Through the Opti system, project information can be submitted, reviewed, organized, and updated by SLDMWA or the project proponents. Project proponents were also provided with the option to submit their project information via a paper copy of the project information form if they were unable to use Opti (e.g., for those without access to the internet). Opti provides access to all submitted project information to any interested party who creates an Opti account, thus improving transparency in the IRWM planning process.

The Call for Projects was announced via an email to the Stakeholder Contact list on May 23, 2018, when the Call for Projects opened. In addition, a public workshop was held on June 13, 2018, to announce the project solicitation and provide information on how to submit projects (including the use of Opti). This meeting was formally noticed in the *Merced Sun-Star* on May 30 and June 6, 2018. Flyers in English and Spanish were also posted to announce the meeting at the County of Merced Community and Economic Development lobby, at Patterson ID offices, on the Patterson ID website, and on the SLDMWA website. Electronic flyers were emailed to the Stakeholder Contact List with an announcement covering the workshop intent. The public workshop covered the following information:

- Background and history of the IRWM Program
- The purpose of an IRWMP
- Overview of the WSJ Region
- Opportunities for public involvement (e.g., attending public workshops, attending meetings of the SLDMWA Board of Directors or Committees, submitting projects, providing comments on the public draft)
- Detailed review of Opti, covering both how to use the system and what information is needed for project submittal

Targeted outreach was conducted to representatives of DACs during the Call for Projects, as discussed further in Section 12.4.

Through Opti, project proponents are able to submit project information on a range of topics in order to describe the project and its benefits. Key topics covered in Opti include:

- Contribution to WSJ Regional Objectives
- Relationship to RMSs
- Technical feasibility
- Benefits to DACs, Native American Tribal Communities, and environmental justice (EJ) considerations
- Project costs, financing, and economic feasibility
- Project status (what stage of development is the project in?)
- Regional and interagency projects
- Climate change adaptation and mitigation
- Plan adoption
- Reducing reliance on the Delta

The project information form (in Appendix D), which is duplicated in the Opti system, allows project proponents to provide information on the project's benefits to the WSJ Region. In addition, the project information form prompts the project proponent for information that the Region must consider per the Prop 1 IRWM Guidelines.

The Opti system includes the capability to export a detailed list of all projects submitted. This list was used in discussions with the Working Group regarding submitted projects and during project prioritization. Opti enables project proponents to add new projects or update existing projects at any time (although changes made after the 2018 Call for Projects close are not reflected in the 2019 WSJ IRWMP). SLDMWA will likely issue new Call for Projects prior to funding solicitations. Projects that were submitted in 2018 include groundwater recharge projects, flood management projects, improvements to water distribution infrastructure, stormwater projects, and others. Projects from the 2006 and 2014 WSJ IRWMP lists were also included in the 2019 WSJ IRWMP if those project proponents wished.

Review (Step 1)

Once the new project information was received, submitted projects were reviewed for consistency with the IRWMP and IRWM program objectives. This is the first step in the overall project prioritization process. In order to be eligible for inclusion in the WSJ IRWMP, projects were required to meet four screening criteria:

- Project is located within, or provides benefits within, the WSJ Region
- Project meets at least one Regional objective
- Project fulfills at least one Statewide Priority
- Project fulfills at least two RMSs

During the 2018 Call for Projects, 42 projects were submitted, and all 42 met the screening criteria (Step 1 of the prioritization process). After eligibility screening, the projects were evaluated for integration opportunities. Each project included in the WSJ IRWMP achieves at least one of the Region's objectives, but the breadth of Regional objectives is such that they cannot all be accomplished through implementation of a single project. Therefore, the Plan establishes a menu of complementary projects. Through integration, project benefits may be combined and enhanced to meet more Regional objectives.

6.2 Project Integration, Prioritization, and Project List Updates

Integration

The projects contained in this Plan were selected to further the objectives of the Region. The overarching goals of this Plan are to improve water supply reliability, protect water uses, and meet community needs by improving water supply sustainability, drainage, and water quality. The Plan is designed to be flexible, adaptive and responsive to changing circumstances.

Projects submitted for inclusion in this plan were evaluated both for independent utility and for potential integration and/or enhancement to increase benefits and reduce costs. All projects submitted during the 2018 Call for Projects would provide benefits as they are currently described. Where reasonable and feasible, project alterations may be made to enhance projects as they develop further and as the proponents prepare to apply for funding. The projects included in the Plan are independent, each helping achieve the Plan's objectives. The Plan's progress is thus measured by the implementation of its projects, which are selected on the basis of their ability to add Regional value through incremental progress toward meeting the Regional objectives.

When integrated, projects' benefits can be maximized and benefits can be compounded between multiple projects. Economies of scale may also be achieved. Integrated projects can provide the best opportunities to realize the objectives of the Region. In some cases, multiple projects of the same type were identified. For example, two bridge replacement projects were submitted by Central California ID and multiple groundwater replenishment projects were submitted by Westlands WD. These projects of similar types could be integrated in order to achieve economies of scale; for example, Central California ID could implement a bridge replacement program which includes replacement of the two bridges (submitted as separate projects). This possibility would be evaluated in detail prior to including these projects in a grant application. However, since such projects still provide independent utility (i.e., they provide benefits even when implemented alone), they have been preserved as separate projects in the project list. For example, the two bridge replacement projects could be implemented separately or together, and benefits would be provided in both cases. Most projects submitted to the WSJ IRWMP provided independent utility and were only expandable within specific service areas due to water place-of-use restrictions, cost-effectiveness, etc.; however, many individual projects submitted did provide a measure of regional benefits without the need for direct integration or merging with other projects. For example, several projects would benefit entire groundwater subbasins, thereby inherently providing a regional benefit (including the Los Banos Creek Recharge and Recovery project and Terra Linda River Ranch Recharge project). The project list also included phased projects, where each phase was listed as a separate project. Specifically, the Floodwater Utilization by Reverse Flow of the DMC project and Patterson ID Groundwater

Bank project were broken down into more discrete pieces to best reflect the stages of work to be completed.

Prioritization

Ideally, all of the Plan's projects would be implemented simultaneously to achieve all Regional objectives in the near-term; however, many factors influence the readiness of a project. Aside from technical and environmental preparedness, a project must secure adequate funding and be politically and institutionally feasible. Projects identified in this Plan were evaluated through the project prioritization process described in this section.

In creating the project prioritization methodology and scoring criteria, the WSJ Region had two primary goals. First, the Region wanted to make project prioritization an objective, transparent, and simple process. Second, the Region sought to meet the requirements of the IRWM Guidelines while also considering Regional goals and needs. Only projects that have advanced beyond the conceptual stage of development were prioritized (i.e., conceptual projects on the project list were not prioritized; however, they are included on the project list in order to show the types of projects that may be implemented in the Region over a longer planning horizon). Conceptual projects were not prioritized because prioritization is meant to be a tool to help guide the Region as they determine the priority level for implementing projects, and conceptual projects are not yet developed in enough detail to be implemented. During scoring, projects are scored based on thirteen scoring criteria. This is Step 2 of the overall prioritization process. The Working Group identified these criteria through a consensus-based approach in May 2018 through a combination of in-person meetings and providing written comment via email. The criteria consider each project's contribution to WSJ IRWMP objectives, technical feasibility, benefits to DACs, project status, and other key considerations. Projects received a score of High, Medium, or Low for each criterion. In Step 3, projects received an overall prioritization based on the individual scores in Step 2. These overall scores also used High, Medium, and Low categories to classify the projects. The full project prioritization methodology can be found below in the *Detailed Project Prioritization Methodology* section. The ranked project list is included in Appendix D. Project scores are intended to be used as a tool when selecting projects for funding applications and for general guidance in discussing project implementation throughout the region, but do not directly determine which projects are included in a funding application or the order of implementation.

The projects entered into the Opti system did not undergo technical evaluation at the prioritization stage. It was assumed that the project proponents provided technically accurate information. Opti allows project proponents to add information on documentation (e.g., feasibility, design, environmental documentation) in order to support their answers to the various questions in the form. This approach was implemented with the understanding that further vetting of projects would occur prior to choosing projects for inclusion in a funding application, as many factors must be considered when selecting projects. For example, project proponents must comply with eligibility requirements stated in the Prop 1 IRWM Grant Program Guidelines, any updates to project status since the project was entered into Opti would be considered, among other items. The Working Group reviewed and tentatively approved the 2019 WSJ IRWMP project list at an in-person meeting in July 2018, followed by final approval via email. The approved projects can be viewed on the Opti site by any interested party. An email notification to the Stakeholder Contact List when the Public Draft was available to review in October 2018 also highlighted the list of projects and provided an opportunity for stakeholders and interested parties to review the project list, ranking, and other project-related information.

Of the 42 projects submitted to the 2019 WSJ IRWMP, 18 were conceptual, and 24 were non-conceptual. Seven projects received High scores, 15 received Medium scores, and two received Low scores. Non-conceptual projects with DAC benefits were also separated into their own list (Appendix D). This allowed for a more equitable comparison between DAC project scores, since projects in DAC areas may not be as developed as projects with more resources devoted to development, and thus may not score as highly as non-DAC projects. Six non-conceptual projects were categorized as DAC projects.

Detailed Project Prioritization Methodology

Step 1: Eligibility Check

Eligibility Requirements	
✓	Project is located within, or provides benefits within, the Westside-San Joaquin Region
✓	Project meets at least one Regional objective
✓	Project fulfills at least one Statewide Priority
✓	Project fulfills at least two Resource Management Strategies

Step 2: Evaluation

Criterion 1: Contribution to Plan Objectives	
High	Project received 45 or more points
Medium	Project received 11-44 points
Low	Project received 10 or fewer points

Criterion 1 Score Calculation Detail

The 14 WSJ IRWMP Objectives are ranked in order of priority. Each objective has a point value according to its priority level – Objective A is worth 14 points, Objective B is worth 13 points, etc. For every objective met, a project would receive the corresponding number of points. The total number of points then translates to a score of High, Medium, or Low as shown above.

Criterion 2: Relation to Resource Management Strategies (RMS)	
High	Project addresses 9 or more strategies
Medium	Project addresses 5 to 8 strategies
Low	Project addresses 0 to 4 strategies

Criterion 3: Technical Feasibility	
High	Documents exist demonstrating the technical feasibility of the project (feasibility study)
Medium	The project is of a type that is generally technically feasible
Low	No information provided

Criterion 4: Benefits to Disadvantaged Community (DAC) Water Issues	
High	Project provides direct benefits to DACs
Medium	Project provides indirect benefits to DACs
Low	No benefits to DACs

Criterion 5: Benefits to Native American Tribal Communities

High	Project provides direct benefits to Native American Tribal Communities
Medium	Project provides indirect benefits to Native American Tribal Communities
Low	No benefits to Native American Tribal Communities

Criterion 6: Environmental Justice (EJ) Considerations	
High	Project will not have EJ impacts
Medium	Project's EJ impacts are uncertain
Low	Project will have EJ impacts

Criterion 7: Project Costs and Financing (relative to local funding match)	
High	Local funding match has been secured/Match not Required (DAC or SDAC project)
Medium	Potential source of local funding match has been identified
Low	Potential source of local funding match has not been identified

Criterion 8: Economic Feasibility	
High	Benefit:cost ratio is greater than 2
Medium	Benefit:cost ratio is between 1 and 2
Low	Benefit:cost ratio is less than 1

Criterion 8 Score Calculation Detail

Benefit:cost (B:C) Ratio scores are calculated by dividing the benefit score by the cost score. The benefit and cost scores are assigned as follows:

Benefit: The benefit score will be determined based on the total points scored by the project in the other categories. Benefit scores will be assigned based on the project score as follows:

Number of Objectives Met	Benefit Score
Project addresses 9 to 12 objectives	3
Project addresses 5 to 8 objectives	2
Project addresses 0 to 4 objectives	1

Cost: Present value (PV) cost of project will be calculated based on the capital cost, annual O&M cost (assumed to be 10% of total construction cost unless otherwise provided), and project lifespan, using a 6% discount rate (per DWR's Economic Analysis Handbook). Cost scores will be assigned based on the PV cost as follows:

PV Cost	Cost Score
<= $2 million	1
> $2 million, <= $20 million	2
> $20 million	3

Criterion 9: Project Status	
High	Project status is listed as Ready to Proceed
Medium	Project status is listed as Under Design
Low	Project status is listed as Planning or Conceptual
Note: DAC projects are exempt from this criterion and will automatically receive a Medium score if they are not considered ready to proceed.	

Criterion 10: Strategic Consideration for IRWM Plan Implementation	
High	Project provides benefits on a regional scale and involves multiple agencies or community groups
Medium	Project provides benefits on a regional scale or involves multiple agencies or community groups
Low	Project does not provide benefits on a regional scale nor involve multiple agencies or community groups

Criterion 11: Climate Change Adaptation	
High	Project addresses 2 or 3 climate change adaptation questions
Medium	Project addresses 1 climate change adaptation question
Low	Project addresses 0 climate change adaptation questions

Criterion 12: Reducing GHG Emission as Compared to Project Alternatives	
High	Project addresses all 3 climate change mitigation questions
Medium	Project addresses 1 or 2 climate change mitigation questions
Low	Project addresses no climate change mitigation questions

Criterion 13: Plan Adoption	
High	Project sponsor will adopt Westside-San Joaquin IRWMP
Medium	Project sponsor may adopt Westside-San Joaquin IRWMP
Low	Project sponsor will not adopt Westside-San Joaquin IRWMP

Step 3: Prioritize Projects

Overall Project Prioritization	
High	Project received 6 or more “Highs” in Step 2
Medium	Project received 2 to 5 “Highs” in Step 2
Low	Project received 0 or 1 “Highs” in Step 2

Project List Updates

SLDMWA has always viewed the IRWMP as a “living” document. In the past, the IRWMP has been reevaluated and revised regularly. IRWMP Updates will continue in the future in order to address inevitable ecological, economic, resource, and social changes in a timely and thoughtful manner. Through this effort, old assumptions will be tested and new solutions developed and implemented to address the current objectives of the Region.

The prioritized project list, contained in Appendix D, will be revised periodically, but no less than every two years. The project list may also be updated to prepare for new funding opportunities. As needed, a new Call for Projects will be issued, and submitted projects will be reviewed and prioritized per the methodology described above. The revised project list will be approved by the Working Group or other body, as appropriate, following updating, and will be made available on the WSJ IRWM planning website through Opti. The project list contained in Opti is considered to be the official WSJ IRWMP project list; no formal plan adoption or re-adoption will be required for project list updating.

6.3 Impacts and Benefits

The IRWMP is a Regional blueprint that guides resource management in the context of environmental and socioeconomic factors. As a planning document, it is not intended to provide the level of detail necessary to implement specific projects, such as California Environmental Quality Act (CEQA) project-level analysis; rather, its purpose is to identify opportunities and facilitate Regional integration through development of partnerships. The specific impacts and benefits associated with each project will be identified in the detailed feasibility studies developed by stakeholders for use in project-specific environmental review and permitting processes. However, for the purposes of this Plan, the impacts and benefits associated with the variety of project types represented in the Plan are described below. Plan-related impacts and benefits are also described.

Project/Program Impacts and Benefits

The potential benefits and impacts associated with the project types included in this Plan are summarized in Table 6-1 and described in more detail below. Additionally, the projects included in this Plan are categorized by project type in Table 6-2.

For each project contained in the IRWMP, potential benefits and impacts are assumed to be similar to those identified for the general project type. During updates to the IRWMP, impacts and benefits of projects and Plan implementation will be re-evaluated and assessed based on project performance and changes in water resource conditions in the region.

Benefits

Water Supply and Reliability Projects

Improving water supply and reliability in the WSJ Region is a key objective of the IRWMP. Projects included in this category are projects that:

- Diversify the Region's water supply portfolio
- Create new supplies
- Augment existing supplies
- Improve efficiencies of existing supplies
- Offset potable water supplies

In general, projects that would achieve this benefit are summarized as follows and are divided into three general project categories.

1. Groundwater Projects
    - Enhance conjunctive management and groundwater storage
    - Aquifer storage and recovery
    - Stormwater capture and recharge
    - Improvement to groundwater monitoring
    - Hydrogeologic investigations and groundwater modeling
    - Groundwater extraction and/or treatment projects
    - Groundwater quality protection projects
2. Recycled and Non-Potable Water Projects
    - Tailwater capture, recirculation and reuse

- Upgrading wastewater treatment facilities to produce recycled water
- Stormwater capture and reuse
- Recycled water treatment and conveyance projects
- Programs matching water quality to water use

3. Water System Improvement Projects
   - New water supply pipelines and/or rehabilitation/repair projects
   - Water system tie-ins, interconnections, and diversion structures
   - Water transfer projects
   - Surface water diversion and treatment projects
   - Water storage and treatment projects
   - Water quality protection projects

Projects that augment the groundwater basin underlying the WSJ Region improve water supply reliability. The Delta-Mendota Subbasin and a portion of the Westside and Tracy Subbasins of the San Joaquin Valley Groundwater Basin underlie most of Region. Use of groundwater for agricultural irrigation and municipal purposes has resulted in historical declines of available groundwater. In past years, the groundwater basin has experienced overdraft conditions, and the decreasing availability of surface water supplies (delivered through the State and Federal water projects) could exacerbate this problem in the future. Groundwater recharge could help improve the state of the groundwater basin and its long-term sustainability. SGMA will facilitate the implementation of projects to protect the groundwater basin. In addition, stormwater capture and use projects can contribute to both the quantity and quality of the groundwater in the basin. The Stanislaus Multi-Agency Regional Stormwater Resources Plan is being prepared for the area of the WSJ Region that falls in Stanislaus County, and contains projects that can improve stormwater management. Where applicable, these projects have been included in the WSJ IRWMP.

Water conservation projects, both for the urban and agricultural sectors, will reduce demands, thereby limiting impacts during periods of drought. These projects will also ensure that all water types are put to their highest and best use, thereby ensuring that the Region's water supplies are not misused. Potable water use can be offset through conservation in addition to stormwater and recycled/non-potable water projects, with new non-potable water supplies used for irrigation, M&I, wildlife refuges, or other beneficial uses, helping to increase the region's water supplies.

Recycled water is a drought-resistant supply that can improve water supply reliability. By centralizing new sewer collection systems in areas that may still be on septic and/or upgrading existing wastewater treatment plants, a greater volume of wastewater can be treated at existing and new wastewater treatment facilities, creating more recycled water for beneficial uses. Increasing the amount of recycled water available for farmland, landscape, golf course, and school irrigation, industrial uses, and other uses will lead to other benefits such as potable water offsets and increased nutrient levels for landscape (reducing the need for fertilizers).

Finally, water system improvement projects will both facilitate the movement of water around the Region, helping to offset localized shortages, and minimizing water loss.

Habitat Protection and Improvement Projects

Projects that contribute to habitat protection and improvement have the ability to enhance and restore the Region's ecosystems and protect threatened, endangered, and sensitive species. These projects can

also reduce the risk of wildfire and the associated post-fire erosion; they will also provide greater climate change adaptability for the Region. The following types of projects would provide this benefit:

- Land conservation
- Surface water quality improvement projects
- Invasive species removal
- Restoration and enhancement of special aquatic features (e.g. wetlands, springs, bogs, riverine environments)
- Stormwater management and pollution prevention
- Debris cleanup and habitat restoration
- Meadow restoration
- Forest fuels reduction
- Road management activities to reduce runoff to streams
- Flood management projects which eliminate or reduce the transport of contaminants

Water Quality Projects

Protecting and improving water quality for beneficial uses is consistent with regional interests and the CVRWQCB Basin Plan. Different types of projects contribute to different types of water quality improvements. For example, groundwater recharge projects can improve groundwater quality in the subbasin, while treatment improvement projects will improve potable water quality. Projects that improve water quality include, but are not limited to:

- Stormwater projects (e.g. stormwater capture and recharge or stormwater management to reduce volume of urban runoff discharged to surface waters)
- Upgrading wastewater treatment plants
- Groundwater monitoring and assessment
- Conversion of private septic systems to municipal sewer systems
- Conjunctive management and groundwater storage
- Sewer collection improvements
- Tailwater capture, recirculation and reuse
- Water treatment projects
- Ecosystem restoration and revegetation projects
- Land conservation
- Salinity management

Agricultural Water Management Projects

Agricultural water management provides many benefits to the region, including economic and job security, water quality protection, water resource protection and habitat protection. Possible projects in this category include:

- Tailwater capture, recirculation and reuse
- Land conservation and land management (to reduce erosion)
- Salinity management
- Ecosystem restoration and enhancement

- Stormwater capture and reuse
- Groundwater monitoring and management
- Recycled water projects delivering water to agricultural users for irrigation
- Agricultural efficient management practices

Urban Water Management Projects

Urban water management projects and programs are, for the most part, conservation projects that manage demand to minimize water use and extend water supplies. These projects not only help with water supply reliability by controlling water demands, but they provide GHG emissions reductions and lower the need for new infrastructure by minimizing energy use and avoiding the cost of treatment and expanding/constructing new infrastructure. Conservation projects and programs include:

- Rebate programs for landscape incentives and residential fixtures such as high-efficiency washing machines and ultra-low flow toilets
- Water audits and landscape budgets
- System water audits, leak detection and repair
- Metering with commodity rates
- Public education and outreach programs

Other possible urban water management projects include:

- Using groundwater that does not meet the water quality requirements for drinking water and other non-potable sources of water for landscape irrigation
- Use of ordinances to manage salinity (e.g., salt discharges from regenerative water softeners), landscape water use, stormwater runoff pollution
- Promoting the use of LID techniques to stormwater capture and groundwater recharge
- Landscaping using drought-resistant plants

Flood Management Projects

Flooding is a concern for some areas within the WSJ Region, especially along the San Joaquin River. Flooding can occur from heavy rainfall, rapid snow melt, saturated soils, or a combination of these conditions. In some cases, flooding is due to inadequate storm drainage systems, unable to handle heavy storms during winter and spring seasons, and from increasing development leading to increases in impervious surface areas and decreases in natural vegetative cover, which reduces the detention and attenuation characteristics of the overland areas. Additionally, climate change may impact the amount, timing, intensity, frequency, and variability of runoff, potentially resulting in floods that are more frequent or of greater magnitude. To reduce potential property and structural damage, and related economic impacts, flood control enhancement may be provided by projects that:

- Capture and divert stormwater
- Improve levee systems (e.g. floodwalls or setback levees)
- Install pervious pavement or other LID infrastructure
- Protect and manage floodplains
- Construct regional flood control infrastructure

Public Education and Outreach Programs

Many water conservation, water quality protection, and water supply projects include public education and environmental awareness components, creating multi-benefit projects or programs. Public outreach programs and components can help promote and increase efficient water management practices, educate about habitat stewardship which can improve water resources, discourage illegal dumping of trash and litter in watercourses, and encourage other BMPs, including appropriate collection and disposal of hazardous liquid wastes and pharmaceuticals.

Public education and outreach efforts can be general, such as those that occur at street fairs, or targeted to specific audiences, such as school children or DACs. Targeted outreach programs can help to identify programs to address concerns and issues in specific communities within the Region.

Other Projects and Programs

There are many other possible project/program types that can provide water resource benefits. These include projects and programs that develop, enhance and/or preserve open space, floodplains, parks, and wildlife refuges, provide ancillary benefits through recreation and education, and facilitate water resources projects through data management and sharing.

Open space preservation is a benefit that can be achieved through implementation of land conservation projects. Preserving open space contributes to other benefits such as environmental and recreational benefits, as well as stormwater control, reduced runoff, and flood management benefits. Reservoirs, parks, wildlife refuges and the wilderness within the Region are used by outdoor recreation enthusiasts throughout the year. Enhancing recreation and public access in the region will be achieved by projects that:

- Conserve and preserve open space and access to public land
- Remove and control invasive species
- Improve water quality
- Provide appropriate sanitation facilities at recreation sites
- Road management activities to reduce runoff to streams
- Improve opportunities for public outreach and environmental education

Data management projects provide benefits by improving data accessibility and dissemination, allowing for the sharing of data collection and reporting activities, and providing public access to data. This can lead to the identification of projects that can help the Region meet its objectives and facilitate project planning, design and implementation.

Finally, local and regional prosperity and economic benefits can be achieved by:

- Avoiding costs of water supply infrastructure with the implementation of water management and water use efficiency projects
- Avoiding flood damage costs
- Avoiding impacts to the economy (e.g. businesses and agriculture) associated with water supply interruption
- Improving the economic resources of DACs
- Increasing tourism with enhanced recreational opportunities and improved water quality and ecosystems

- Constructing and maintaining proposed IRWM projects

As previously stated, working on a regional basis aids in protecting the economy of the WSJ Region and minimizing direct monetary impacts felt by DACs in the region through the stabilization of water and wastewater utility rates and agricultural and industrial job stability. IRWM planning and collaboration can lead to multi-benefit projects that achieve cost savings through cost-sharing opportunities, economies of scale, resource sharing, and other mechanisms. Existing resources can be optimized, duplication of efforts avoided, and larger scale efforts developed to provide cost savings to all parties involved.

Impacts

Implementation of the projects described in this plan may also have quantitative and/or qualitative impacts if the IRWMP and/or its component projects are not managed or implemented properly. These impacts may include increased project costs to agencies and ratepayers, delayed construction and/or operation of planned facilities leading to delayed water supply and other benefits, and negative impacts to surface water and/or groundwater quality. If the projects are not implemented, limitations on operational flexibility could increase, especially in times of drought, leading to increased water rationing and associated pressure on water users and the environment.

Project-specific environmental compliance processes will be completed by project proponents prior to project implementation. These processes will determine the significance of project-related environmental impacts. Each project will comply with the CEQA and National Environmental Policy Act (NEPA) requirements, if applicable, prior to and throughout implementation, and mitigate potential impacts where possible.

Negative impacts that could be associated with the implementation of projects and programs included in this Plan are similar to those of other water resources projects. In general, temporary, site-specific impacts related to construction and potential long-term impacts associated with project operation are anticipated. Short-term, site-specific construction impacts from implementing physical project facilities may include increased traffic and/or congestion; noise; and impacts to public services, utilities, and aesthetics. Other potential, longer-term impacts are described in more detail below.

Potential impacts from project implementation are briefly described in the following sections.

Water Quality Degradation

Groundwater-related projects, such as projects that increase groundwater pumping or implement conjunctive use, could degrade water quality if not operated appropriately for the groundwater basin and conditions. In addition, projects that involve the implementation of potentially contaminating activities in groundwater recharge areas could result in negative impacts to groundwater quality. Surface water quality could be similarly impacted by projects that encourage recreation and/or intensive development by increasing loading of nutrients, bacteria, and other contaminants to adjacent surface water bodies, negatively impacting water quality for water supply and environmental needs.

Recreation-related projects also have the potential to increase erosion and sedimentation. Increased motor vehicle traffic and foot traffic can increase erosion and sedimentation to adjacent water bodies, negatively affecting water quality for water supply and the environment/habitat purposes. Water quality issues associated with increased erosion and sedimentation can be detrimental to aquatic communities. Additionally, storm drains and channel modifications that are implemented to manage flood flows can contribute to erosion and sedimentation.

Reduced Groundwater Availability and Reliability

There are groundwater quality issues in many areas within the Tracy, Westside, and Delta-Mendota groundwater subbasins. Projects that impact water quality and/or yield could reduce overall groundwater availability and water supply reliability to users depending on the source. Increased groundwater pumping in the subbasins could create overdraft conditions, potentially degrading water quality and further decreasing overall reliability.

Land Use Compatibility (Rights-of-Way)

A potential impact of any project that includes construction of physical facilities is land use compatibility. The types of projects that could potentially have land use compatibility or rights-of-way issues include:

- Water conveyance facilities
- Storage tanks or reservoirs
- Treatment plants
- Wastewater collection systems
- Tailwater collection and recirculation systems
- Recycled water distribution facilities

Construction of new facilities, such as roads, could result in disturbance of otherwise undisturbed areas and may result in loss of open space and habitat.

Disturbance of Habitat and Endangered Species

Open spaces in the Region provide habitat for numerous species, including special-status species (i.e. endangered, threatened, sensitive, or candidate). Projects that involve facility construction have the ability to disturb surrounding habitat and endangered species, depending on the location, type of construction, and facilities. All projects implemented will comply with CEQA and NEPA, as applicable, and as part of the process, will identify and implement mitigation measures for potential environmental impacts as necessary.

Energy Consumption

The water sector plays a significant role in California's energy consumption. Implementing certain projects may increase energy use. Water and wastewater treatment projects that require significant amounts of power may result in increased energy consumption in the region, as would increase groundwater pumping and the transmission of water around the Region. Increased energy consumption can increase GHG emissions, further exacerbating projected climate change impacts.

Economic Impacts

Implementation of certain projects may have associated long-term economic impacts to agencies, irrigators/landowners and ratepayers. Project financing has historically provided a challenge in areas of the WSJ Region. Even when grants and/or low-interest loans are available to subsidize project capital costs, agency rate revenues are sometimes insufficient to properly operate and maintain the project. Because funds available to implementing agencies are generally limited, it will be important to evaluate financing methods and avenues for potential projects prior to implementation such that potential economic impacts on ratepayers, landowners, and agencies in the Region can be minimized.

Table 6-1: Project Impacts and Benefits

Project Type	Project Type – Sub-Category	Regional		Interregional	
		Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Water Supply Reliability	• Conjunctive Use • Groundwater Management • Storage Development • Improved Conveyance • Recycled Water • Stormwater Capture and Reuse/Recharge • Conservation	• Water quality degradation • Reduced groundwater availability and reliability	• Increased groundwater storage / recharge • Improved water supply reliability • Improved water quality • Reduced land subsidence and/or fissuring • Improved water management coordination • Avoided costs of imported water supply • Avoided costs of water supply infrastructure • Local economic prosperity	• Water quality degradation • Reduced groundwater availability and reliability	• Increased groundwater storage/recharge • Improved water supply reliability • Improved water quality • Reduced land subsidence and/or fissuring • Improved water management coordination • Avoided costs of imported water supply • Avoided costs of water supply infrastructure • Regional economic prosperity
Habitat Protection and Improvement	• Land Conservation • Invasive Species Removal • Restoration/Revegetation	• Economic impacts • Disturbance of habitat and endangered species • Increased sedimentation and erosion	• Improved water quality • Flood control enhancement • Habitat protection, restoration and enhancement • Open space preservation • Reduced threat to wildfires	• Economic impacts • Disturbance of habitat and endangered species • Increased sedimentation and erosion	• Improved water quality • Flood control enhancement • Habitat protection, restoration and enhancement • Open space preservation • Reduced threat to wildfires
Water Quality	• Salinity Management • Pollution Prevention • Stormwater Runoff Quality Management • Local Impact Development • Septic to Sewer Conversion	• Water quality degradation • Disturbance of habitat and endangered species • Land use compatibility	• Improved water quality • Improved water supply reliability	• Water quality degradation	• Improved water quality • Improved water supply reliability
Agricultural Water Management	• Conservation • Tailwater Capture and Recirculation • Recycled Water Conveyance and Use	• Land use compatibility • Water quality degradation • Disturbance of habitat and endangered species	• Improved water supply reliability • Increased nutrient levels for plants • Potable water offsets	• Land use compatibility • Water quality degradation • Disturbance of habitat and endangered species	• Improved water supply reliability • Increased nutrient levels for plants • Potable water offsets

Project Type	Project Type – Sub-Category	Regional		Interregional	
		Potential Impacts	Potential Benefits	Potential Impacts	Potential Benefits
Urban Water Management	• Conservation • Leak Detection and Repair • Recycled Water Conveyance and Use	• Land use compatibility • Water quality degradation • Disturbance of habitat and endangered species	• Improved water supply reliability • Increased nutrient levels for plants • Potable water offsets	• Land use compatibility • Water quality degradation • Disturbance of habitat and endangered species	• Improved water supply reliability • Increased nutrient levels for plants • Potable water offsets
Flood Management	• Improved Infrastructure	• Land use compatibility (rights-of-way) • Disturbance of habitat and endangered species • Increased sedimentation and erosion • Economic impacts	• Flood control enhancement • Increased groundwater storage / recharge • Avoided costs of flood damage • Local economic prosperity	• Land use compatibility (rights-of-way) • Disturbance of habitat and endangered species • Increased sedimentation and erosion • Economic impacts	• Flood control enhancement • Increased groundwater storage / recharge • Avoided costs of flood damage • Regional economic prosperity
Public Education and Outreach	• Conservation Education • General Public Education • DAC Support • Regional Outreach Activities	None	• Identification and facilitation of projects directly supporting DACs • Increased public awareness and support of projects • Improved consumer response to RMS • Improved facilitation of project implementation	None	• Identification and facilitation of projects directly supporting DACs • Increased public awareness and support of projects • Improved consumer response to RMS • Improved facilitation of project implementation
Other	• Data Collection and Management • Recreation – Parks, Trails	None	• Improved data accessibility and dissemination • Public access to data • Project implementation facilitation • Enhanced recreation and public access • Local economic prosperity	None	• Improved data accessibility and dissemination • Public access to data • Project implementation facilitation • Enhanced recreation and public access • Regional economic prosperity

Table 6-2: Project Types

Project Name	Project Types							
	Water Supply Reliability	Habitat Protection & Improvement	Water Quality	Agricultural Water Management	Urban Water Management	Flood Management	Public Education and Outreach	Other
Non-conceptual Projects								
Althea Avenue Bridge Replacement						●		
Russell Avenue Bridge Replacement						●		
Orestimba Creek Recharge and Recovery Project (OCRRP)	●		●	●		●		
North Valley Regional Recycled Water Program	●	●	●	●				
Delta-Mendota Canal Turnout Flowmetering Improvement Pilot Program	●							
West Stanislaus Irrigation District Fish Screen Project	●	●	●	●				
Pumping Plant 7-1 Variable Frequency Drive Project	●							●
Los Banos Creek Recharge and Recovery	●	●				●		
Little Salado Creek Groundwater Recharge and Flood Control Basin	●	●	●			●	●	
Terra Linda River Ranch Recharge Project	●	●	●	●		●		
Aquifer Storage and Recovery Project	●		●	●		●		
Lateral Inter-Connection Project	●			●				
Lateral 13 Intertie Project	●			●				●
Del Puerto Canyon Reservoir	●		●	●		●	●	
Grassland Bypass Project Capacity Enlargement			●			●		
Groundwater Monitoring Program: Multi-Well Aquifer Monitoring	●			●	●			●
Delta-Mendota Canal Subsidence & Conveyance Capacity Study	●							●
Kaljian Drainwater Reuse Project	●		●	●		●		
West Stanislaus Irrigation District Pumping Plant 3 & 4 Modernization	●	●		●				
Broadview Water District Drainage Water Treatment Project	●		●	●				
Pasajero Groundwater Replenishment Project	●					●		
Panoche Creek Groundwater Replenishment Project	●					●		
Cantua Creek Groundwater Replenishment Project	●					●		
Crescent Canal Project	●					●		
Conceptual Projects								
Lift Canal Rehabilitation Project	●							
Newman LID Water Quality and Conservation Project	●	●	●	●	●	●	●	
Salado Creek Flood Management and Repair Project						●		
Salado Creek Landscape and Pedestrian Path Project		●	●		●	●	●	
Patterson Wellhead Treatment	●		●		●			
Storm Drainage Enhancements along Salado Creek			●			●		
Percolation Ponds for Stormwater Capture and Recharge	●	●			●	●		
New Tertiary Filtration System at WQCF	●		●		●			

Project Name	Project Types							
	Water Supply Reliability	Habitat Protection & Improvement	Water Quality	Agricultural Water Management	Urban Water Management	Flood Management	Public Education and Outreach	Other
South Side Reservoir Pump Relocation	●			●		●		
PID Groundwater Bank Phase 1 - Feasibility	●							●
PID Groundwater Bank Phase 2 - Design and Construction	●		●	●		●		
Technical Assistance Project							●	
Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal - Phase 1.1. Prefeasibility Analysis	●							●
Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal - Phase 2. CCID Outside Canal s/o Check 14	●			●		●		
Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal - Phase 3. DMC Pumpback	●			●		●		
Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal - Phase 1.2. Pilot Project	●			●				
Generic Data Management System Framework and Santa Nella County Water District Data Management System Project							●	●
West Stanislaus Irrigation District Lateral 4-North Recapture and Recirculation Reservoir	●		●	●		●		

At the Plan level, implementation of this IRWMP may have additional impacts and/or benefits beyond those identified for the project types previously described. A summary of these potential Plan-level impacts and benefits are described below.

Regional Impacts and Benefits

Implementation of this Plan and ongoing IRWM planning will lead to numerous and wide-ranging benefits including, at a minimum:

- A more sufficient and reliable water supply;
- Protection of existing water quality;
- Better use of existing supplies;
- Cost-effective, multi-benefit projects;
- Improved Regional water supply resiliency;
- Improved Regional understanding and management of water resources; and
- Increased understanding of water resources issues.

These benefits will preserve the economic and environmental health and well-being of the Region, provide cost-sharing opportunities through economies of scale and resource sharing, improve the coordination and facilitation of joint projects, and reduce conflicts by addressing the issues and concerns of stakeholders within the Region, in neighboring IRWM regions and in the counties encompassed by this Plan.

As previously described, potential impacts of implementation of this Plan could include a variety of temporary construction-related impacts during project construction, including dust, noise, and traffic generation. Other impacts may include increased costs associated with water infrastructure financing. Additional impacts may be identified on a project-by-project basis during CEQA or NEPA analyses.

If the projects such as the ones in the WSJ IRWMP are not implemented, the impacts to the region's, water, wastewater and irrigation agencies, and its residents would be vast. The issues the region is currently experiencing would not be resolved, and while individual, localized planning efforts and projects would likely continue, they would not achieve the same magnitude and multitude of benefits as would be derived from regional planning and implementation.

Interregional Benefits and Impacts

Interregional projects such as the NVRRWP, a joint project between entities within the WSJ and East Stanislaus Regions, stand to provide benefits that extend beyond regional boundaries. These projects not only benefit the local agencies and residents of the WSJ Region, but the Delta and members of the public throughout California. Specific ways in which the WSJ IRWMP provides benefits beyond the WSJ Region include the following:

- Improved regional water supply and reliability for the Region and the counties in which it resides, achieved through several water storage and recycled water projects, will reduce pressure on the Delta, the groundwater basin, and the agricultural-based economy in times of significant drought. Additional wastewater reuse projects will also reduce the demand for potable water, potentially increasing downstream supplies.

- Conjunctive use projects will increase water supply reliability within the region, resulting in increased surface water supply availability in dry years and reduced pressure on the San Joaquin River and the State and Federal water projects as primary water supplies.

Most likely, project-dependent construction-related impacts would not impact other IRWM regions, as project and program facilities would be implemented within the Region itself. These construction impacts would be temporary in nature and result in predominantly local impacts, if any.

There is also the potential to provide benefits beyond local and regional water resources. For example, enhanced tree cover, which is viewed as a habitat enhancement, may also directly benefit regional air quality through the creation of microclimates and the filtering capacity provided by trees. By optimizing water supply operations and implementing conjunctive use, additional surface water supplies may be available for hydropower generation to benefit statewide energy resources and for other fisheries and habitat management projects.

Benefits and Impacts to DACs and Environmental Justice-Related Concerns

Protection of the residents and economy of DACs and correction of EJ concerns are priorities for the IRWMP. (Note that, as of the 2019 IRWMP Update, there are no federally- or state-recognized Native American communities in the WSJ Region.) EJ is addressed by ensuring that all stakeholders have access to the IRWM planning decision-making process and that minority and/or low-income populations do not bear disproportionately high and adverse human health or environmental impacts. Working on a regional basis aids in protecting the economy of the Region and the counties in which it resides, and minimizes direct monetary impacts felt by DACs in the region through the stabilization of utility rates. Implementation of the Region's flood control projects will protect the local communities from disastrous flood damage. Regional coordination has been, and will continue to be, achieved through public meetings and communication, conducting routine reviews to ensure that DACs are not being adversely affected by project and Plan implementation, and by using grant monies to help offset project implementation costs.

Impacts to DACs will be kept to a minimum, and ongoing coordination and public involvement will aid in preventing possible impacts. Construction of project facilities will create short-term environmental impacts (noise, dust, traffic disruption) in neighboring communities. Preliminary analyses of the areas affected by construction of project facilities will ensure that these construction nuisance impacts will not be borne predominantly by any minority population or low-income group. Such impacts would be evaluated through environmental compliance processes (CEQA and/or NEPA) prior to project implementation.

Chapter 7 Plan Performance and Monitoring

The WSJ IRWM Region tracks the progress of IRWMP implementation through project development and plan implementation monitoring. It is also important that the projects included in the WSJ IRWMP comply with applicable rules, laws, and permit requirements. This section outlines the processes to ensure these items occur.

7.1 Project Monitoring

The project proponent, acting as the lead agency implementing a project in the WSJ IRWMP, will be responsible for preparing a project-specific monitoring plan prior to construction, performing monitoring activities, and tracking and maintaining monitoring information. The monitoring plan must identify project-specific performance measures and may include the following:

- Project objectives / performance measures
- What is being monitored (e.g. water quality before and after construction)
- Monitoring location and frequency
- Who will perform monitoring
- Monitoring methodology
- How the data will be collected, tracked, reviewed and maintained
- What statewide databases will the data be uploaded to
- Schedule of monitoring and demonstration of available funding and resources for monitoring timeline
- Protocol and measures if problems are encountered during monitoring

Project monitoring plans are typically a requirement of DWR written into IRWM grant agreements; thus, any project that receives IRWM grant funding would prepare and submit its project monitoring plan to DWR. While a monitoring plan is only required for projects that are funded through the IRWM grant program, the WSJ RWMG encourages preparation of a monitoring plan and performance of monitoring activities regardless of the funding source in order to evaluate project effectiveness and help improve implementation of future projects. Measuring how a project is meeting both the project objectives and contributing to the Region's objectives will help SLDMWA and stakeholders better understand the effectiveness of the project, similar projects, and may assist the Region in updating the IRWMP objectives based on adaptive management if necessary.

As described in Chapter 8, Data Management, as a project is developed and implemented, the project proponent must upload relevant project data and documents to statewide databases, as appropriate or required. In 2018, the WSJ Region also began using Opti, a web-based data management system, to manage data and make data publicly available. The WSJ Region also uses available local, statewide, and federal databases to share data with other SLDMWA member agencies and stakeholders. During project monitoring, data must be collected according to the procedures and using the methods described in Chapter 8. Each project proponent will be responsible for ensuring that its project is monitored to comply with all applicable rules, laws, and permitting requirements. This includes acquiring necessary permits and complying with CEQA and the NEPA, if necessary.

7.2 Plan Implementation Monitoring

Implementation of the WSJ IRWMP occurs via the implementation of the projects that are included in the IRWMP. Because of this, monitoring and evaluation of WSJ IRWMP implementation is heavily dependent on Project Monitoring (described in Section 7.1). Implementation progress of the WSJ IRWMP will be measured via the performance of individual projects. As projects are implemented, they contribute to the WSJ IRWMP goals.

Project-specific monitoring plans will be required by DWR for all projects that are funded through the IRWM grant program. These plans will be prepared and implemented by project proponents. Project proponents are responsible for conducting the necessary monitoring and reporting the results in accordance with the applicable grant agreement. Project proponents must also conduct any required reporting, including submittal of data to DWR or other entities, if stipulated in the grant agreement. Project implementation will also be evaluated by DWR relative to the schedule in the grant agreement.

For projects that are not funded by the IRWM grant program, project-specific monitoring is not required. However, the WSJ Region encourages project proponents to conduct monitoring to evaluate the status of all IRWM projects that are implemented. All projects, regardless of funding source, are required to conduct monitoring in compliance with all applicable rules, laws, and permit requirements.

Project proponents are encouraged to submit monitoring data and project performance data to Opti. This makes project implementation and monitoring more transparent, as members of the public are able to view information in Opti. Project proponents should also keep the information in Opti as up-to-date as possible, regardless of whether their project receives IRWM funding. For example, cost information is likely to become more concrete as projects develop. Schedule information can also be kept current as different phases of the project (e.g., design, environmental documentation, permitting) progress. The use of Opti allows SLDMWA to assess the progress of WSJ IRWMP projects being implemented, the benefits being realized, and the Regional goals achieved.

SLDMWA staff will review the WSJ IRWMP project list every two years at a minimum. For projects that have moved past the conceptual stage, project status may be summarized at a high level in a table, such as example shown in Table 7-1. Not every project in the WSJ IRWMP needs to be reviewed or evaluated if no progress was scheduled to occur during a given year.

Table 7-1: Example Project Status Table

Project	Project Proponent	Status	Performance Monitoring Plan Prepared?
Project A	Water Agency A	In Design	No
Project B	Water Agency B	Construction Started in July 2014	Yes

During the biennial staff review of projects, any available monitoring plans or results will be reviewed. Monitoring results will be uploaded to Opti when possible. The monitoring results should help SLDMWA determine if the project objectives were achieved or are in the process of being achieved. It is assumed that if the project's objectives are being met, the Region's objectives are also being met (since all projects included in the WSJ IRWMP would advance the Region's objectives if implemented). The project

proponents are responsible for providing the updated information to SLDMWA via upload to Opti. Provided that implementation information is available, SLDMWA will prepare a list of objectives that are being advanced. This will allow the Region to highlight any Regional objectives that have not yet been addressed. If projects have not helped to meet these objectives, it could mean that objectives are not relevant to the Region, are not realistic and achievable, and should be reconsidered, or it could mean that projects have not yet been implemented that contribute to the objective(s). For example, if in a given year, multiple water supply projects are implemented, the flood management related objectives may not be met. SLDMWA and participating agencies can take this information into consideration when discussing which projects should be implemented in the near-term, during project prioritization, and during preparation of grant applications.

Information on project status, implementation, and effectiveness will be incorporated individual project operation in order to adapt the project to better meet the overall objectives of the project. The Region will also take into account project performance as the Region faces new challenges, especially those related to climate change. Through processes like those described above, the Region promotes adaptive management to new issues that may arise. The WSJ IRWMP itself will also undergo changes as new information and management tools become available. The WSJ IRWMP has changed significantly since its inception in 2005, and the RWMG will continue to evaluate the Plan's success in order to make the most progress possible moving forward. Figure 7-1 illustrates the adaptive management process for revising both projects and the WSJ IRWMP in the future.

As the Region continues to meet in the future, SLDMWA will maintain the meeting materials, including notes on status of projects that are being implemented and objectives to be met, given availability of information. SLDMWA will convene meetings of project proponents or other groups as needed.

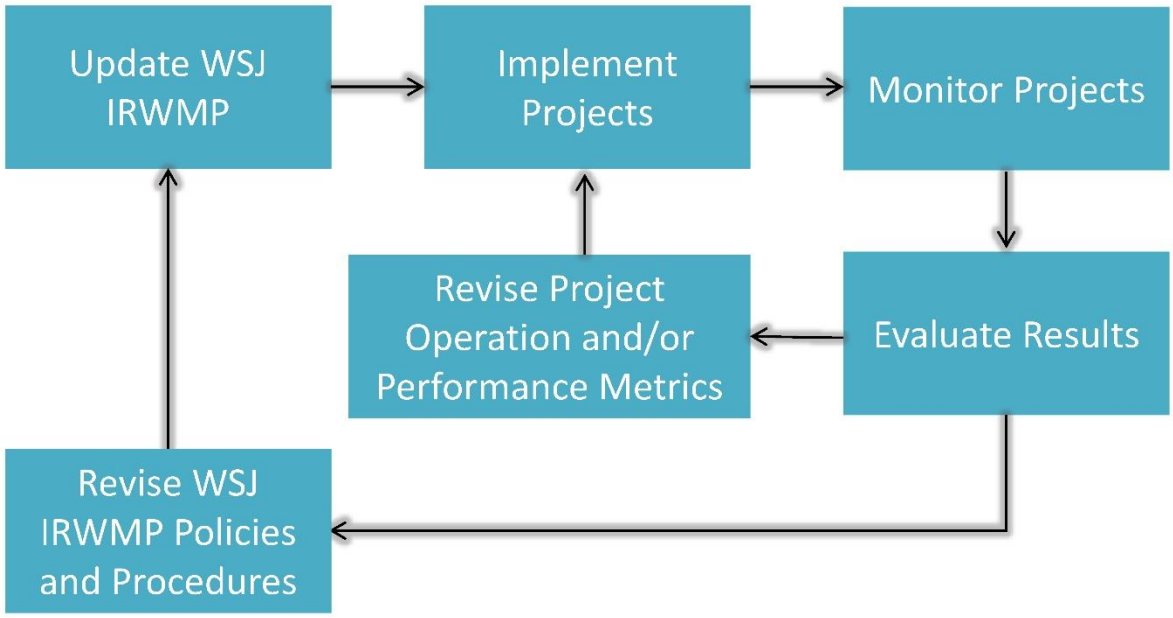


Figure 7-1: Adaptive Management of the WSJ IRWMP and Projects

7.3 Project Implementation to Date through IRWM Grant Program

While many projects included in the 2006 and 2014 WSJ IRWMPs have been implemented, the following discussion focuses on three projects that were implemented using IRWM implementation grant funding. Implementation of these projects contributed to the following objectives: increased reliability of water supply south of the Delta, enhancement of water recycling, habitat improvement, and aquifer utility. In July 2014, SLDMWA applied for $20 million of Prop 84 IRWM implementation grant funds. Ultimately, funding was awarded for three of the six proposed projects, for a total grant award of $2,742,915. These projects are:

- Non-Potable Water System Phase III, implemented by City of Patterson
- Marshall Spanish Return System Agricultural Drainage Recirculation Project, implemented by Patterson ID
- NVRRWP, implemented by Del Puerto WD

Non-Potable Water System Phase III Project

The Non-Potable Water System Phase III Project expanded the City of Patterson's non-potable water supply from 12 customers (with a total demand of 885 AFY) to 20 customers (with a total demand of 1,275 AFY) through construction of additional non-potable water pipeline. The City of Patterson has no surface water entitlements and depends solely on local groundwater wells for potable and non-potable supplies. Potable water supplies are produced solely from the lower aquifer. Historically during droughts, and as is currently being observed, the amount of pumped groundwater increases substantially in the Region, causing groundwater quality and quantity to diminish (including in the lower aquifer). The project allows for greater use of water from the non-potable upper aquifer, thereby offsetting 390 AFY of potable groundwater from the lower aquifer. The project helps match water quality to use and supports WSJ IRWMP Objective H: "Maximize utility of Regional aquifers while improving sustainability." The Project helps manage the Region's aquifers in a manner that better aligns with the City's water supply and quality needs. The project reduces the amount of high-quality water withdrawn from the lower aquifer, thereby lowering the chance of overdraft and subsidence while also maximizing use of water from the upper aquifer.

Marshall Spanish Return System Agricultural Drainage Recirculation Project

The Marshall Spanish Return System Agricultural Drainage Recirculation Project supports multiple objectives from the WSJ IRWMP. Prior to the project, water from the Marshall Road and Spanish Land Grant Drains was discharged into the San Joaquin River. With project implementation, this discharge no longer occurs and is recirculated and blended into Patterson ID's conveyance system. The associated pollutants (including pesticides, silt, and salt) in the drain water are no longer discharged to the River. The water quality improvements from this project contribute to Objective K of the WSJ IRWMP: "Develop Regional solutions that protect environmental and habitat concerns and provide potential for improvement." The project meets this Objective by reducing pollutant loading in the San Joaquin River. The San Joaquin River is listed as an impaired water body for a variety of constituents, including chlorpyrifos, diazinon, salt, and boron. Recirculation of agricultural drain water by the project eliminates the discharge of these constituents to the San Joaquin River and improves the water quality and associated habitats.

The project also promotes water supply reliability for Patterson ID. A portion of Patterson ID's water supply comes from the CVP, which can be highly unreliable; in some years, Patterson ID receives only a

fraction of their full allocation. By providing 5,000 AFY of additional agricultural water supply, the project reduces reliance on Delta supplies and supports WSJ IRWMP Objective A: "Provide for more reliable water supply south of the Delta."

The WSJ IRWMP also emphasizes the value of water recycling through Objective G: "Promote and enhance water recycling." The project recovers approximately 5,000 AFY that would otherwise be discharged. This water is reused for irrigation purposes, supporting water reuse in the Region.

North Valley Regional Recycled Water Program (NVRRWP)

The NVRRWP, located within Stanislaus County, consists of construction of a pipeline to deliver recycled water produced by the Cities of Modesto and Turlock to Del Puerto WD agricultural customers and South-of-Delta wildlife refuges for beneficial use.

Del Puerto WD, also a CVP agricultural water contractor, has seen significant shortages and decreased reliability in the quantity of water it receives annually under the terms of its federal water service contract and most recently received 0% of its CVP contracted allocation in 2014 and 2015. Its customers need a reliable water supply to continue to grow and manage the highly-productive agricultural land, prevent crop damage and loss, and maintain jobs to help sustain the economy in the Del Puerto WD service area, the counties, and the region.

The primary benefit of the NVRRWP is providing recycled water in the Del Puerto WD service area thereby providing supplemental water supplies and increasing agricultural water supply reliability, which supports Objective A: "Provide for more reliable water supply south of the Delta," as well as Objective G ("Promote and enhance water recycling"). Construction has been completed on the Modesto component of the NVRRWP which will expand recycled water use to the Del Puerto WD service area with recycled water produced by the City of Modesto. This augments the Del Puerto WD's CVP supplies by up to 16,690 AFY. The Turlock component, which will begin construction in 2018, will deliver an additional 9,500 AFY of recycled water to Del Puerto WD upon completion.

A secondary benefit is that recycled water from the NVRRWP will be made available to South-of-the-Delta wildlife refuges, helping the USBR meet Incremental Level 4 Refuge water demands. On average, up to 27% of the available recycled water will be delivered to the refuges. Delivery schedules may vary by water year type but will be made primarily during the fall/winter-time "flood-up" months when the refuge water needs are the greatest. This project component meets three WSJ IRWMP Objectives: Objective D, "Provide potential for environmental and habitat improvement, including wetlands," Objective C: "Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation," and Objective A: "Provide for more reliable water supply south of the Delta."

Chapter 8 Data Management

The WSJ Region is a relatively large IRWM region with many agencies; as a result, a significant amount of data are generated on a regular basis as a result of IRWM planning, regional and agency planning, programs in support of state mandates (such as CASGEM) and related to the projects included in this Plan. For the purposes of this section, data includes, but are not limited to:

- Designs, including plans and specifications, of projects included in the Plan
- Feasibility studies or other planning documents for projects included in the Plan
- Data gathered prior to, during, or after construction of the projects included in the Plan (e.g. groundwater quality data)
- Data gathered in support of other programs

8.1 Data Needs

During preparation of the WSJ IRWMP Update, the following data needs were identified:

- Updated water supply gap analysis. The Westside Water Supply Gap Analysis was completed for and presented in the *2003 Westside Integrated Resources Management Plan* (SLDMWA, 2003), as described in Chapter 2, Region Description. The analysis evaluated current and projected future water supplies and demands in the Region and estimated water supply shortages (gaps) under 1999 and 2025 conditions. This analysis should be updated to evaluate conditions in years beyond 2025 and to provide a more up-to-date picture of the water supplies and demands in the Region.
- Region-specific climate change analysis. Potential climate change impacts and vulnerabilities for the WSJ Region are described in Chapter 13 of this Plan. The discussion is based on various statewide analyses and documents. These documents provide adequate detail regarding potential impacts to the Central Valley; however, it would be beneficial to perform a climate change analysis specific to the WSJ Region and its potential impacts on SLDMWA member agencies. Many of the agencies in the Region rely heavily on CVP water supplies, which are expected to be significantly impacted by climate change and biological and water quality changes in the Delta. Having a thorough understanding of how climate change may impact water supplies through a more robust analysis is critical to sustainable, long-term water supply planning. Some climate change analysis may occur as part of GSP preparation efforts, which could be incorporated into future WSJ IRWMP updates.
- Groundwater balance and groundwater quality analysis. With the recent dry years, groundwater levels throughout the Central Valley have been falling at an unprecedented rate. Understanding the current status of the underlying groundwater basin, along with a detailed water balance and ongoing groundwater elevation monitoring, can provide the Region with critical information that will allow it to effectively manage the underlying groundwater basin in a sustainable manner. Similar to groundwater elevations, understanding current groundwater quality and potential sources of pollutant loadings to the groundwater basin is essential to managing the groundwater basin in an effective, sustainable manner. Recent work related to groundwater quality occurred as part of the *Western San Joaquin River Watershed Groundwater Quality Assessment Report,* completed in 2015. This report was prepared by the Westside San Joaquin River Watershed Coalition for the San Joaquin Valley Drainage Authority, and synthesized

available groundwater quality data and ranked areas of groundwater vulnerability. Continued monitoring and evaluation of groundwater quality in the Region is essential for water resources management. In addition to the water balance previously described, delineating the areas of the basin that are most permeable, and therefore contribute the most recharge to the basin, is key to protecting them. Also, understanding current land use practices and their potential impacts to groundwater quality will provide needed understanding for identifying and implementing management strategies to control potential future loadings. Work to close these data gaps (for both groundwater elevation and quality) will occur under SGMA and GSP planning, as subbasins in the Region are required to achieve sustainability by approximately 2040. Under SGMA, GSPs are required to include water budgets; they must also contain components related to the monitoring and management of groundwater quality. Therefore, some groundwater data gaps will likely be addressed as SGMA implementation progresses. Information captured in GSPs will be incorporated into future updates of the WSJ IRWMP as appropriate.

- Recycled Water Master Plan (RWMP). Recycled water is a "drought-proof" supply that can add to the Region's water supply portfolio. A RWMP, or at a minimum, a recycled water market assessment, can provide necessary information to determine what demands exist, both in the present and future, for recycled water and what supplies are available to fulfill those demands.

8.2 Data Collection, Maintenance, and Dissemination

Gathering and developing data at a project level is essential to the successful development and implementation of a project. Data gathered relative to a project are generally collected and managed by the lead implementing agency (or project proponent). With this update of the WSJ IRWMP, Opti has been implemented as the centralized data management system (DMS) for the WSJ Region . Opti was used to collect project information during the 2018 Call for Projects. Opti serves as a central repository for project information entered by the project proponents, and can also be used to house more detailed information, such as data collected during project implementation. Opti also makes project information publicly available to any interested stakeholder. Opti is a Region-focused DMS which contributes to transparency within the Region and facilitates project updates on an ongoing basis. Additionally, project-specific data are available from websites, published reports, implementing agencies, and governmental agencies. The Region also leverages the availability of statewide databases, using those as a means of sharing and transferring information between interested parties, including IRWM planning participants, stakeholders within and outside the region, and state and federal agencies. Using the existing statewide databases supports the efforts to share collected data and ensures the data collected through the IRWM planning process are available for education and potentially other analyses to better understand water resources in the Region and in California. It also allows stakeholders to contribute to data analyses by using the publicly available websites which interested parties can access and review.

Each project proponent is responsible for collecting, maintaining, performing quality assurance/quality control (QA/QC) on project-specific data collected, and uploading its data to relevant statewide databases, including but not limited to:

- California Environmental Data Exchange Network - http://www.ceden.org/
- Water Data Library - http://www.water.ca.gov/waterdatalibrary/
- CASGEM - https://www.water.ca.gov/Programs/Groundwater-Management/Groundwater-Elevation-Monitoring--CASGEM

- CEQAnet Database - http://www.ceqanet.ca.gov/

Data collection techniques are determined on a project-by-project basis and may vary slightly for each entity. Typical data collection techniques are summarized in Table 8-1. Agencies in the WSJ Region monitor groundwater levels, groundwater quality, and water use as part of regular water management activities. Additional data may be collected in new locations for project-specific purposes.

Table 8-1: Typical Data Collection Techniques

Data Type	Method for Collection	Relevant Statewide Database
Groundwater Levels	Electronic water level indicator or sounding cable	CASGEM, WDL
Groundwater Quality	Well sampling	CEDEN, WDL, Geotracker
Water Demand	SCADA, meter readings	Maintained locally
Environmental Documentation (e.g. EIRs, Negative Declarations)	Prepared by lead agency and submitted to the State Clearinghouse within the Office of Planning and Research	CEQAnet Database
Surface Water Flows	Weirs, staff gages	CEDEN, CAWSC, eWRIMS
Surface Water Quality	Surface water sampling	CEDEN, WDL, SWAMP

QA/QC measures may differ among entities, but typically, the data are reviewed, validated, and put into the appropriate format compatible with and necessary to integrate into existing databases. Projects that receive IRWM grant funding administered by DWR are required to monitor the project for up to 10 years following completion and ensure data are collected, maintained, and distributed as required.

Chapter 9 Financing

SLDMWA has identified a variety of potential funding sources and mechanisms for ongoing IRWM planning in the WSJ Region, as well as implementation of the WSJ IRWMP (i.e. implementation of the projects included in the Plan). To implement many of the projects that comprise the Plan, funding will be sought from local, Regional, State, and federal funding opportunities. Each project will have unique requirements, so funding will be sought from one or more of the aforementioned sources, as appropriate. Lastly, the source of funding for a particular project does not always correspond with whom ultimately pays the cost; this is particularly true with respect to the projects with federal interest and involvement. Potential funding for IRWM planning and implementation of projects is described in the following sections.

9.1 IRWM Planning Financing

The WSJ Region has made significant progress in IRWM planning since the first Plan was prepared. The participating agencies and stakeholders recognize the need to maintain momentum by continuing coordination in IRWM planning efforts, even after the WSJ IRWMP Update is finalized. The most efficient and cost-effective way to ensure ongoing IRWM planning discussions take place in the Region is to include a standing agenda item on regular SLDMWA Board of Directors or Committee meeting agendas. The agenda item will allow for discussion of items of interest, such as IRWM grant applications, the implementation of a project included in the WSJ IRWMP, or opportunities for land use or water supply coordination with and between IRWM planning participants. Should additional action be required, other meetings specific to IRWM planning may be scheduled. Funding sources for ongoing IRWM planning and coordination and future WSJ IRWMP updates are summarized in Table 9-1.

Table 9-1: Funding Sources for Ongoing IRWM Planning

Funding Source	Certainty / Longevity
SLDMWA Member Agencies	High – SLDMWA includes the cost of IRWM planning in its overall budget, which is paid for by all members. SLDMWA can budget for ongoing IRWM Planning, depending on availability of funds.
Future rounds of IRWM planning grants administered by DWR	Low – It is unknown if there will be future rounds of planning grants. Prop 1 planning grants were awarded in 2016 and have been exhausted. Availability of future planning grants would be dependent upon future funding for the IRWM program and competitiveness for planning grants.
DAC Involvement Grant Program	Medium – The Region received funding through DWR's DAC Involvement Program to help prepare the 2019 IRWMP Update. Funding for future updates is unknown and would depend on future funding for the program, which is not guaranteed.

9.2 Project Financing

Table 9-2 summarizes the potential funding sources and certainty of funding for capital, implementation, and O&M costs for projects implemented in the WSJ Region. Typically, grant and loan funding is not available for financing of O&M costs. Note that financing for projects is also considered in the Project Review Process as described in Chapter 6.

Table 9-2: Funding Sources for Projects that Implement the IRWMP

Funding Source	Certainty
Ratepayers (within Project Proponent service area or area of project benefit)	High – user rates pay for O&M of a utility's system. Depends upon rate structure adopted by the project proponent and the Proposition 218 rate approval process. Can be used for project implementation as well as project O&M.
General Funds or Capital Improvement Funds (of Project Proponents)	High – general or capital improvement funds are set aside by agencies to fund general operations and construction of facility improvements. Depends upon agency approval.
Special taxes, assessments, and user fees (within Project Proponent service area or area of project benefit)	High - Monthly user fees, special taxes, and assessments can be assessed by some agencies should new facilities directly benefit existing customers. Depends upon the rate structure adopted by the project proponent and the Proposition 218 rate approval process.
Clean Water State Revolving Fund (CWSRF) Loan Program administered by the SWRCB	Medium – historically, the SWRCB has had $200 to $300 million available annually for low-interest loans (typically ½ of the General Obligation Bond Rate) for water recycling, wastewater treatment, and sewer collection projects. During recent years, available funding has become limited due to high demand. Success in securing a low-interest loan depends on demand of the CWSRF Program and available funding. Applications are accepted on a continuous basis. SWRCB prepares a fundable list for each fiscal year; in order to receive funding, a project must be on the fundable list. Full applications must be submitted by the end of the calendar year to be considered for inclusion on the following year's fundable list.
Water Recycling Funding Program (WRFP) – Planning and Construction Grants from SWRCB	High (planning) / Low (construction) – WRFP grants are funded by Prop 1, as well as the general CWSRF Program. Planning grants (for facilities planning) are available and can fund 50% of eligible costs, up to $75,000. Construction grants have been exhausted; low-interest loans through the CWSRF program are available and while limited, recycled water projects receive priority over wastewater projects (which are also eligible under CWSRF, the umbrella program for the WRFP).
Drinking Water State Revolving Fund Loan Program administered by the SWRCB Division of Drinking Water	High – approximately $100 to $200 million is available on an annual basis for drinking water projects. Low-interest loans are available for project proponents should they decide to seek financing. Funding has become more limited; however, applicants are encouraged to apply.
Infrastructure State Revolving Fund Loan Program administered by the California Infrastructure and Economic Development Bank (I-Bank)	High – low-interest loans are available from I-Bank for infrastructure projects (such as water distribution). Maximum loan amount is $25 million per applicant. Applications are accepted on a continuous basis.
Title XVI Water Recycling and Reclamation / Water Infrastructure Improvements for the Nation (WIIN) Program – Construction Grants (USBR)	Medium – grants up to 25% of project costs or $20 million, whichever is less, are available from USBR for water recycling projects. A Title XVI Feasibility Study must be submitted to and approved by USBR to be eligible. USBR solicits grants annually.
WaterSMART Title XVI Water Recycling and Reclamation	Low – grants up to $150,000 have been available in the past for preparation of Title XVI Feasibility Studies. It is possible future rounds may be administered.

Program – Feasibility Study Grants from USBR	
Bonds – revenue bonds can be issued to pay for capital costs of projects allowing for repayment of debt service over 20- to 30-year timeframe	Medium – depends on the bond market and the existing debt of project proponents.
IRWM implementation grants administered by DWR	Medium – The Region will pursue grant funding through the Prop 1 Round 1 Implementation Grants. Applications are expected to be due in early 2019, depending on the Funding Area. Approximately $28 million will be available in the San Joaquin River Funding Area, and approximately $30 million will be available in the Tulare-Kern Funding Area over two rounds, both of which overlap the Region.
DAC Involvement Program	Medium – The Region will receive funding through DWR's DAC Involvement Program through the San Joaquin River Funding Area (which was awarded a total of $3.1 million for the Funding Area as a whole) and the Tulare/Kern Funding Area (which was awarded a total of $3.4 million for the Funding Area). This funding has been secured by the respective Funding Areas. Funding may be used to help develop a project within the Region in order to advance it toward implementation. This program is not guaranteed to be funded in the future.

Chapter 10 Technical Analysis

The WSJ IRWMP serves as a guide to illustrate the regional opportunities that have been developed to improve resource management and integration within the Region. The purpose of this section is to document the data and technical analyses that were used in the development and update of the Plan.

The multiple plans, studies, and data sets used to prepare the original 2006 IWRP, 2014 IRWP Update, and the 2019 WSJ IRWMP Update are summarized in Table 10-1. While the past Plan versions provided a starting point for the 2019 IRWMP Update, additional plans and data prepared and compiled since 2014 were used to ensure the Plan addresses current conditions and is forecasted for the 20-year planning horizon. The plans and data sets shown in the following table provided a basis for describing water management in the WSJ Region and helped identify data gaps as described in Chapter 8, Data Management. In many cases, the studies and data sets were prepared by or for the local planning entities and are therefore representative of the WSJ Region's current conditions and historic records, and also provide the best information for forecasting future years.

Table 10-1: Studies and Data Sets Used to Prepare the WSJ IRWMP

Document/Data	Author/Source, Year	Results/Information Derived	Use in WSJ IRWMP
Stanislaus County Multi-Agency Regional Stormwater Resource Plan	Woodard & Curran, in progress	Stormwater management	Incorporated by reference; description of stormwater/flood issues and projects
California's 2017 Climate Change Scoping Plan	California Air Resources Board (CARB), 2017	Impacts of climate change, adaptation and mitigation methods	Strategies for addressing climate change
Del Puerto Water District Water Management Plan	Del Puerto Water District, 2017	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
Guidelines for Cloud Seeding to Augment Precipitation (ASCE MOP 81)	American Society of Civil Engineers, 2016	Guidelines for precipitation enhancement	Resource management
City of Tracy 2015 Urban Water Management Plan	Erler & Kalinowski, Inc. 2016	Current and future water use, water supply sources, conservation measures, infrastructure description	Region description, relation of local planning to regional planning
City of Newman 2015 Urban Water Management Plan	Gouveia Engineering, Inc., 2016	Current and future water use, water supply sources, conservation measures, infrastructure description	Region description, relation of local planning to regional planning

Document/Data	Author/Source, Year	Results/Information Derived	Use in WSJ IRWMP
Patterson Irrigation District Water Management Plan/Agricultural Water Management Plan	Patterson Irrigation District, 2016	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
City of Los Banos 2015 Urban Water Management Plan	Provost & Pritchard, 2016	Current and future water use, water supply sources, conservation measures, infrastructure description	Region description, relation of local planning to regional planning
James Irrigation District Water Management Plan 2015	Provost & Pritchard, 2016	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
City of Patterson 2015 Urban Water Management Plan	RMC Water and Environment, 2016	Current and future water use, water supply sources, conservation measures, infrastructure description	Region description, relation of local planning to regional planning
Climate Resilience Evaluation and Awareness Tool (CREAT) Climate Scenarios Projection Map.	U.S. Environmental Protection Agency (USEPA), 2016	Maps of climate change projections	Regional climate change impacts
Western San Joaquin River Watershed Groundwater Quality Assessment Report	Luhdorff & Scalmanini, 2015	Groundwater quality and trends, groundwater vulnerability	Groundwater quality
Groundwater Management Plan for the Southern Agencies in the Delta-Mendota Canal Service Area	AECOM, 2014	Groundwater conceptual model, groundwater elevations and trends; groundwater management needs	Development of RMS and identification of related projects
Central California Irrigation District Water Management Plan	Central California Irrigation District, 2014	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
Safeguarding California: Reducing Climate Risk.	CNRA, 2014	Climate change impacts, statewide water management concerns	Steps to reducing climate risks to water resources
Groundwater quality data (CASGEM)	DWR, 2014	Groundwater quality	Identifying groundwater quality issues
Regional Flood Management Plan for the Mid San Joaquin River Region	ESA, 2014	Flood risks in the San Joaquin Region and WSJ Region	Discussion of flood risk and adaptation measures

Document/Data	Author/Source, Year	Results/Information Derived	Use in WSJ IRWMP
Firebaugh Canal Water District Water Management Plan	Firebaugh Canal Water District, 2014	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
Panoche Water District Water Management Plan	Panoche Water District, 2014	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
Bringing Flows into Focus	SLDMWA, 2014	Low Salinity Zone (LSZ) model uncertainty	Salt and salinity management
American Community Survey data	U.S. Census Bureau, 2010-2014	Median Household Income Data for Census Tracts, Block Groups, and Places	Identified DACs in the region to include in Region Description and apply in stakeholder outreach
West Stanislaus Irrigation District Water Management Plan	West Stanislaus Irrigation District, 2014	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
Banta-Carbona Irrigation District Water Management Plan	Banta-Carbona Irrigation District, 2013	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
California Water Plan 2013 Update	California Department of Water Resources (DWR), 2013	Climate change impacts, statewide water management concerns	Connection to large scale water issues, future water management planning
Merced County 2030 General Plan	Merced County, 2013	Plans and guidelines for present and future	Region description, relation of local planning to regional planning
Groundwater-quality data in the Western San Joaquin Valley California	USGS, 2017	Synthesis of groundwater quality data	Groundwater quality
California Adaptation Planning Guide	California Natural Resources Agency (CNRA), 2012	Parameters affecting climate change	Future water management planning
Columbia Canal Company Agricultural Water Management Plan	Columbia Canal Company, 2012	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
Our Changing Climate 2012, Vulnerability & Adaptation to the	Moser et al., 2012	General climate change impacts statewide	Future water management planning

Document/Data	Author/Source, Year	Results/Information Derived	Use in WSJ IRWMP
Increasing Risks from Climate Change in California.			
Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future.	National Research Council (NRC), 2012	Prediction of sea level rise	Sea level rise tables, regional climate change impacts
San Luis Water District 2011/2012 Water Management Plan	Provost & Pritchard, 2012	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
Westlands Water District Water Management Plan	Westlands Water District, 2012	Agricultural water use, management practices and needs	Region description, agricultural water supplies and demands
Groundwater Management Plan for the Northern Agencies in the Delta-Mendota Canal Service Area	AECOM, 2011	Groundwater conceptual model, groundwater elevations and trends; groundwater management needs	Development of RMS and identification of related projects
Climate Change Handbook for Regional Water Planning	DWR, 2011	Parameters affecting climate change	Future water management planning, vulnerability assessment checklist
City of Patterson 2010 General Plan	City of Patterson, 2010	Plans and guidelines for present and future	Region description, relation of local planning to regional planning
Hydrologic Response and Watershed Sensitivity to Climate Warming in California's Sierra Nevada	Null et al., 2010	Hydrologic response and watershed sensitivity; parameters affecting climate change; modeling of 15 watersheds and deriving of statistical parameters and results	Regional climate change impacts, future water management planning
City of Los Banos 2030 General Plan Update	City of Los Banos, 2009	Plans and guidelines for present and future	Region description, relation of local planning to regional planning
2009 California Climate Adaptation Strategy	CNRA, 2009	Climate adaptation methods, climate change impacts	Methods for adapting to and mitigating climate change

Document/Data	Author/Source, Year	Results/Information Derived	Use in WSJ IRWMP
Potential Impacts of Climate Change in the United States	Congressional Budget Office (CBO), 2009	General climate change impacts nationwide	Broader climate change impacts
Merced County General Plan Update: Qualitative Comparison of Water Supply and Demands in Merced County	Nolte, 2009	Plans and guidelines for present and future	Region description, relation of local planning to regional planning
Westside Water Supply Gap Analysis	Stoddard & Associates, 2009	Water supply information	Region description
Weather and Climate Extremes in a Changing Climate. Regions of Focus: North American, Hawaii, Caribbean and U.S. Pacific Islands.	United States Climate Change Science Program, 2008	Climate change impacts in California	Regional climate change impacts
City of Los Banos 2030 General Plan	Dyett & Bhatia, 2007	Plans and guidelines for present and future	Region description, relation of local planning to regional planning
Upper Kings Basin Integrated Regional Water Management Plan (IRWMP)	WRIME, 2007	Groundwater trends	Region description
San Joaquin Valley Groundwater Basin - Tracy Subbasin (Bulletin 118)	DWR, 2006	Groundwater basin description, groundwater management concerns	Description of groundwater basin and conditions
San Joaquin Valley Groundwater Basin Delta-Mendota Subbasin (Bulletin 118)	DWR, 2006	Groundwater basin description, groundwater management concerns	Description of groundwater basin and conditions
San Joaquin Valley Groundwater Basin - Westside Subbasin (Bulletin 118)	DWR, 2006	Groundwater basin description, groundwater management concerns	Description of groundwater basin and conditions
San Joaquin Valley Groundwater Basin - Kings Subbasin (Bulletin 118)	DWR, 2006	Groundwater basin description, groundwater management concerns	Description of groundwater basin and conditions

Document/Data	Author/Source, Year	Results/Information Derived	Use in WSJ IRWMP
West Side Integrated Resources Management Plan	SLDMWA, 2003	Water supply gap analysis; water supply management information	Evaluate current and projected future water supplies and demands
2025 Fresno General Plan and related Draft Environmental Impact Report No. 10130	City of Fresno, 2002	Plans and guidelines for present and future	Region description, relation of local planning to regional planning
Geology, Hydrology, and Water Quality of the Tracy-Dos Palos Area	USGS, 1971	Geology, hydrology, and water quality of the Tracy-Dos Palos Area; groundwater management needs	Estimates of groundwater storage capacity

Chapter 11 Relation to Local Planning

11.1 Local Water Planning

SLDMWA, its member agencies, and other planning entities in the WSJ Region have a long history of coordinated planning efforts, that include IRWM planning, other local water planning efforts, water delivery coordination (i.e. through the Delta-Mendota Canal) and water resources projects over the years. The 2019 WSJ IRWMP Update allows the Region to incorporate various planning efforts, including:

- Groundwater management,
- Urban water management,
- Agricultural water management,
- Water supply planning,
- City and County general planning,
- Irrigation district master planning,
- Flood management, and
- Other planning efforts that are shared within the Region.

A list of the local water plans that were used in the WSJ IRWMP is included in Chapter 10, Technical Analysis. The following sections provide a brief summary of the relationship between local planning efforts and IRWM planning. SLDMWA and its member agencies manage water resources through planning efforts and coordination with each other, state and federal agencies, and other local planning entities, as necessary. The member agencies will leverage IRWM planning in the Region, as well as the relationships formed and maintained through the planning process, to help fulfill their management role. During future WSJ IRWMP updates, local planning documents that have been prepared and updated since the 2019 WSJ IRWMP Update will be reviewed and incorporated, as appropriate. Updates of local planning documents and WSJ IRWMP updates will require ongoing coordination to ensure consistency and allow for input from local planning entities and WSJ IRWM planning participants in all relevant water resources-related planning efforts. Because many of the local water planning entities in the Region are SLDMWA member agencies and participants in the RWMG, they can coordinate on a regular basis for water management planning activities both through the IRWM planning process and local planning efforts.

Some of the local planning documents discussed in this chapter address not only water management issues, but also include climate change adaptation and mitigation strategies (for example, UWMPs, flood management planning documents, and General Plans). Other discussion of climate change in relation to local water planning occurs in Chapter 13. Chapter 13 addresses climate change issues in depth and draws on both regional climate studies and local planning documents to provide a complete picture of mitigation and adaptation strategies that apply to the WSJ Region. Additionally, water management issues related to climate change are discussed in Chapter 2, Region Description, which is based heavily on local plans such as UWMPs, AWMPs, and GWMPs.

Groundwater Management

Since 1995, SLDMWA has held an activity agreement with the City of Tracy, City of Patterson, South San Joaquin Drainage District, Plainview WD, Del Puerto WD, Banta-Carbona ID, West Stanislaus ID, Patterson ID, and Westside ID (AECOM, 2011). As the umbrella organization used to develop and implement groundwater management plans, SLDMWA has been able to comprehensively review factors influencing the water balance associated with the Delta-Mendota groundwater basin. These factors include

groundwater elevations, estimates of basin-wide groundwater pumping and sustainable yield, and groundwater quality. This information has been compiled into two groundwater management plans, one for the northern part of the region (AECOM, 2011) and one for the southern part of the region (AECOM, 2014). Both plans meet the requirements set forth by AB303. The USGS has also provided data from its multiple groundwater level monitoring facilities to SLDMWA for inclusion in data analyses.

SLDMWA is coordinating with regional stakeholders and agencies and the State on SGMA compliance. Many GSAs have been established in the Region, and these GSAs are working together to prepare GSPs by 2020 or 2022 (depending on basin priority) in order to comply with SGMA. Information from the GSPs being prepared within the Region (listed in Table 11-1) will be incorporated into future WSJ IRWMP updates. SLDMWA will continue working alongside its member agencies and other regional stakeholders to identify management objectives, implement the groundwater management plans, actively monitor the groundwater basin, and identify and execute management strategies to manage the basin in a sustainable manner. As SGMA evolves and GSPs are developed, further opportunities to coordinate groundwater management and IRWM planning will likely arise, and SLDMWA will work to incorporate goals and findings of GSPs into the WSJ IRWMP (including climate change adaptation and/or mitigation strategies). Projects, programs, and actions for inclusion in GSPs are expected to be identified in early 2019 (for GSPs due in 2020) or 2021 (for GSPs due in 2022). During that process, the coordinated GSP project teams can ensure that applicable GSP projects are submitted for inclusion in the IRWMP via the WSJ IRWMP Opti system. Some coordination has already occurred in this respect. Projects qualifying for Category 1 advanced funding under SGMA are required to be included in an IRWMP; these qualified projects were added to the WSJ IRWMP during the 2018 Call for Projects. Applicable projects identified in the GSP may be added to the WSJ Opti system at a later date.

Further coordination between the IRWM and SGMA planning processes may occur as more projects from GSPs are incorporated into the WSJ IRWMP Opti system. Due to timing of the GSP preparation, this would occur following adoption of the WSJ IRWMP. However, WSJ projects maintained in the Opti system are considered a living project list, so projects submitted after the WSJ IRWMP is adopted would still be considered part of the official IRWMP project list. Additionally, GSP projects could potentially take advantage of IRWM funding opportunities, depending on the timing, due to the breadth of eligible project types. The finance section of the GSPs will include discussion of IRWM funding opportunities.

Table 11-1: GSPs and GSAs within the Westside-San Joaquin Region[1]

GSP[2]	Groundwater Subbasin	GSAs Participating
Westside Subbasin GSP	San Joaquin Valley - Westside	Westlands Water District, Fresno County
San Joaquin River Exchange Contractors GSP	San Joaquin Valley - Delta-Mendota	San Joaquin River Exchange Contractors Water Authority GSA (GSP to be jointly developed with Cities of Newman, Gustine, Los Banos, Dos Palos, Firebaugh, Mendota, Turner Island Water District-2, County of Madera-3, portion of Merced County – Delta-Mendota, and a portion of Fresno County Management Area B)
Northern and Central Delta-Mendota Subbasin GSP	San Joaquin Valley - Delta-Mendota	Central Delta-Mendota Multi-Agency GSA, City of Patterson GSA, DM-II GSA, Northwestern Delta-Mendota GSA, Ora Loma Water District GSA, Patterson Irrigation District GSA, West Stanislaus Irrigation District GSA, Widren Water District GSA
Grassland GSP	San Joaquin Valley - Delta-Mendota	Grassland GSA
Fresno County GSP (*area near Mendota)*	San Joaquin Valley - Delta-Mendota	Fresno County – Management Area A, Fresno County – Management Area B
Tracy Subbasin GSP	San Joaquin Valley - Tracy	Banta-Carbona Irrigation District, Byron-Bethany Irrigation District, City of Antioch, City of Brentwood, Contra Costa County, County of Sacramento, Diablo Water District, Discovery Bay Community Services District, East Contra Cost Irrigation District, San Joaquin County – Tracy, Steward Tract GSA, City of Tracy, West Side Irrigation District
Aliso Water District GSP	San Joaquin Valley - Delta-Mendota	Aliso Water District GSA
James ID GSP	San Joaquin Valley - Kings	James GSA
Pleasant Valley WD GSP	San Joaquin Valley – Pleasant Valley	Pleasant Valley WD GSA

[1]Information compiled from DWR's SGMA portal as of October 24, 2018 and the Delta-Mendota SGMA website.
[2]GSP names may still be under development and subject to change.

Urban Water Management

There are many urban water providers within the WSJ Region, however, not all are required to prepare UWMPs per CWC. Per the Urban Water Management Planning Act, every urban water supplier that either provides over 3,000 AF of water annually or serves more than 3,000 connections is required to assess the reliability of its water sources over a 20-year planning horizon considering normal, dry, and multiple dry years and prepare and submit an UWMP to DWR every five years. The Cities of Tracy (EKI, 2016), Los Banos (AECOM, 2016), Newman (Gouveia Engineering, Inc, 2016) and Patterson (RMC, 2016) prepared UWMPs in 2015. These plans are used to evaluate water supplies and demands within their sphere of influence,

estimate water supply shortfalls in the future, document water conservation measures already being implemented, and identify additional conservation measures that can be implemented in the future, particularly in light of climate change impacts. Information from these plans is incorporated throughout the WSJ IRWMP, most notably in the Region Description chapter.

In addition to UWMPs, the Region's urban entities participate in other related planning activities. For example, the City of Tracy has been involved with multiple regional planning activities, including the South County Water Supply Project, Tracy Basin AB 3030 Regional Groundwater Management Plan, and the Semitropic Water Bank. The City of Tracy has used these regional planning efforts to feed its local planning efforts and the design of local projects. The City of Newman has been coordinating with Crows Landing, Stanislaus County, and Central California ID on the Orestimba Creek Flood Management Project for the last 15-20 years. This project would provide levee improvements that would reduce flood risk to Newman and adjacent agricultural areas. A feasibility study was prepared in 2012, and the project is included in the Stanislaus County Multi-Agency Regional SWRP. Coordinated projects such as this, involving municipalities, irrigation districts, and other parties, reflect not only local water resources planning, but the desire of the Region's stakeholders for larger, broader solutions to water resource issues.

Agricultural Water Management

With the passage of the CVPIA and then SBx7-7 in 2013, agricultural water suppliers are required to comply with water conservation requirements as outlined in Part 2.55 of Division 6 of the CWC. This code section requires that agricultural water suppliers prepare and submit AWMPs to DWR. These AWMPs are required to describe the purveyors' water uses and the quantity and quality of water resources at their disposal, to provide water accounting and water supply reliability information, and to summarize water use efficiency measures currently in place or planned for the future. Similar to UWMPs, the water demand and supply figures contained within the AWMPs are incorporated into the IRWM planning process to help assess the overall state of water resources in the Region.

In an effort to address projected supply shortfalls, many local agricultural water suppliers (who are also SLDMWA member agencies) have worked together and with other agencies/cities to address the Region's problems. For example, Del Puerto WD has been coordinating with the Cities of Modesto and Turlock (located in the East Stanislaus IRWM Region) to implement the NVRRWP. This project will result in the delivery of recycled water from the cities to Del Puerto WD agricultural customers to offset CVP supplies and improve water supply reliability. Regional partnering such as this provides for regional agricultural sustainability. This type of coordination helps to resolve local problems and to provide models for other districts within the Region and/or provide solutions that can be expanded to address problems on a Regional basis.

City and County General Planning

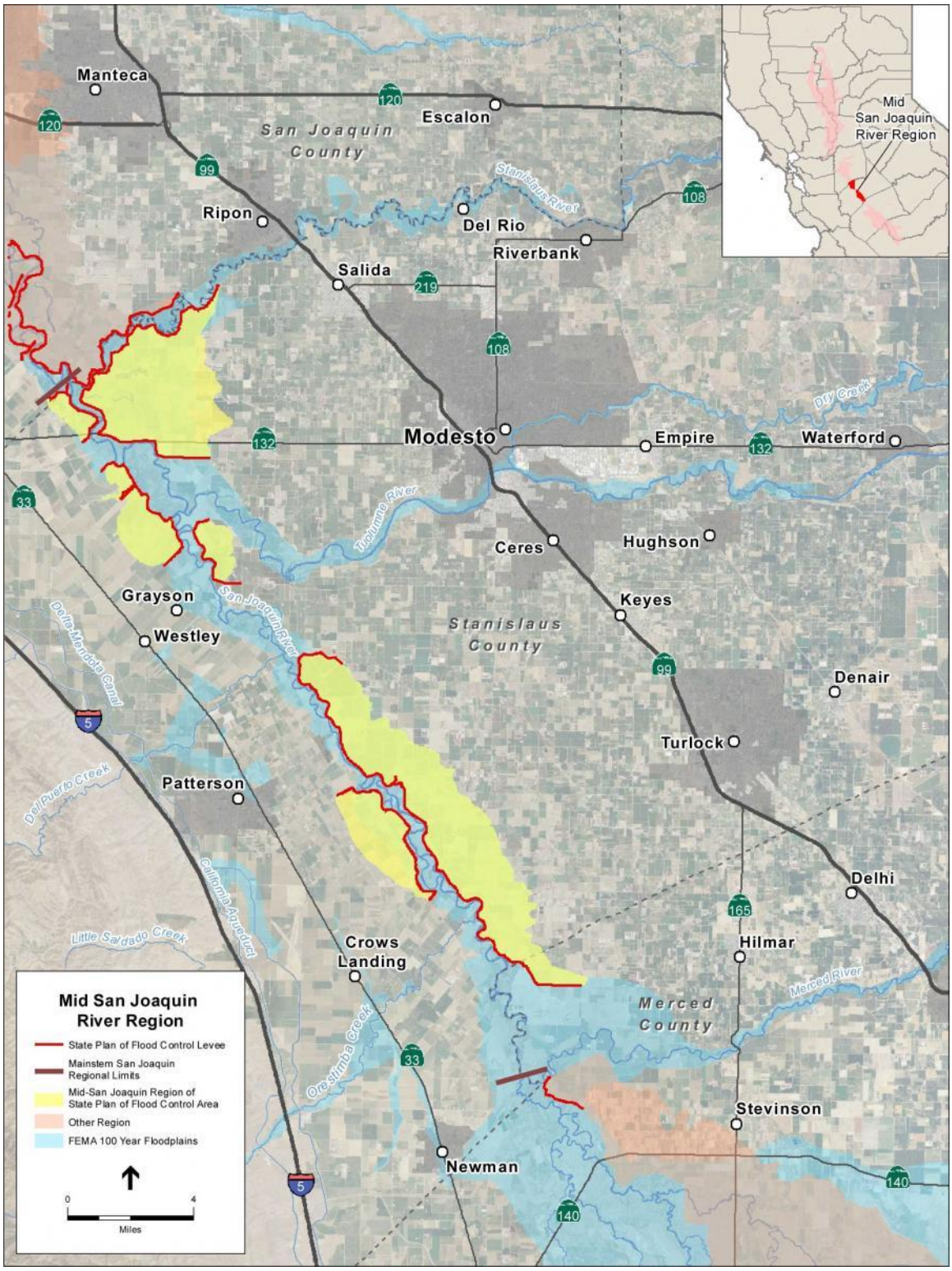
The WSJ Region includes portions of five California counties: San Joaquin, Stanislaus, Merced, Fresno and Kings. Each County develops and maintains a General Plan, which includes goals and policies related to water resources within the County. These plans may also include strategies for adapting to climate change or reducing GHG emissions. For example, the Merced County General Plan contains policies on development in areas that may be more severely impacted by climate change impacts, such as fire and flooding. These types of considerations are incorporated into the WSJ IRWMP's discussion of climate change in Chapter 13. As with other local planning documents, the Counties' goals, objectives and policies regarding water resources management are considered and incorporated into IRWM planning efforts as applicable.

In addition to General Planning, other types of water resource planning occur at the County level. For example, Fresno County is helping to implement and maintain the Fresno County Metropolitan Flood Control District's Storm Drainage and Flood Control Master Plan and updating it as needed. As part of this planning, the County is helping to determine optimal locations for drainage basins and other facilities that spur urban development in more localized communities. Cities in Fresno County communicate their own needs to Fresno County so as to provide parameters for these plans. Fresno has made use of past studies of SLDMWA in making its policies (and vice versa). Another example of coordinated local planning efforts is in Merced County. Merced County is reviewing existing incorporated and unincorporated communities and anticipated new towns in order to identify current groundwater and surface water resources and compare this supply to future projected demands within these communities. This requires active participation of the County, its cities, and its unincorporated communities. It has based its projects, in part, on past studies conducted by SLDMWA.

Flood Protection

The Mid-San Joaquin River Regional Flood Management Plan (RFMP) is one of six DWR-funded regional flood management planning efforts in the Central Valley. Completed in 2014, the RFMP covers the areas surrounding the San Joaquin River (between the Stanislaus-San Joaquin River confluence and the Merced-San Joaquin River confluence) (Figure 11-1). The RFMP was developed by a multi-agency team comprised of Resource District 2092, Stanislaus County, DWR, a consultant team, an outreach team, and 16 stakeholder groups and organizations, including several cities, counties, and irrigation districts. The RFMP was developed to identify projects to prevent flooding in the Mid-San Joaquin River region, and includes an assessment of regional flood hazards, proposed improvement, regional priorities, enhanced operations and management, emergency response planning, land use and environmental enhancements, a regional financial plan, and an updated regional atlas. The RFMP contains projects and strategies to help the Region adapt to changes in climate that are expected to further alter the flood regime. The plan development, because of its large number of interested groups, was locally-driven and required significant collaboration.

WSJ Region cities that are not within the Mid-San Joaquin River floodplain, such as Patterson and Newman, have developed their own independent floodplain management plans. Together, the projects developed under the RFMP and these locally-developed plans provide the basis for Regional flood management. Flood management planning in the Region has informed the development of the WSJ IRWMP, and projects identified in flood management planning efforts have been incorporated into the WSJ IRWMP. For example, the Salado Creek Flood Management and Repair Project and West Stanislaus ID Fish Screen Project are both included in the RFMP and WSJ IRWMP.



Source: ESA, 2014.

Figure 11-1: Mid-San Joaquin River Regional Flood Management Plan Area

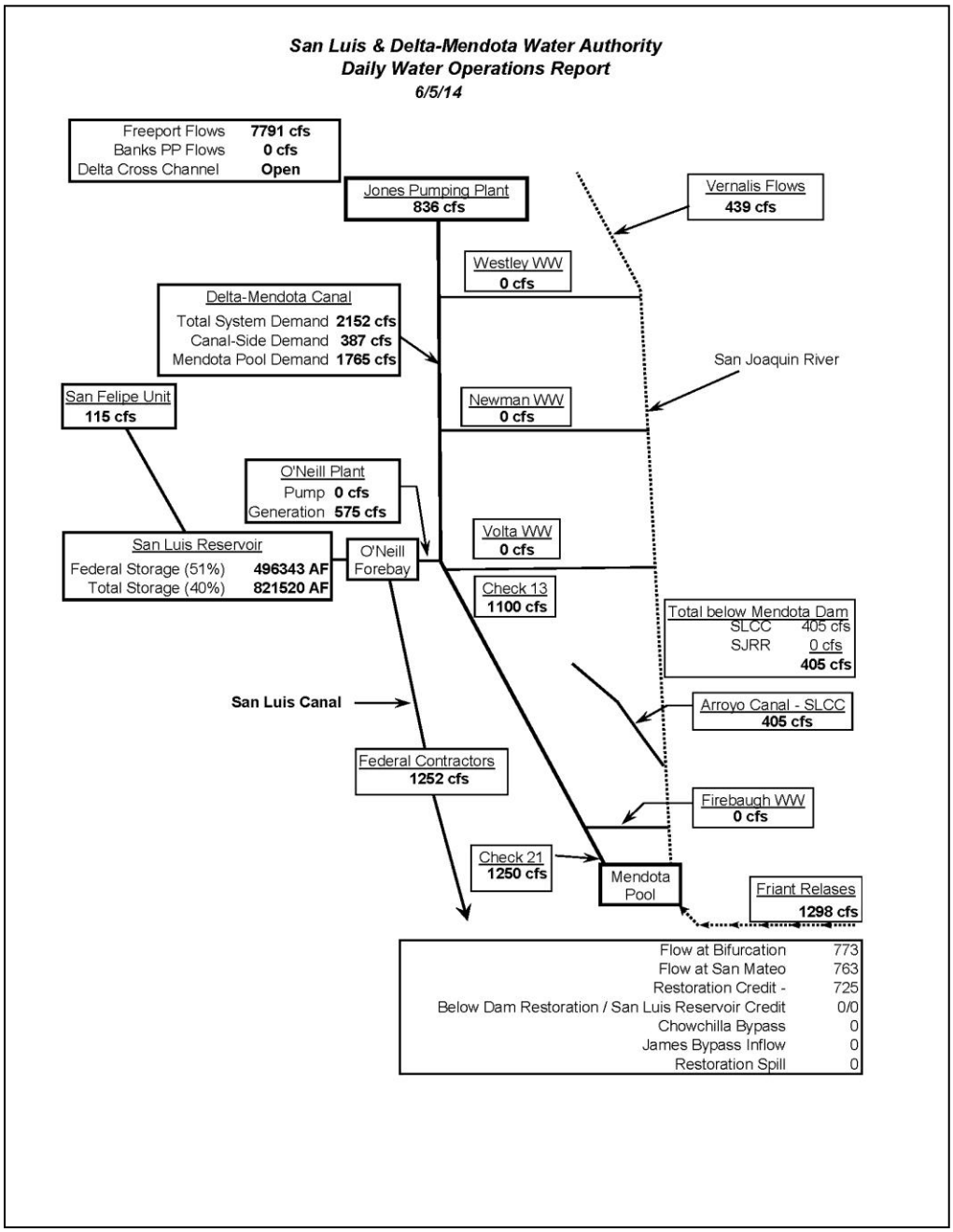
Watershed Management

SLDMWA lies at the lower reaches of most of the larger river watersheds and does not currently manage any watersheds. Most watershed management that has occurred in the WSJ Region has been through project-specific planning efforts and indirectly through day-to-day operations (i.e. delivery of CVP water that originally passed through the San Joaquin River Watershed). Future watershed management opportunities may arise as the Region looks to capturing and reusing stormwater runoff from smaller creeks originating on the west side of the San Joaquin Valley. Any future watershed management efforts will be incorporated into future updates of the WSJ IRWMP.

Water Supply Assessments

California SB 610, Water Supply Assessments (WSAs), and SB 221, Written Verifications of Water Supply, are required by CWC for proposed developments to evaluate long-term water demands and to ensure that existing and/or projected new supplies are available to meet those demands in the future. Water supply assessments often consider data in the UWMPs and IRWMPs as the basis for their analysis. In turn, WSAs can provide data and analyses for incorporation into the WSJ IRWMP, which aids in developing a regional picture of water demands and supplies.

In preparing and analyzing WSAs, SLDMWA incorporates local planning elements from several water infrastructure facility planning documents, including those of the Jones Pumping Plant, the Delta-Mendota Canal, and the San Luis Reservoir, in addition to other planning documents of its member agencies. SLDMWA uses this planning information in combination with real-time data collection, such as flow rates in the DMC at Vernalis and the San Joaquin River, to develop Daily Water Operations Reports such as Figure 11-2. SLDMWA also considers seasonal and historical reservoir water storage, reservoir drawdown rates, and current export and outflow data to develop future water demand and supply projections. Many regional cities, counties, and water/irrigation districts store data in their general plans or water management plans, such as City of Patterson (City of Patterson, 2010), Los Banos (City of Los Banos, 2009), Merced County (Nolte, 2009) and (Merced County, 2013), Fresno County (Fresno Planning and Development Department, 2002), and Del Puerto WD (Del Puerto WD, 2017). These reports are then used to identify solutions to water supply issues within the WSJ Region, redirect or alter existing water balances as needed, and to formulate management plans. Allocation of water to urban areas and agricultural services are then determined based on water year type and water availability.



Water supply reports available at: http://sldmwa.org/ohtdocspdf_documentsdaily-water-report/

Figure 11-2: Sample SLDMWA Daily Water Operations Report

Stormwater Management

SLDMWA is not directly involved in stormwater management. To date, stormwater runoff management has been handled primarily on the county and city level. Examples of this type of planning include:

- Fresno County has plans to install curbing and gutters on existing developed roadways which are lacking drainage facilities; a range of individual projects are included in the Fresno Council of Governments Federal Transportation Improvement Program and implementation is ongoing. The County has also worked with the Fresno Metropolitan Flood Control District to discuss which methodologies will be effective in removing pollutants and maintaining high quality surface and groundwater.
- Merced County's Stormwater Management Program involves the coordination of the City of Atwater, City of Merced, County of Merced, and Merced ID. These entities work together to promote public education, public involvement, to design and construct treatment infrastructure, to manage new developments, and to create prevention programs.

Senate Bill (SB) 985 requires a SWRP as a condition for receiving funds for storm water and dry weather runoff capture projects from any bond approved by voters after January 2014. The next upcoming grant solicitation period through the State Water Resources Control Board's (SWRCB's) Storm Water Grant Program, currently funded by Prop 1, is expected to occur in Spring 2019, with approximately $90 million available for implementation projects. Similar to IRWMPs, SWRPs focus on multi-benefit projects. SWRPs can be prepared for a range of geographic areas (not limited to IRWM Region boundaries, political boundaries, or groundwater basins). Once SWRPs have been developed, they must be incorporated into the relevant IRWMPs. Currently, four SWRPs overlap the WSJ Region – the Stanislaus Multi-Agency Regional SWRP, the Merced SWRP, Madera County SWRP and Kings Basin Storm Water Resources Management Plan (SWRMP). However, as shown in Figure 11-3, overlap with Merced, Madera, and Kings Basin is minimal.

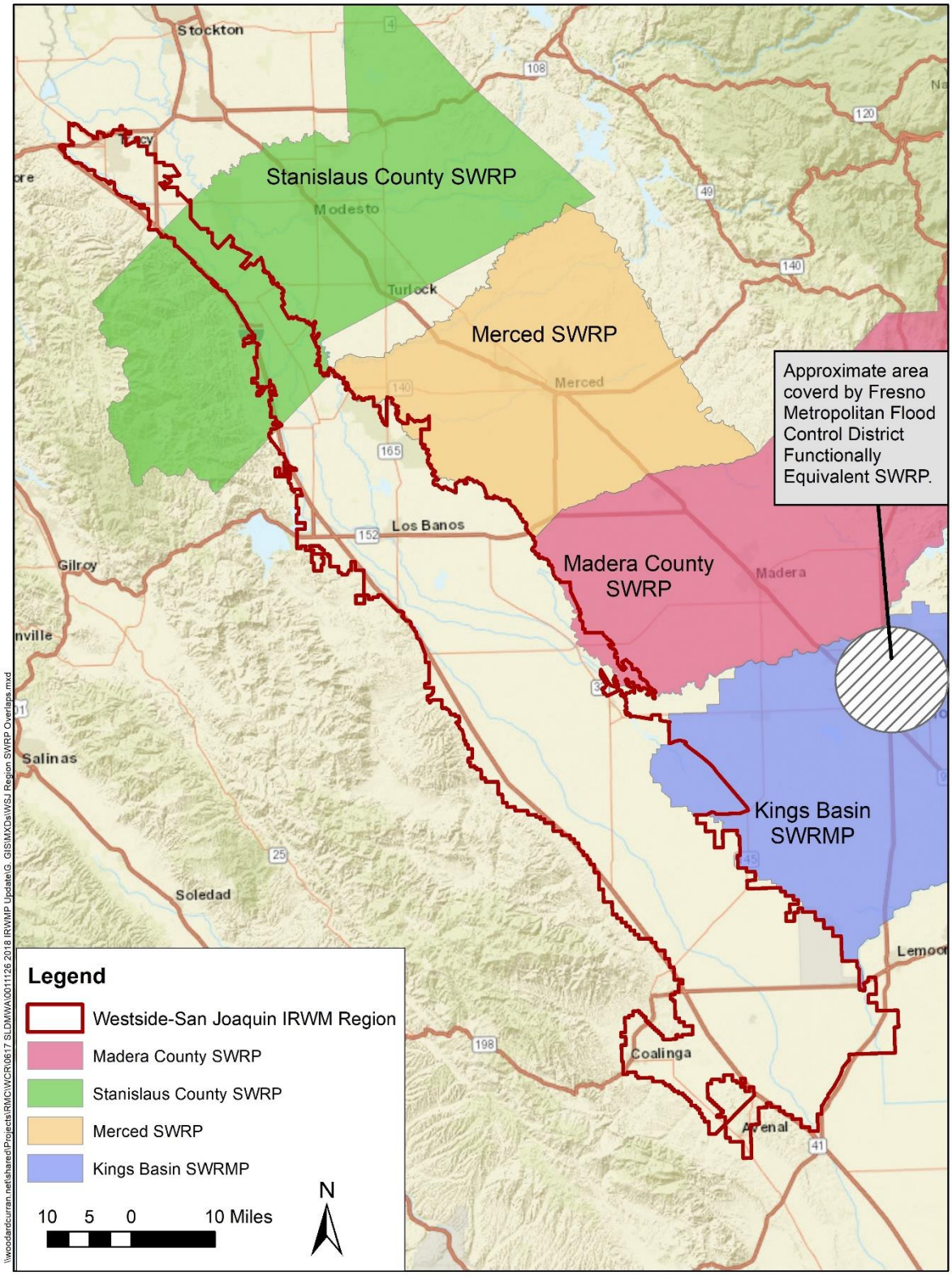


Figure 11-3: Stormwater Resources Plans Overlapping WSJ Region

The Stanislaus Multi-Agency Regional SWRP is under development concurrently with the WSJ IRWMP. Stanislaus SWRP development included a call for projects in fall 2017; SLDMWA, Del Puerto WD, and the City of Patterson submitted multiple projects for inclusion. SWRP projects that were within the WSJ Region were incorporated into the WSJ IRWMP by transferring the projects from the Stanislaus SWRP Opti site to the WSJ Opti site. Further, individual follow-up was conducted with SWRP project proponents to ensure that they were aware of the opportunity to add their project to the IRWMP. SWRP project proponents may also be able to apply for IRWM funding (administered by DWR) in addition to Storm Water Grant Program funding (administered by SWRCB). The WSJ IRWMP will also incorporate the finished Stanislaus County SWRP by reference. The executive summary of the Stanislaus County SWRP is included as Appendix E.

Three SWRPs overlap smaller portions of the WSJ Region. The Kings Basin SWRMP covers part of the WSJ Region near the City of San Joaquin. A completed SWRP for Madera County and an in-progress SWRP for the Merced IRWM Region both include areas adjacent to the WSJ Region and overlap small portions of the WSJ Region along its eastern border. So far, coordination has not occurred between the WSJ Region and the agencies developing these SWRPs, however, this is an area for future consideration. If other SWRPs that overlap the WSJ Region are completed, relevant information and projects will be incorporated into the WSJ IRWMP during future updates (although none are anticipated at this time).

The WSJ IRWMP also considers information from other local stormwater planning documents, such as those prepared at the city level. As stormwater management in the Region continues to become more robust, the WSJ IRWMP will incorporate these efforts by reference, and by including relevant information in future WSJ IRWMP updates.

Salt and Salinity Management

SLDMWA is actively working with a variety of other planning agencies to monitor the salinity levels in the Delta. Multiple federal, state and local agencies have researched and implemented salinity-management strategies around the complexity of this system, both in terms of its dynamic, tidally-influenced nature and management and protection of its diverse local ecosystem. Delta salinity is relevant to agencies in the WSJ Region because irrigators in the Region depend on CVP supplies that originate in the Delta.

Outside of the Delta, other salinity issues, such as groundwater salinity, are being addressed through cooperative efforts. The primary effort to address salinity in the Region is through the CV-SALTS program, which is led by the Central Valley Salinity Coalition. The Coalition has been working since July 2008 to create a Salt and Nutrient Management Plan (SNMP) for the Central Valley. Initial work included an assessment of the salt and nutrient conditions in the Central Valley and delineation of management zones. The Final SNMP was completed in December 2016, and the process of amending Basin Plans to include SNMP control programs is underway. Coordination between IRWM Planning and SNMP work is ongoing, driven by the participation of SLDMWA in both efforts.

Emergency Response, Disaster Plans

Table 11-2 summarizes flood emergency responders, by emergency level, for the San Joaquin River Hydrologic Region, as outlined in the 2009 CWP (DWR, 2009). While cognizant of this structure, SLDMWA is not an emergency responder as it has no flood-related duties at either the county or regional level. However, SLDMWA does maintain its own emergency response plans, and coordinates regularly with the USBR and the counties in which it lies to ensure coordination of emergency response efforts.

Table 11-2: Summary of Flood Emergency Responders

FLOOD EMERGENCY RESPONDERS, SAN JOAQUIN RIVER HYDROLOGIC REGION		
Responder	**Level**	**Comment**
Person(s) or organization(s) on the site	0	Any emergency
Emergency services units of the 34 cities in the region	1	Any emergency
Lower San Joaquin Levee District	1	Levees and bypasses, Mendota to Merced River
Reclamation Districts 1602, 2099, 2100, 2101, 2102	1	Levees on the west bank of the San Joaquin River
Reclamation Districts 2031, 2063, 2091, 2092	1	Levees on the east bank of the San Joaquin River
Emergency services units of the 16 counties in the region	1 or 2	Any emergency, and by request from Level 1 responders
Department of Water Resources	2	Flood Operations Center, flood fight and Corps liaison
California Emergency Management Agency, Coastal Region	3	Any emergency, Alameda, Contra Costa, and San Benito Counties, by request of county (operational area)
California Emergency Management Agency, Inland Region	3	Any emergency, Alpine, Amador, Calaveras, El Dorado, Fresno, Madera, Mariposa, Merced, Sacramento, San Joaquin, Stanislaus, and Tuolumne Counties, by request of county (operational area)
California Emergency Management Agency, Southern Region	3	Any emergency, Mono County, by request of county (operational area)
US Army Corps of Engineers	3	Specified water-related emergencies, by request of DWR
California Conservation Corps	3	Personnel and equipment for flood fight
Department of Forestry and Fire Protection	3	Personnel and equipment for flood fight
California Emergency Management Agency Headquarters	4	All emergencies, entire hydrologic region, by request of Cal EMA Region

Source: DWR, 2009

Disadvantaged Community Involvement Program

The Disadvantaged Community Involvement (DACI) Program is administered by DWR and is designed to ensure the involvement of DACs in IRWM planning efforts. DWR has awarded grant funding to each IRWM Funding Area in order to contribute to DAC planning activities and projects, which includes a DAC Needs Assessment. The WSJ IRWM Region is located in the San Joaquin River Funding Area (SJRFA). The SJRFA completed its DACI grant proposal in Summer 2018 and is in the process of executing a grant agreement with DWR to secure $3.1 million in funding for DAC planning activities and projects. A DAC Needs Assessment will be conducted throughout the entire SJRFA and will provide a better understanding of the water, wastewater, and stormwater management needs of DACs in the WSJ Region. Although the Needs Assessment will be conducted as part of the IRWM program, it can also be used to inform implementation of other documents, including GSPs and SWRPs. As IRWMPs, SWRPs, and GSPs continue to develop, they can incorporate the findings of the Needs Assessment as they plan outreach efforts, engage local communities, and prioritize projects.

11.2 Relation to Local Land Use Planning

The member agencies of SLDMWA in general do not have land use planning authority. As such, regional stakeholders have taken steps to reach out and educate local land use planners and decision makers on

the relationship between their legal authority to affect land use and the subsequent impacts upon water resource management. Many of these efforts are relatively recent and resultant of rapid urban development to meet housing demand throughout the Region. More developed and detailed efforts have occurred with respect to regional conservation and general plans.

SLDMWA, its member agencies and Regional stakeholders have the opportunity to participate in local land use planning and conversely, land use planners are able to participate in the WSJ IRWM planning process through attendance of meetings, submittal of projects for inclusion in the Plan, and public review and comment. As the reliability of water supplies continues to change due to climate change and as cities in the Central Valley continue to grow, local water and land use planning entities recognize the need for continued coordination and collaboration. This will likely occur through meetings specific to land and water planning, through the IRWM planning process, and the existing land use planning efforts. Additional meetings and coordination should contribute to a collaborative, proactive relationship between land use planners and SLDMWA water managers.

Land use and IRWM planning are linked in many ways. For example, land use decisions made by local governments affect many aspects of SLDMWA member agencies' management and regulatory compliance responsibilities, including conveyance capacity, drainage, groundwater recharge, flood control, operational flexibility, municipal and recreational development, water quality, and water supply. For decades, city and county land use decisions have been made in isolation from the resource considerations of local water agencies. Within the last several years, as the rate of development has increased inversely to the abilities of local water agencies to meet demands, conflicts have arisen and the need for education and collaboration has become evident. In response, local water agencies and governments have initiated discussions to identify resource management issues related to growth and are beginning to develop formal cooperative processes to ensure mutually acceptable outcomes. Relationships with land use agencies could be strengthened by the WSJ Region providing comments on new land planning policies, or by encouraging land use planners to attend IRWMP-related meetings.

Measures to mitigate or offset impacts to sensitive species and communities have been developed and implemented by the cities and counties in the Region as part of their General Plans. Additionally, many of the goals of the general planning documents are consistent with the WSJ IRWMP objectives and consider water management issues. For example, the Conservation and Open Space Element of the Stanislaus County General Plan emphasizes the conservation and management of economically productive natural resources and conservation of open space lands (any parcel or area of land or water that is essentially unimproved). Creating and maintaining open space is beneficial to groundwater recharge and the stabilization of groundwater quality. Many of the general plans in the Region seek to conserve function and values of wetland communities and related riparian areas which, in turn, positively affect aesthetics, water quality, floodplain management, ecological function, recreation, and tourism. SLDMWA member agencies and land use planners have coordinated on the General Plans of all five counties in which it lies.

Land use planning and water planning are intrinsically related. For example, the City of Mendota experiences flooding from Panoche-Silver Creek in certain areas, and therefore cannot safely develop these areas. Growth and the implementation of land use planning cannot occur until a solution to flooding is identified and implemented. Land use changes and growth, which would diversify the local economy, is limited to areas that are not prone to flooding. Additionally, prior to growth within the WSJ Region, adequate water supplies must be secured. These issues offer opportunities to develop an integrated solution that manage flooding, water resources, and land use planning in an effective and efficient manner.

Chapter 12 Stakeholder Involvement

The WSJ Region believes that stakeholder outreach and involvement are vital to developing regional solutions to ongoing water resources conflicts. SLDMWA was formed for the purpose of coordinating the O&M of key federal water infrastructure for the benefit of many; it is therefore inherent to SLDMWA's function to serve and represent the needs of its members. As the RWMG for the WSJ Region, SLDMWA extends this charter and belief to the regional level, seeking input and involvement from all regional stakeholders.

12.1 SLDMWA Composition

The SLDMWA Board of Directors, serving as the Region's RWMG, performs several outreach functions on behalf of the Region. SLDMWA serves the needs of 28 member agencies (Table 1-1), which are predominantly agricultural in nature (but also include M&I and environmental refuge uses), by developing and disseminating information concerning a variety of issues that serve the common interest of the membership, such as: Delta exports, water supply, water quality, water development, conservation, distribution, drainage, contractual rights, and surface and groundwater management. SLDMWA and all of its member agencies are legal entities, established under various aspects of California law. As such, all Board and standing committee meetings are open to the public and are posted on SLDMWA's website at www.sldmwa.org/ and noticed in the newspaper; agendas and minutes are produced and made readily available ahead of the meeting, and public comment periods are offered at each meeting.

SLDMWA's Board is comprised of 19 individuals and supported by several standing committees. Participation on the Board and standing committees is divided among five formal Divisions that compose the entirety of SLDMWA's membership. Members of these institutional bodies are generally directors, managers, or staff of the member agencies that express a particular interest or provide a particular skill relative to the body's area of concern (i.e. resource policy, O&M, finance, etc.). Extensive participation by member agencies not only informs SLDMWA's actions but provides a feedback loop through which ideas and planning efforts, such as the WSJ IRWMP, may be vetted. Additionally, many of these individuals participate in groups outside the realm of water, such as commodity bargaining associations, governmental associations, redevelopment agencies, planning commissions, and non-profit organizations. Participation in this breadth of organizations provides SLDMWA stakeholders, and thus the Plan, great perspective about and an understanding of intricate regional interests that are relevant to the Plan and contribute to the Plan's scope and potential to provide direct and ancillary benefit to the Region through stakeholder selection of its objectives, RMSs, and projects.

12.2 Stakeholder Identification and Involvement

Through connections with its member agencies, regional planning efforts, and member agency participation in planning projects throughout the San Joaquin Valley as a whole, SLDMWA has developed an extensive stakeholder list consisting of water and irrigation districts, cities, federal, state and county representatives, and non-profit organizations (Appendix F). This list was originally created during the 2014 Plan Update and was revised for the 2019 Plan Update. Potential new stakeholders were identified by RWMG members, Working Group members (including staff of local nonprofits), and through coordination with outreach efforts occurring under the Northern & Central Delta-Mendota Region GSP, which is under development concurrently with the WSJ IRWMP Update.

SLDMWA began the WSJ IRWMP Update process through a formal NOI to update the Plan, which was published in the *Merced Sun-Star* on May 30, 2018 (Appendix A). Other announcements were distributed to the stakeholder contact list via email. These include announcements of the Call for Projects; public workshops (held in June 2018 and December 2018); and the Public Draft of the WSJ IRWMP Update. Communication with identified stakeholders helps create a public process that provides outreach and opportunities to participate in the WSJ IRWM planning process. Any interested party, stakeholder, or member of the public that wishes to participate in the IRWM planning process is welcomed. Interested stakeholders and other interested parties can join the Plan review and/or implementation process at any time regardless of their ability to contribute financially.

In addition to direct outreach to identified stakeholders, SLDMWA uses its website as a tool to streamline public involvement. With the 2019 WSJ IRWMP Update, the Region also implemented use of Opti. Opti is a web-based tool which is used for submittal, storage, and viewing of WSJ IRWMP project information. Project proponents are able to submit their project information through the Opti site. Project information in Opti is publicly available, so any interested stakeholder may view project information via the site. This allows for open and transparent gathering of project information. Opti also streamlines future project updates, as the project information can be updated as the project develops but does not need to be resubmitted each time. Opti is also used for mapping projects and for posting announcements related the 2019 WSJ IRWMP Update. Opti can be accessed at http://opti-dev.rmcwater.com/wsj/.

Since its original Plan development efforts, SLDMWA has held both formal and informal meetings open to the public, inviting member agencies, potential stakeholders, members of DACs and interested parties to understand the plan updating purpose, describe the decision-making processes, and invite participation and generate ideas and projects. The full 2019 WSJ IRWMP Update stakeholder contact list is included as Appendix F; categories of stakeholders represented include:

- Water Districts
- Irrigation Districts
- Community Services Districts
- Cities
- Counties
- Surrounding IRWM Regions
- Groundwater Sustainability Agencies
- SLDMWA member agencies
- Agricultural landowners/farms
- Disadvantaged Community contacts
- Non-Profits
- State and federal agency representatives
- Utilities

A variety of stakeholder participation is required in order to create a balance in interest. For example, participation by water districts, cities, and community organizations allows for all sides of project impacts and benefits to be discussed at the planning level. During the 2019 WSJ IRWMP Update, two public meetings were conducted. One was held to announce the Call for Projects and instruct stakeholders on how to submit projects, and the other was held to announce the Public Draft of the WSJ IRWMP Update.

In the WSJ Region, the primary barrier to involvement in the IRWM process is the lack of awareness of IRWM planning. SLDMWA and its member agencies take steps to inform stakeholders and members of the public of the WSJ IRWMP update effort through emails, announcements, meetings, and public workshops, as well as direct phone calls to DACs. The Region has taken steps to reduce the effort needed to participate in the Update process by providing several avenues for participation; at the lowest level of commitment, stakeholders may offer comments at a public meeting or submit comments on the Public Draft via email, while at the highest level of commitment, stakeholders may participate on the Working Group, providing feedback on all aspects of the Plan update. Participation on the Working Group requires commitment to attending monthly meetings and being an active participant that reviews necessary documents and provides feedback on the documents and process in general. Due to limited staffing, participation on the Working Group can sometimes be difficult for certain agencies or community representatives. Thus, providing opportunities for various levels of participation is key. The Region also hopes to reduce the effort needed to submit a project (and update project information in the future) by using Opti to solicit projects, and by providing assistance with project submission to any DAC who requests it.

Stakeholder participation is an integral part of addressing the WSJ IRWMP Objectives and the RMSs that apply to the Region. First, stakeholder involvement can help increase the number of projects that are submitted to the WSJ IRWMP. Project submission and implementation are necessary to fulfill the Region's objectives. Stakeholder input on projects is also a key part of project integration, whereby projects may be combined or altered to provide multiple benefits. Second, stakeholders play an important role in addressing RMSs. Some RMSs relate directly to the involvement of community members, such as Outreach & Engagement, Water & Culture, and Water-Dependent Recreation. Fostering community participation in the WSJ IRWMP Update can directly address those RMSs. Stakeholders are also necessary to address RMSs because they provide input on which RMSs make the most sense for their communities. Stakeholders also have specific local knowledge that can help determine the most applicable RMSs for a given area. Therefore, stakeholder input to the IRWM planning process is crucial for addressing the RMSs and WSJ IRWMP Objectives.

12.3 Decision-Making Process

Decision-making authority for the Region lies with the RWMG, which is composed of SLDMWA's Board of Directors. When making decisions relative to IRWM Planning, the RWMG considers recommendations from other groups, including the Working Group, other subcommittees, and other stakeholders (including members of the public).

Under the RWMG, ad-hoc working groups and steering/technical committees are formed as necessary to focus on matters of particular expertise, such as the update of this Plan. Currently, the Working Group, which is involved with the day-to-day detail of the WSJ IRWMP, is the primary body making informal decisions and providing recommendations to the RWMG. The Working Group provides oversight on all aspects of the WSJ IRWMP (such as Plan text, goals and objectives, project solicitation and prioritization, and stakeholder outreach). The Working Group communicates with the RWMG and offers recommendations when action is warranted, such as prior to Plan updates or adoption.

In addition to the Working Group, SLDMWA's subcommittees, such as the O&M Technical Committee, the policy-oriented Water Resources Committee, and the Finance & Administration Committee, may also provide recommendations as needed. For example, the Water Resources Committee provided input on

the Regions' Goals and Objectives. These subcommittees will continue to be involved on a case-by-case basis.

The Working Group, RWMG, and other groups strive to reach consensus in their decision-making; however, this may not always be possible due to the variety of interests within the Region. The Region aims to foster productive relationships at all times by communicating an a proactive, open, multilateral manner in order to facilitate understanding and participation by all groups.

12.4 Outreach to Disadvantaged Communities

A DAC, according to the State of California (CA Water Code, Section 79505.5(a)), is a community with a MHI less than 80 percent of the California statewide MHI. DWR compiled the U.S. Census Bureau's ACS data for the period of 2012 to 2012. Based on this data, a community with an MHI of $51,026 or less is considered a DAC.

Within the WSJ Region, all five counties within the Region (San Joaquin, Stanislaus, Merced, Fresno and Kings Counties) have communities that meet the DAC definition and almost the entire Region is considered disadvantaged (see Figure 2-10 in Chapter 2). To promote DAC identification and involvement, in mid-2009, the WSJ Region conducted a comprehensive review of community water agencies, flood control agencies, and EJ organizations within its boundaries. This process was used to educate community members on the IRWM process, to help the Region understand the issues confronted by DACs, and to better address the needs of minority and/or low-income communities. The results of this review were used to develop a list of potential stakeholders for directed further outreach on IRWM issues and targeting DACs. At the end of December 2009, the Region mailed formal letters to these potential stakeholders requesting participation in a survey to identify water quality, water treatment, flood control, and water supply needs for DACs in the Region. Follow-up contacts were made first by email, and then by telephone, in January of 2010. This effort resulted in:

- Identification of DACs in the Region;
- Development of interest in participating in the IRWM planning process; and
- An initial list of 22 projects that would benefit DACs and low-income communities.

DAC representatives that participated in this initial outreach effort and in recent project list updates include Cities of Newman and San Joaquin, and Stratford Public Utility District.

For the 2019 WSJ IRWMP Update, the Region built on its previous efforts to identify and involve DACs. Targeted DAC outreach was conducted during the spring and summer of 2018 in order to inform DAC members of the WSJ IRWMP Update and opportunities to participate. Members of the Working Group and RWMG (including local nonprofit representatives such as Self-Help Enterprises) identified DAC contacts that may be interested in participating in the Plan Update. These individuals were contacted via phone and informed of the opportunities to participate, whether through participating in the Working Group, attending public workshops, or submitting projects. One outcome of focused DAC outreach was the identification of areas that were not previously included in the Region (such as the City of Mendota and much of the City of Avenal) that could benefit from being part of an IRWM Region. Several areas, including DACs that were not covered by any other IRWM region, were added to the WSJ Region via a boundary change (discussed in Chapter 1). When needed, DAC members also received technical assistance submitting their projects to the Opti database.

12.5 Outreach to Native American Communities

According to the U.S. DOI Indian Affairs, as of January 2018, there are no listed federally- or state-recognized Native American tribes within the WSJ IRWM Region. Should any Native American tribes be recognized within the Region in the future, the RWMG will invite them to participate in the IRWM planning process, either by participating in the Working Group or through participation in public meetings or project submittal. Furthermore, if new tribes were recognized in the Region, the Region's governance structure could be modified in order to allow for tribal representatives to participate at a higher level of the governance structure.

Chapter 13 Climate Change

The potential effects of climate change in California are well documented in multiple studies, reports and agency communications (DWR, 2009; CNRA, 2012; Null, et al, 2010; DWR, 2011) and generally point to increased temperatures, sea level rise, a reduced winter snowpack, altered precipitation patterns, and more frequent storm events. The purpose of this section is to identify the forecasted climate change impacts specific to the WSJ Region and interpret these changes in climatic and hydrologic variables in terms of the region's vulnerability. This section also describes how the RMSs pursued in the region can be useful as adaptation responses for the areas of vulnerability and how the Region can monitor climate change information relevant to the region in the future. Climate change aspects are relevant for many of the components of this plan (Objectives, Coordination, RMSs, etc.); therefore, climate change is discussed, as applicable, in the respective chapters.

Climate change is a term with a very specific physical meaning – the long-term change in climatic conditions on the planet – but in the context of IRWM, the term has crossover implications in the physical and natural systems, social and economic activities, and the interaction between stakeholders to plan and implement projects and strategies to accomplish objectives. Several specific aspects of climate change are discussed in this section; some of the relevant terms are defined below:

- **Climate change mitigation** refers to reductions in GHG emissions that may result from the implementation of policies, projects, and programs, and are discussed in this chapter when presenting RMSs considered by the WSJ Region.
- **Climate change adaptation** refers to policies, projects and programs that can be used to reduce the vulnerability of the Region to climate change and are discussed in this chapter when presenting RMSs considered by the WSJ Region.
- **Climate change impacts** refers to changes in specific climatic variables and sea level, but also the resulting impacts in specific aspects of the water resources system such as streamflows, snowpack, water temperature, ecosystem stress, etc. Impacts are discussed in this section first as part of the assessment of vulnerability, but also in terms of how the performance of specific projects and RMSs may vary as a result of climate change.
- **Climate change data** refers to data, information, modeling results and forecasts related to specific climate, hydrology and ecology variables of interest to the Region. This is discussed in the vulnerability assessment at the end of the chapter when presenting a general plan for continued data gathering efforts.

13.1 Legislative and Policy Context

The climate change elements of this WSJ IRWMP need to consider the current legislative, regulatory, and policy context. In California, specifically, there are a number of policies and laws dealing with climate change (mitigation, adaptation, vulnerability assessment). Relevant legislation and executive orders in terms of California's response to climate change have been considered in this plan and are summarized in the following sections.

Executive Order EO S-3-05 (2005)

EO S-3-05 establishes GHG emission reduction targets for California:

- By 2010, reduce GHG emissions to 2000 California levels
- By 2020, reduce GHG emissions to 1990 California levels

- By 2050, reduce GHG emissions to 80 percent below 1990 California levels

The California Environmental Protection Agency (CalEPA) has established the Climate Action Team (CAT) to coordinate efforts to meet these targets. Specifically relevant to the water sector is the Water-Energy subgroup (also known as WET-CAT) which is tasked with exploring mitigation strategies for energy consumption related to water use. Currently, WET-CAT is tasked with implementation and analysis of five water-related measures (identified in the AB 32 Scoping Plan): water use efficiency, recycled water, water systems efficiency, stormwater reuse, and renewable development (CARB, 2017).

AB 32: The California Global Warming Solutions Act of 2006 (2006)

AB 32, the California Global Warming Solutions Act of 2006, codifies the mid-term GHG reduction target established in EO S-3-05 and provides further details for those targets. AB 32 identifies CARB as the State agency responsible to develop regulations, emission limits and additional measures to meet the limits.

CARB has designed a California cap-and-trade program that is enforceable and meets the requirements of AB 32. The program started on January 1, 2012, with an enforceable compliance obligation beginning with the 2013 GHG emissions.

Under AB 32, CARB was required to prepare a Scoping Plan to identify and achieve reductions in GHG emissions in California. The first Scoping Plan was adopted by CARB in 2008, and recommended specific strategies for different business sectors, including water management, to achieve the 2020 GHG emissions limit. An updated Scoping Plan was released in 2014 which reviewed progress to date and identified next steps toward meeting the 2020 emissions goal. A second update was finalized in November 2017. In the water sector, the following high-level goals and objectives were identified to reduce GHG emissions (CARB, 2017):

- Develop and support more reliable water supplies for people, agriculture, and the environment, provided by a more resilient, diversified, sustainably managed water resources system with a focus on actions that provide direct GHG reductions.
- Make conservation a California way of life by using and reusing water more efficiently through greater water conservation, drought tolerant landscaping, stormwater capture, water recycling, and reuse to help meet future water demands and adapt to climate change.
- Develop and support programs and projects that increase water sector energy efficiency and reduce GHG emissions through reduced water and energy use.
- Increase the use of renewable energy to pump, convey, treat, and utilize water.
- Reduce the carbon footprint of water systems and water uses for both surface and groundwater supplies through integrated strategies that reduce GHG emissions while meeting the needs of a growing population, improving public safety, fostering environmental stewardship, aiding in adaptation to climate change, and supporting a stable economy.

The Scoping Plan's goals and objectives were considered during establishment of the WSJ Region's IRWMP goals and objectives.

SB 97 (2007)

SB 97 (SB 97) directed the Governor's Office of Planning and Research to develop Guideline amendments for CEQA to include the analysis of climate change in the environmental permitting process. The CEQA Guidelines call for lead agencies to determine baseline conditions and levels of significance and to evaluate mitigation measures. The guidelines do not prescribe mitigation measures.

Executive Order S-13-08 (2008)

EO S-13-08 is an executive order with the purpose of advancing California's ability to adapt to climate change and more specifically sea level rise. It directs a number of State agencies to engage in planning and research efforts to assess the vulnerability of California's transportation system and key coastal infrastructure to different sea level rise scenarios for the years 2050 and 2100. It also required the CAT (see EO S-3-05 above) to develop state strategies for adaptation in the water sector, ocean and coastal resources, infrastructure, biodiversity, and other areas. The CNRA, working through CAT, prepared the California Climate Adaptation Strategy in response to this EO (discussed below).

SB 375 (2008)

The Sustainable Communities and Climate Protection Act of 2008 (Sustainable Communities Act, SB 375) aligns with the State's goals to reduce GHG emissions through coordinated transportation and land use planning. Under the Act, CARB sets regional targets for GHG emissions reductions from passenger vehicle use. In 2010, CARB established these targets for 2020 and 2035 for each region covered by one of the State's metropolitan planning organizations. For the WSJ Region, the corresponding Metropolitan Planning Organizations are the San Joaquin Council of Governments, Stanislaus Council of Governments, Merced County Association of Governments, Madera County Transportation Commission, and the Council of Fresno County Governments. CARB will periodically review and update the targets, as needed.

California Climate Adaptation Strategy (2009)

The CNRA developed the California Climate Adaptation Strategy (2009) in response to EO S-13-08, outlining a set of guiding principles: "California must protect public health and safety and critical infrastructure; California must protect, restore, and enhance ocean and coastal ecosystems, on which our economy and wellbeing depend; California must ensure public access to coastal areas and protect beaches, natural shoreline, and park and recreational resources; new development and communities must be planned and designed for long-term sustainability in the face of climate change; California must look for ways to facilitate adaptation of existing development and communities to reduce their vulnerability to climate change impacts over time; and California must begin now to adapt to the impacts of climate change. We can no longer act as if nothing is changing."

Twelve key recommendations resulting from the strategy (CNRA, 2009) are:

1. Appoint a Climate Adaptation Advisory Panel to assess the greatest risks to California from climate change and to recommend strategies to reduce those risks, building on the Climate Change Adaptation Strategy.
2. Implement the 20x2020 water use reductions and expand surface and groundwater storage; implement efforts to fix Delta water supply, quality and ecosystems; support agricultural water use efficiency; improve statewide water quality; improve Delta ecosystem conditions; and stabilize water supplies as developed in the Bay Delta Conservation Plan.
3. Consider project alternatives that avoid significant new development in areas that cannot be adequately protected from flooding, wildfire, and erosion due to climate change.
4. Prepare, as appropriate, agency-specific adaptation plans, guidance or criteria.
5. For all significant state projects, including infrastructure projects, consider the potential impacts of locating such projects in areas susceptible to hazards resulting from climate change.
6. The Climate Adaptation Advisory Panel and other agencies will assess California's vulnerability to climate change, identify impacts to state assets, and promote climate adaptation/mitigation

awareness through the Hazard Mitigation Web Portal and My Hazards Website, as well as other appropriate sites.

7. Identify key California land and aquatic habitats that could change significantly during this century due to climate change.
8. The California Department of Public Health will develop guidance for use by local health departments and other agencies to assess mitigation and adaptation strategies, which include impacts on vulnerable populations and communities, and assessment of cumulative health impacts.
9. Communities with General Plans and Local Coastal Plans should begin, when possible, to amend their plans to assess climate change impacts, identify areas most vulnerable to these impacts, and develop reasonable and rational risk reduction strategies using the CAS as guidance.
10. State firefighting agencies should begin immediately to include climate change impact information into fire program planning to inform future planning efforts.
11. State agencies should meet projected population growth and increased energy demand with greater energy conservation and an increased use of renewable energy.
12. New climate change impact research should be broadened and funded.

GHG Reporting Rule (2009)

Closely related to SB32 but at the federal level, in September 2009, USEPA released the Mandatory Reporting of Greenhouse Gases Rule (74FR56260, Reporting Rule) which requires reporting of GHG data and other relevant information from large sources and suppliers in the United States, such as Pacific Gas & Electric.

California Ocean Protection Council Resolution (2011)

Adopted in March 2011, this resolution directs entities implementing coastal projects to consider sea level rise vulnerabilities and establishes that state agencies should make decisions regarding coastal and ocean management based upon guiding principles presented in the 2009 California Climate Adaptation Strategy (see above).

National Water Program 2012 Strategy: Response to Climate Change (2012)

In 2012, the USEPA released a report entitled *National Water Program 2012 Strategy: Response to Climate Change*. The report assesses climate change impacts on water resources and identifies long- and short-term strategies to address the potential impacts of climate change. The report also outlines guiding principles for enacting its vision and recommendations for program support across agencies.

California Water Plan (CWP) Update (2013)

The CWP, updated every five years by DWR, is the State's strategic planning document for sustainable water management. The CWP discusses the status and trends of California's water supply and related resources. The CWP also facilitates collaboration between various groups, including elected officials, agencies, tribes, water and resource managers, businesses, academics, stakeholders, and the public, as these groups work together to make informed decisions about the future of water in California. The CWP also includes RMSs which are aimed at reducing water demand, increasing water supply, reducing flood risk, improving water quality, and enhancing environmental and resource stewardship. In addition to the RMSs, the CWP Update 2013 lists the following 17 objectives to help achieve the goals of the CWP:

1. Strengthen integrated regional water management
2. Use and reuse water more efficiently

3. Expand conjunctive management of multiple supplies
4. Protect and restore surface water and groundwater quality
5. Practice environmental stewardship
6. Improve flood management using an integrated water management approach
7. Manage the Delta to achieve the coequal goals for California
8. Prepare Prevention, Response and Recovery Plans
9. Reduce the carbon footprint of water systems and water uses
10. Improve data, analysis, and decision-support tools
11. Invest in water technology and science
12. Strengthen Tribal/State relations and natural resources management
13. Ensure equitable distribution of benefits
14. Protect and enhance public access to the State's waterways, lakes, and beaches
15. Strengthen alignment of land use planning and integrated water management
16. Strengthen alignment of government processes and tools
17. Improve integrated regional water management finance strategy and investments

At a more local level, the CWP includes reports that summarize regional water conditions, including a water balance, water quality conditions, and flood management. The CWP identifies ten regions in the State; the WSJ Region is overlapped by the San Joaquin River and Tulare Lake Hydrologic Regions. These regional summaries also delineate the challenges facing each region and potential future scenarios for water management in the region and the WSJ IRWMP update draws on this information throughout. A 2018 CWP Update is underway as of spring 2018.

Safeguarding California: Reducing Climate Risk, an Update to the 2009 California Climate Adaptation Strategy (2014)

As an update and supplement to the 2009 California Climate Adaptation Strategy, the CNRA prepared the *Safeguarding California Plan*. The intent of the Plan is to provide policy guidance for decision makers at the state level. The Plan details the climate risks to nine sectors, including water resources, and makes recommendations within each sector. The Plan provides the following guidance to address climate risks relative to water resources (CNRA, 2014):

1. Vigorously prepare California for flooding
2. Support regional groundwater management for drought resiliency
3. Diversify local supplies and increase water use efficiency
4. Reduce Sacramento-San Joaquin Delta climate change vulnerability
5. Prepare California for hotter and dryer conditions and improve water storage capacity
6. Address water-related impacts of climate change on vulnerable and disadvantaged populations and cultural resources
7. Continue to mainstream climate considerations into water management
8. Utilize LID and other methods in State and regional stormwater permits to restore the natural hydrograph
9. Require closer collaboration and coordination of land use and water planning activities to ensure that each reinforces sustainable development that is resilient to climate changes
10. Protect and restore water resources for important ecosystems
11. Better understand climate risks to California water and develop tools to support efforts to prepare for climate risks

Climate Ready Utilities (2015)

In 2010, the USEPA released its Climate Ready Water Utilities Program, which provided tools to support water and wastewater utilities as they plan for the future. The tools and resources aimed to help utility owners and operators to understand climate risks, provide adaptation strategies, and support decision making. In 2015, the USEPA released an update to the 2010 report, entitled *Adaptation Strategies Guide for Water Utilities*. The guide focuses on adaptation strategies for drinking water, wastewater, and stormwater utilities. The guide is intended to help utilities identify climate-related threats and come up with an adaptation plan.

Statewide Climate Change Projections

The statewide effects of climate change provide relevant background for discussing climate change within the WSJ Region. Below is a brief overview of climate change impacts on the State.

- **Temperature:** California's average temperature has increased by 1.7°F over roughly the past century (Moser et al., 2012). Higher elevations have seen the highest temperature increases. Summer temperatures in California are expected to increase by 0.9 to 3.6°F by 2030 (CAT, 2009). Temperature increases are expected to be more pronounced in the summer than in the winter (CAT, 2009). Higher temperatures also increase evapotranspiration, which raises crop water demands.
- **Precipitation:** With a warming climate, more precipitation is expected to fall as rain rather than snow (CNRA, 2012). This will likely cause more streamflow in the winter, and less in the spring and summer, when water demands are higher. Extreme precipitation events are also expected to become more frequent (CBO, 2009).
- **Snowpack:** The Sierra Nevada snowpack has been shrinking (CCSP, 2008). California's snowpack is also expected to melt earlier in the spring due to rising spring temperatures. Accelerated snowmelt reduces the snowpack's ability to act as a natural reservoir and puts additional pressure on the state's water storage infrastructure.
- **Streamflow:** With more frequent storm events and earlier spring snowmelt, as well as increase possibility of drought, streamflow in the State's surface water bodies is likely to become more variable (CNRA, 2012). This results in stress on water infrastructure and water suppliers, and also poses flood risks. Water quality can be impacted by reduction in streamflows because pollutants become more concentrated in lower volumes of water
- **Wildfire:** As drier and warmer weather becomes more common across the state, wildfire risk is expected to remain high or increase (CCSP, 2008). Sediment runoff into water bodies after wildfires can lower water quality.

13.2 Climate Change Projections for the Region

For the WSJ IRWMP, two main sources of information have been used to define potential climate change impacts for the Region. The first one is the Climate Resilience Evaluation and Awareness Tool (CREAT) tool developed by the USEPA, from which specific temperature and precipitation forecasts are available with geographic specificity. The second source of information is a study on hydrologic response and watershed sensitivity to climate change for the watersheds of the Sierra Nevada, published in 2010 (Null et. al., 2010). The importance of the hydrologic response study is that the climate variables of temperature and precipitation have been used as inputs to mechanistic hydrology models that forecast watershed impacts. The following sections describe the CREAT results and the analysis by Null *et al*.

CREAT Results

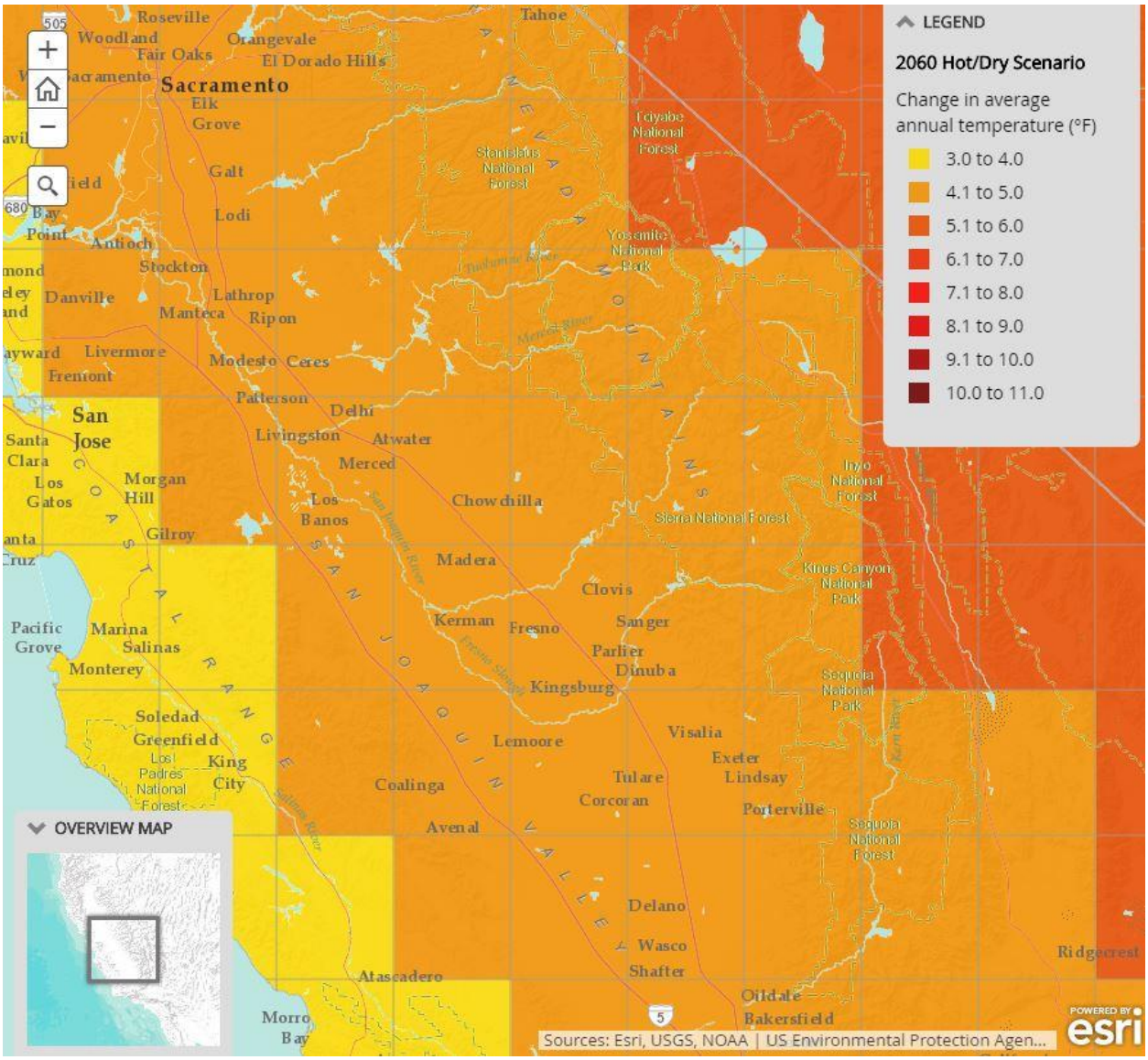
CREAT is a risk assessment- and scenario-based planning application for utilities in United States. Developed by the USEPA, it contains basic national and regional climate science information, and has the ability to access data for specific geographic locations with comparisons of temperature and precipitation under mid-term and long-term conditions using different sets of predictions.

The most significant watersheds for the WSJ Region are the western-slope Sierra Nevada watersheds of the Stanislaus, Tuolumne, Merced, San Joaquin, and Kings Rivers. CREAT results were obtained from the USEPA's CREAT Climate Change Scenarios Projection Map for an area in the Kings River headwaters and in the Tuolumne River in order to show predicted changes for a geographic range across these watersheds (USEPA, 2016). Table 13-1 shows the predicted change in annual temperature and precipitation forecasted for the year 2060 for a general circulation model (GCM, also referred to as a global climate model) with a hot and dry tendency (worst-case projections). Table 13-1 also shows the predicted change in 100-year storm intensity. Figure 13-1 and Figure 13-2 display the CREAT Climate Change Scenarios Projections for much of central California, including both the WSJ Region and the sources of its rivers in the Sierra Nevada.

Table 13-1: Changes in Temperature and Precipitation (CREAT Results, 2060 Prediction)

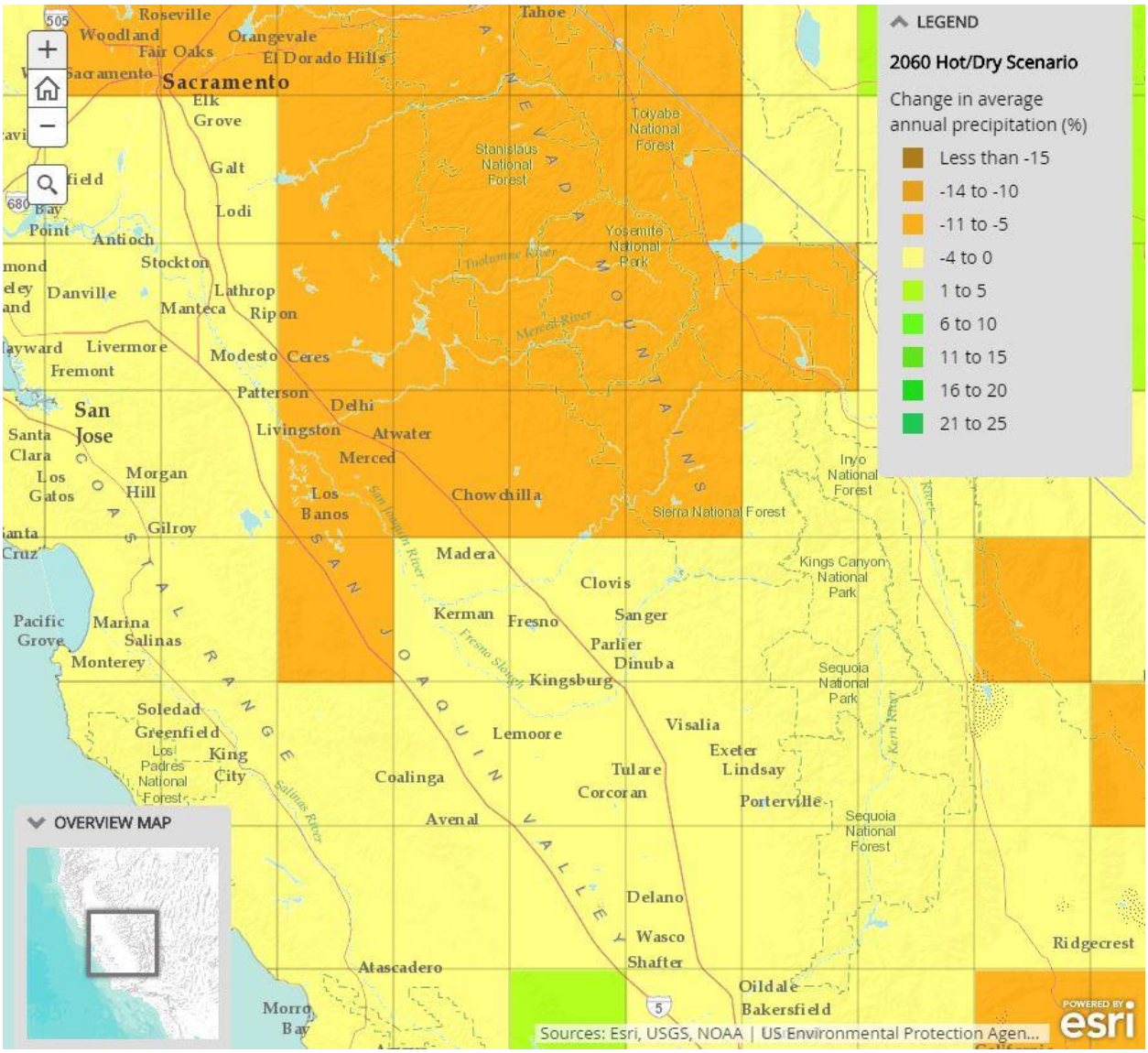
Watershed	Average Temperature Difference	Annual Precipitation Difference	Change in 100-Year Storm Intensity[1]
Kings River	+4.9 °F	-4.0%	+15 to 25%
Tuolumne River	+4.6 °F	-5.3%	+10 to 27%

[1]Range represents 2 GCM scenarios, one showing a stormier future than the other.



Source: USEPA, 2016

Figure 13-1: CREAT Predictions of Change in Average Temperature by 2060, Using a Hot/Dry Model Scenario

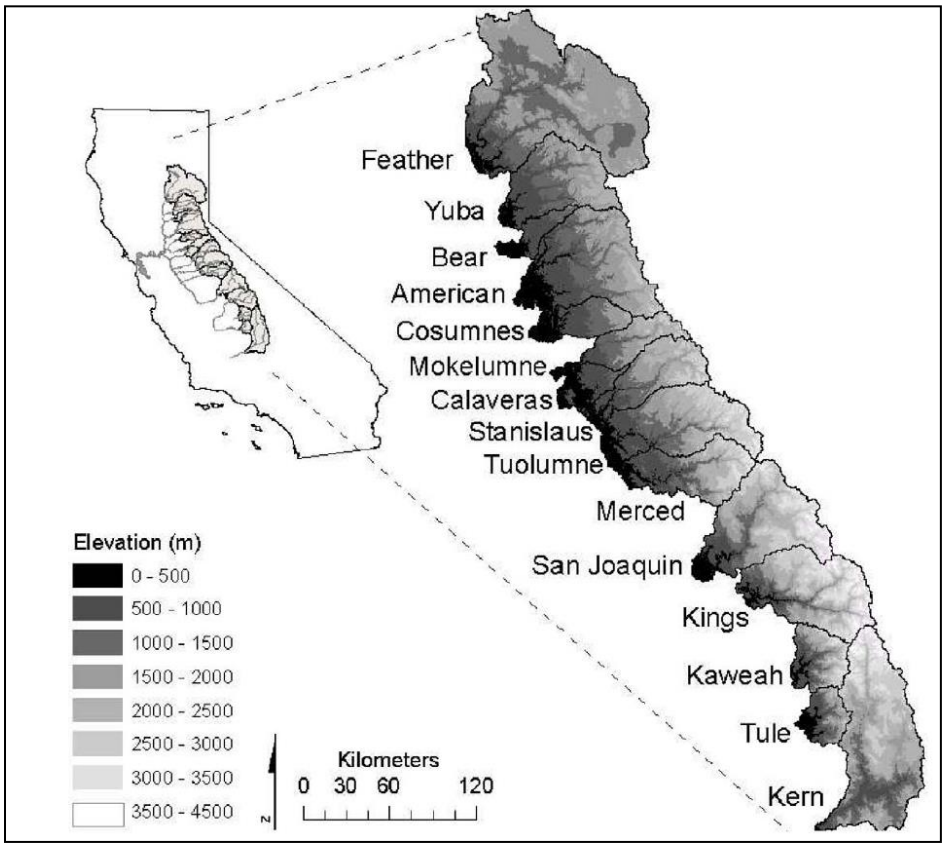


Source: USEPA, 2016

Figure 13-2: CREAT Predictions of Change in Average Annual Precipitation by 2060, Using a Hot/Dry Model Scenario

Hydrology Impacts and Watershed Sensitivity

While the forecasted results in temperature and precipitation give an idea of how the local weather is expected to change on average, it is necessary to translate those changes into impacts on water resources systems. The study *Hydrologic Response and Watershed Sensitivity to Climate Warming in California's Sierra Nevada* (Null, et. al., 2010) assessed the differential hydrologic responses to climate change of 15 west-slope Sierra Nevada watersheds. Figure 13-3 shows the watersheds evaluated in the 2010 study. The Stanislaus, Tuolumne, Merced, San Joaquin, and Kings Rivers, which correspond to the most significant watersheds for the WSJ Region, are all included in the analysis.



Source: Null et al, 2010.

Figure 13-3: West-Slope Sierra Nevada Watersheds Studied

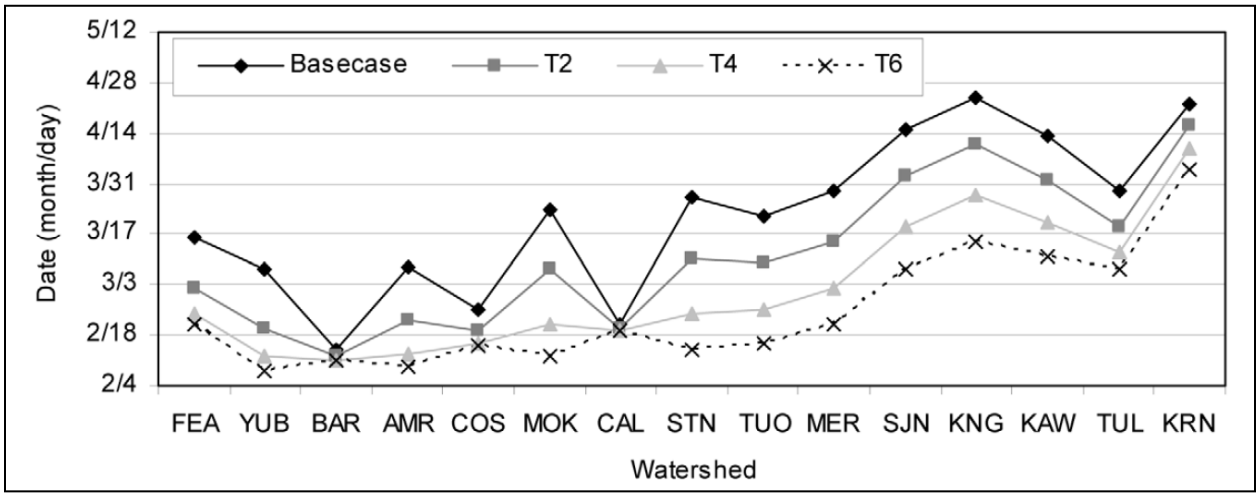
The study of hydrologic response and watershed sensitivity is based on a mechanistic hydrology model developed in WEAP21 (Water Evaluation and Planning model, developed by Stockholm Environmental Institute) to simulate intra-basin hydrologic dynamics given the climate variables. The model uses historical data from the period of 1981 to 2001, which includes a wide range of climatic variability including the wettest year on record (1983), the flood year of record (1997) and a prolonged drought (1988-1992). In terms of temperature, incremental climate warming alternatives were developed with uniform increases in air temperature of 2°C, 4°C, and 6°C (T2, T4 and T6, respectively) to evaluate impacts on regional water systems. (For reference, these increases equate to 3.6°F, 7.2°F, and 10.8°F, respectively.) For each scenario, the model produced simulated hydrology sequences and computed mean annual flow, centroid timing and low-flow duration for each of the watersheds in the study.

Results of modeling the 15 watersheds indicated that increases in temperature generally result in lower mean annual flow (the average yearly flow in the watershed). A summary of the reduction in average annual flow for the relevant watersheds contributing flows to the WSJ Region is presented in Table 13-2. Reductions in mean annual flow could have significant implication for the ability to meet demands for agricultural, urban and environmental water uses.

Table 13-2: Modeled Mean Annual Flow for Watersheds and Temperature Scenarios

Watershed	Annual Average Flow (mcm)				Change from Base Case (%)		
	Base Case	*T2*	*T4*	*T6*	*T2*	*T4*	*T6*
Stanislaus	1,561	1,523	1,482	1,435	-2.4	-5.1	-8.1
Tuolumne	2,445	2,401	2,354	2,304	-1.8	-3.7	-5.8
Merced	1,348	1,308	1,272	1,237	-3.0	-5.6	-8.2
San Joaquin	2,294	2,265	2,235	2,201	-1.3	-2.6	-4.1
Kings	2,117	2,094	2,070	2,041	-1.1	-2.2	-3.6

In California climate change predictions, the timing of stream flows is consistently shown to be an element with considerable impact, affecting the management of surface water reservoirs for both flood control and water supply. The study by Null *et al*. evaluated the runoff centroid timing, which is the date at which the total annual runoff at the outlet of each watershed has passed. Centroid timing is primarily driven by snowmelt, which is driven by temperature. Results of the study for all of the 15 watersheds modeled are presented in Figure 13-4.



Source: Null *et al.,* 2010 – Figure 6, page 8
Base case – baseline scenario
T2 – 2°C temperature increase
T4 – 4°C temperature increase
T6 – 6°C temperature increase

FEA – Feather
YUB – Yuba
BAR – Bear
AMR – American
COS – Cosumnes

MOK – Mokelumne
CAL – Calaveras
STN – Stanislaus
TUO – Tuolumne
MER – Merced

SJN – San Joaquin
KNG – Kings
KAW – Kaweah
TUL – Tule
KRN – Kern

Figure 13-4: Average Centroid Timing by Watershed and Climate Scenario

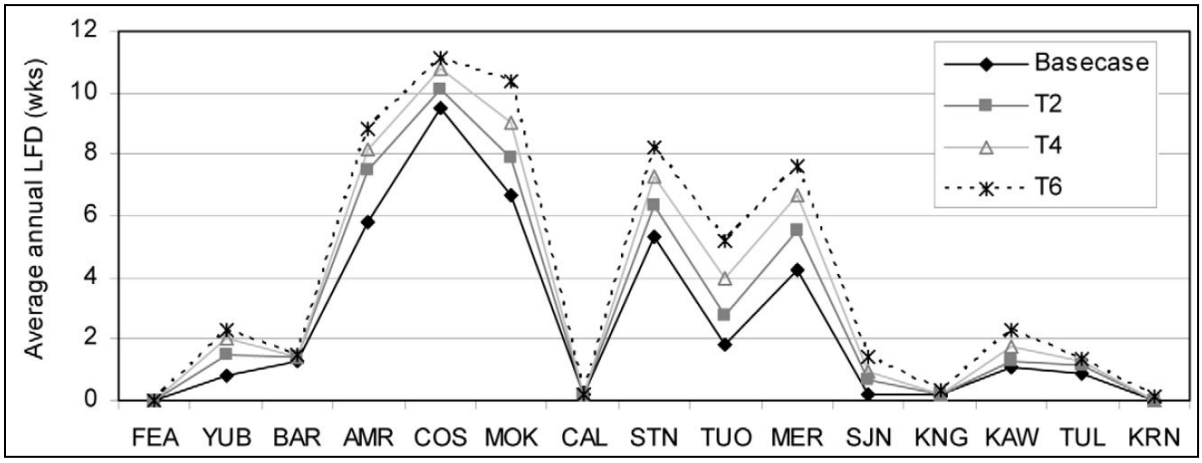
The results in Figure 13-4 are presented with the label for each watershed in the x-axis in the order of north to south. The y-axis presents the centroid timing (date). The relevant watersheds for the WSJ Region are labeled as follows:

Stanislaus – STN
San Joaquin – SJN
Tuolumne – TUO
Kings - KNG
Merced – MER

The results show significant changes in centroid timing as indicated by the separation of the lines from base case to T2, T4, and T6. The minimum difference in centroid timing is for the scenario with a 2°C increase in temperature, which is about a 2-week change in centroid timing. The difference with T6 is over one month, indicating that the flows would arrive to the Region about a month earlier due to earlier snowmelt. This could have significant implications for water management in the Region. The watersheds of interest have very similar impacts in centroid timing mostly due to the fact that they have similar proportion of areas of high and lower elevations. Areas of high elevations are more susceptible to hydrology changes due to temperature increase given that these are snowpack-driven watersheds.

A third variable simulated by Null *et al.* is low flow duration. Low flow duration is the number of weeks with "low flow" conditions and, in this case, "low flow" has been defined as periods of at least three weeks where weekly discharge divided by total discharge for the water year is less than 1%. Although this definition of low flow is not based on a specific regulation, it does represent a flow condition that can stress a water supply system and aquatic habitat.

The results of modeling simulated changes in low flow duration are presented in Figure 13-5 with the label for each watershed along the x-axis (from north to south). The y-axis shows the number of weeks under low flow conditions (average over the years simulated).



Source: Null *et al.*, 2010 – Figure 8, page 9
Base case – baseline scenario
T2 – 2°C temperature increase
T4 – 4°C temperature increase
T6 – 6°C temperature increase

FEA – Feather
YUB – Yuba
BAR – Bear
AMR – American
COS – Cosumnes

MOK – Mokelumne
CAL – Calaveras
STN – Stanislaus
TUO – Tuolumne
MER – Merced

SJN – San Joaquin
KNG – Kings
KAW – Kaweah
TUL – Tule
KRN – Kern

Figure 13-5: Average Number of Low Flow Weeks by Watershed and Climate Scenario

For the relevant watersheds for the WSJ Region (Stanislaus, Tuolumne, Merced, San Joaquin and Kings), the results show changes in low flow duration for the Stanislaus, Tuolumne and Merced Rivers as indicated by the separation of the lines from base case to T2, T4, and T6. The minimum difference in low flow duration is for the scenario with a 2°C increase in temperature, which is about one more week of low flow duration. Changes are much less significant for the San Joaquin and Kings Rivers. It is also relevant to mention that the estimated low flow durations in this case are specifically for the rivers in a geographic location outside the WSJ Region. The low flows in these locations, however, will be likely correlated with lower flows downstream in areas within the WSJ Region.

Based on these predictions, it behooves the WSJ Region to consider the implications for water management. Earlier snowmelt and more intense storm events will result in increased runoff and potential flooding, which will likely occur earlier in the year, be more variable, and carry a greater sediment load. Resilient systems are needed to deal with the expected changes in the intensity of these events, including measures to capture runoff for beneficial use as groundwater recharge. Extended dry periods are also expected to occur with a changing climate; these would result in extremely low streamflow and low amounts of recharge. Low streamflow can exacerbate water quality issues as less dilution occurs. Poor recharge can also result in land subsidence during droughts. Therefore, hydrologic changes present a range of water supply, water quality, and flood management issues that the Region will consider. Adaptations to these issues are discussed in more detail in Section 13.3 under the respective vulnerability category.

Sea Level Rise

Although the WSJ Region is not a coastal region, it is dependent on the CVP for water supply to a large extent. As CVP supplies are conveyed via the Delta, sea level rise may impact the Region if Delta salinity increases and reservoir operations are impacted. Disruptions in the overall operation of the CVP can result in impacts to all CVP contractors. This makes sea level rise a relevant, climate change-driven factor to consider in terms of vulnerability. Section 13.3, where the vulnerability of the region is discussed, includes a description of the relevance of sea level rise to water supply for the WSJ Region. Table 13-3 presents assessments of potential sea level rise in the Delta region according to a variety of GCM model scenarios.

Table 13-3: Sea Level Rise Projections for San Francisco and Delta Region (2050)

Scenario	Projection
"Business as usual" scenario (with a mix of fossil fuel and non-fossil fuel)	11.0 ± 3.6 in
Lower emission scenario	4.8 in
"Business as usual" scenario (fossil fuel intensive)	23.9 in

Source: NRC, 2012. Projected sea levels are increases in mean sea level from the year 2000.

13.3 WSJ Region Climate Change Vulnerability

The climate change issues facing the Region were evaluated using the comprehensive Region Description (Chapter 2), California-wide predictions of climate change impacts, and regional/local climate change impacts. This information provided a basis for the WSJ IRWMP Region to assess its vulnerabilities to climate change. The Region used DWR's *Climate Change Handbook for Regional Water Planning* Vulnerability Assessment Checklist to evaluate vulnerabilities (Appendix G). The Checklist is framed as a series of questions related to vulnerabilities in seven categories: Water Demand, Water Supply, Water

Quality, Sea Level Rise, Flooding, Ecosystem and Habitat Vulnerability, and Hydropower. The following sections discuss the vulnerabilities of the region to climate change impacts within these categories as identified during completion of the checklist. The Region's vulnerabilities, as well as the technical and financial feasibility of addressing the vulnerabilities are summarized in Table 13-4.

Table 13-4: WSJ Region Vulnerabilities to Climate Change

Area of Vulnerability	Summary	Technical Feasibility of Addressing Vulnerability	Financial Feasibility of Addressing Vulnerability
Water Demand	A large percentage of the water demand in the WSJ Region is driven by agricultural irrigation. Higher temperatures will drive increased evapotranspiration rates and increase irrigation demand. This is applicable not only to agricultural demands (although that is the most significant impact), but also to outdoor demands in urban areas in the Region.	Feasible. Demands may be reduced through efficiency measures, but these do have a limit, beyond which more drastic changes would be necessary within the Region to reduce demand further.	Varies. Certain efficiency measures such as retrofits could be inexpensive, while solutions such as developing a new water supply would be costly.
Water Supply	The Region is highly dependent on surface flows that are vulnerable to decreased precipitation and snowpack in the Sierra Nevada. The water management system in the Region and State relies heavily on surface storage, including snowpack in the Sierras. The storage of water in snowpack is vulnerable, with earlier snowmelt and more intense short-duration storm events expected. More extended and potentially more frequent droughts will compound supply vulnerability and can also result in higher demands in agricultural and urban areas.	Feasible. Strategies like conjunctive management and recycled water expansion are technically feasible and some are already in use within the Region. More extreme solutions would include development of new surface storage.	Strategies for adapting to climate change impacts on water supply would generally be expensive. Development of new storage or supplies would be costly, as would treatment of low-quality supplies. The implementation of such projects can be cost prohibitive for agencies and communities, especially those in the WSJ Region that are DACs.
Water Quality	Surface water quality is vulnerable due to several factors, including increased low flow duration, an expected reduction in meadows, and a potential increase in storm intensity with short-term turbidity effects. Groundwater quality can also be vulnerable due to greater pressure on aquifers to offset surface supply shortages, thus creating overdraft conditions. Wildfires are expected to be more likely with post-event impacts to surface water quality.	Feasible. Technologies exist to treat water to a variety of standards and could be implemented within the Region if necessary. Solutions such as land use management could also be implemented (both to prevent wildfires and erosion in general), although some would need to occur outside the Region to have a downstream effect.	Varies. Strategies such as increased water treatment or aquifer remediation would be quite expensive. Land management changes or fire prevention efforts would be less costly.
Flood Management	The Region's flood management system is vulnerable to the changes in the balance of	Feasible. Strategies that could be implemented include riparian area	Varies. Including LID strategies in a new project would be relatively

Area of Vulnerability	Summary	Technical Feasibility of Addressing Vulnerability	Financial Feasibility of Addressing Vulnerability
	storage to streamflow triggered by earlier snowmelt. More intense storms are also predicted while meadow area may be reduced, eliminating a natural peak flow reduction mechanism.	restoration, LID, stormwater runoff management, and levee improvements.	inexpensive, while levee improvements could be very costly.
Ecosystem and Habitat	Some terrestrial habitats will be vulnerable to increases in the frequency of wildfires, but the higher vulnerability may be in aquatic habitat due to changes in runoff timing and increased low flow periods and droughts. Higher water temperatures can also degrade water quality and stress aquatic species.	Feasible. Ecosystem restoration, pollution prevention, land management are proven strategies to preserve ecosystem services and restore habitats. Some issues, such as effects of climate change, may be more difficult to address on a Regional level, although mitigation measures may be implemented to help reduce these effects.	Varies. Ecosystem and habitat restoration projects may range widely in cost but can be an effective alternative to more costly infrastructure projects.
Hydropower	The Region produces some hydropower, which could be vulnerable to reduced surface water flows and CVP water availability. Energy needs in general are also expected to rise in the future due to increasing temperatures and irrigation demands. The rising cost of hydropower generated outside the Region (and associated increased cost of water delivery) also represents a vulnerability for ratepayers within the Region.	Low feasibility. The Region may be able to address some impacts indirectly through water supply improvements, but the majority of impacts could not be addressed.	Low. Producing additional hydropower in the Region would require new projects and is unlikely to be financially viable.
Sea Level Rise	A large number of water purveyors in the WSJ Region rely heavily on the Delta, the Delta-Mendota Canal, and associated conveyance. Sea level rise will require more Delta outflow to maintain manageable levels of salinity near the export facilities. This may result in a less reliable water supply south of the Delta, and thus within the Region.	Low feasibility. The Region may be able to address some impacts indirectly (e.g., through water supply improvements to reduce reliance on the Delta), but occurrence of sea level rise could not be directly addressed by the Region except through efforts to reduce greenhouse gas emissions.	Low. This vulnerability would need to be addressed indirectly via improvements to water supply (discussed above).

Vulnerability Assessment

Water Demand and Supply

The correlation between temperature and water demand for irrigation is well documented and understood. In the WSJ Region, which encompasses approximately 2 million acres in total, about 800,000 acres are partially or solely irrigated with CVP water (depending on water availability conditions). Thus, the largest percentage of the water demand is driven by agricultural irrigation, and higher temperatures will drive great evapotranspiration rates and increase demands. This is applicable not only to agricultural demands (although that is the most significant impact), but also to outdoor demands in urban areas in the region.

In terms of environmental demands, Section 3406(d) of the CVP Improvement Act (CVPIA) requires firm water supplies to be delivered to federal, state and some private wildlife refuges. Historically, the wetlands throughout the region received water from the San Joaquin River. The CVPIA required firm water supplies of suitable quality to maintain and improve wetland habitat. This specific demand and other habitat-related demands may not increase but will continue to need limited water supplies under climate change conditions.

Compounding the impacts of increased water demands, water supply is also projected to be vulnerable to climate change impacts. Reduced annual precipitation and the timing of that precipitation combined with higher temperatures will result in new seasonality of flows due to earlier snowmelt in the Sierra Nevada, as discussed in Section 13.2.

Reduced surface water supplies could trigger a reduction in agricultural surface water use, resulting in a corresponding increase in groundwater use. This, in turn, may result in groundwater elevation declines such that infiltration from rivers to groundwater occurs, resulting in a groundwater-base flow disconnect. Many of the water users in the Region rely on groundwater on a permanent, seasonal or dry-year basis, and overall stresses in surface water make groundwater in the Tracy, Delta-Mendota and Westside subbasins susceptible to overdraft, which has further effects such as land subsidence.

CVP Supply

Disruptions in the overall operation of the CVP can result in impacts to all CVP contractors, and some critical elements of the CVP are vulnerable to sea level rise in terms of salinity impacts. A rising sea level will impact the Delta by increasing the risk of overtopping and other forms of levee failure, and by increased saline/brackish tidal pressure, which if not countered by increases in freshwater outflows, will lead to higher salinity intrusion and higher salinity levels in the Delta.

The CVP's Jones Pumping Plant is located in the southwestern edge of the Delta (just outside the WSJ Region) and lifts water into the Delta-Mendota Canal, which travels southward to the Mendota Pool, supplying water along the way to CVP contractors and San Luis Reservoir. Although irrigation canals are not subject to drinking water regulations, increased salinity levels at the plant due to a levee failure could require a temporary stop in diversions to the CVP because agricultural crops are sensitive to water quality and because the supply eventually mingles with that of the SWP in San Luis Reservoir, which serves water to both agricultural and municipal users. There are no set thresholds for salinity, bromide, or other constituents at which the Jones Pumping Plant would cease operations, but a significant increase in salinity in the vicinity of the pumping plants intakes could result in CVP disruption with impacts to the WSJ Region.

Water Quality

Surface water quality is vulnerable due to several factors, including longer periods of low flows, more frequent and intense droughts, and higher water temperature that can reduce dissolved oxygen concentrations. The vulnerability of meadows and other vegetated areas upstream can have consequences for water quality since natural vegetation removes pollutants and/or prevents them from entering streams. Wildfires are expected to be more likely and will bring with them post-event impacts to surface water quality. A potential increase in storm intensity could also trigger short-term turbidity increases. These negative surface water impacts also affect habitat vulnerability (described further below) by reducing or degrading suitable habitat.

Groundwater quality can also be vulnerable to climate change due to increased use of aquifers to offset surface supply shortages. This results in the use of deeper wells or shallower wells with lower water quality than currently produced. Overdraft conditions may persist for longer periods, preventing the basins from recovering even during wet periods, with associated water quality consequences. Increased pumping of deeper, higher quality groundwater can result in increased vertical gradients, with poorer quality shallow groundwater migrating to and impacting the deeper zones. As discussed in Chapter 2, groundwater levels in some areas of the Region have been declining due to the long-term overdraft conditions caused by continued pumping, and climate change may continue to exacerbate these effects.

Flood Management

A majority of the San Joaquin River's 100-year floodplain (in the stretch of the San Joaquin River at the geographic edge of the WSJ Region) is within the Region (Figure 2-4). The vulnerability of the region to floods is significant since there have been critical flooding events with great consequences for the economy, infrastructure, assets, and residents, even in the relatively recent past. These historical floods have been triggered by high peak flows due to high-intensity storms and/or rapid snowmelt at the Sierra Nevada foothills triggered by tropical storms. As described previously, it is expected that more intense storms could result from climate change. The WSJ Region is vulnerable to changes in the balance between storage and streamflow that can be triggered by earlier snowmelt under climate change conditions. More intense storms are predicted while natural recharge areas may be reduced, eliminating a natural peak flow attenuation mechanism.

Ecosystem and Habitat

There are a number of natural areas in the San Joaquin Valley that, while scattered throughout the region, provide concentrated areas of grasslands and habitats, such as freshwater marshes, valley sink scrub, and grassland vernal pool habitats. Some terrestrial habitats can be vulnerable to increased frequency of wildfires, but aquatic habitats are more vulnerable overall due to changes in runoff timing and increased low flow periods and droughts. Increases in water demands and reductions in overall water supplies will make it challenging for the Region to protect habitats under increased competition for limited supply, particularly in dry years. Higher water temperatures can also degrade water quality and stress aquatic species of interest.

Hydropower

Within the Region, some hydropower is generated at the O'Neill Pumping Plant when water is released from the O'Neill Forebay into the Delta-Mendota Canal. The electricity produced is sold and distributed to the larger power grid. The plant produces power intermittently, generally in the months of May through October, although this depends on the needs of the water users south of Los Banos. The plant may

generate more energy during droughts, as generally water users in this area rely on water delivered through the Jones Pumping Plant, receiving water from the O'Neill Forebay only when other allocations are reduced. The O'Neill Pumping Plant is not a major source of power in the Region, thus, any impacts of climate change on this source will likely have minor effects on the Region. Overall, the effects of climate change on the Region's hydropower production are uncertain. Most of the hydropower for the CVP is generated outside the Region; this represents a significant vulnerability for the Region, as CVP water rates could be impacted by reduced hydropower generation capacity.

Sea Level Rise

Although the WSJ Region is not a coastal area and does not stand to be directly impacted by sea level rise (e.g., via flooding), it may be indirectly impacted via the Delta. As noted above, the Region depends heavily on the CVP for water supply. These supplies are conveyed via the Delta. With sea level rise, salinity in the Delta may increase, impacting reservoir operations and transfer of water through the Delta, and increasing the risk of levee failure. With higher sea levels, the Delta will become more saline/brackish unless sufficient freshwater outflows are present. This has implications for water supplies conveyed through the Delta (including CVP supply). Additional discussion of sea level rise impacts on water supply are discussed in the Water Demand and Supply subsection, above.

Vulnerability Prioritization

These six areas of vulnerability were reviewed and prioritized by the Working Group. The vulnerabilities were ranked as either high or low priority. The Working Group designated high priority areas as ones that should be addressed first; lower priority areas were noted to require medium- to long-term solutions. The vulnerability areas were not further ranked within each category. The vulnerability areas were ranked as follows:

- High Priority (address first): water supply, water quality, and flood management vulnerabilities
- Lower Priority (medium- to long-term): water demand, ecosystem/habitat, and hydropower vulnerabilities

The ranking reflects the Region's primary concerns and the urgency with which the vulnerabilities should be addressed. Due to the Region's high level of dependence on water supply to support its agricultural industry, water supply was highly prioritized. A majority of the projects included in this WSJ IRWMP are related to, or have important components of, water supply, reflecting the Region's views on the importance of addressing water supply needs today and into the future. Flood management is also of concern in the Region as its effects can be widespread and costly to life and property; the potential for damaging floods is expected to rise as climate changes. Therefore, flood management was identified as a high priority area. The final high-priority vulnerability is water quality. The Region has experienced water quality issues which affect both domestic and agricultural water use, and addressing these issues is central to climate change adaptation and continued water supply. This WSJ IRWMP has strong statements relating to flood management and environmental stewardship, reflecting the primary prioritization of those vulnerabilities.

Water demand, ecosystem/habitat, and hydropower vulnerabilities are expected to be less exacerbated by climate change than water supply, quality, and flood management; therefore, these vulnerabilities have been assigned a lower priority. The Region aims to implement adaptation measures to reduce these vulnerabilities but may do so over a long-term timeframe in order to address more pressing issues first.

DAC Climate Vulnerabilities

Climate change impacts to DACs are similar to the vulnerabilities of the Region as a whole. However, DACs have fewer resources to adapt to climate change impacts. For example, prolonged droughts, which are expected to become more common due to climate change, disproportionately impact DACs that rely solely on groundwater or do not have diversified supplies. Future efforts, such as those conducted under SGMA, will help evaluate undesirable results that DACs may be experiencing related to their groundwater supply. Additionally, DACs may not have the financial or staff resources to implement new water supply projects to prepare for drought. Individual community members may also be impacted if water rates rise (due to supply shortages or increased delivery costs resulting from rising energy prices). DACs can also suffer from drought-related impacts on Region's agricultural economy, such as lost jobs due to lowered agricultural production. Although the WSJ Region has relatively little area within the 100-year floodplain, DACs in low-lying areas are particularly vulnerable to flooding resulting in damages or displacement.

13.4 RMSs Providing Climate Change Adaptation

The WSJ Region has been collaborating on planning and program and project implementation efforts for many years. Regional planning has been the primary forum to address regional issues and conflicts. This WSJ IRWMP distinguishes itself from previous regional planning efforts in the WSJ Region in that a formal assessment of climate change impacts and vulnerability has been performed, and RMSs are discussed in the context of climate change adaptation and mitigation. In many cases, an RMS applicable to the Region has the potential to mitigate climate change impacts by reducing GHG emissions, and in many cases, the RMSs can be used to adapt to climate change impacts, reducing the Region's vulnerability. The RMSs are presented in Table 13-5 with references to the vulnerability areas in which they can increase the regions resiliency.

Table 13-5: Applicability of RMSs in Adapting to Climate Change Vulnerabilities

Resource Management Strategies	Water Demand	Water Supply	Water Quality	Flood Management	Ecosystem and Habitat	Hydropower
Reduce Water Demand						
Agricultural Water Use Efficiency	●	●	●			
Urban Water Use Efficiency	●	●	●			
Improve Operational Efficiency and Transfers						
Conveyance-Delta		●	●	●	●	
Conveyance-Regional/Local		●	●	●	●	
System Reoperation		●		●		●
Water Transfers		●			●	
Increase Water Supply						

Resource Management Strategies	Water Demand	Water Supply	Water Quality	Flood Management	Ecosystem and Habitat	Hydropower
Conjunctive Management and Groundwater		●	●	●		
Desalination		●				
Precipitation Enhancement		●				●
Recycled Municipal Water		●			●	
Surface Storage-CALFED		●	●	●	●	●
Surface Storage-Regional/Local		●	●	●	●	●
Improve Water Quality						
Drinking Water Treatment and Distribution		●	●			
Groundwater Remediation/Aquifer Remediation		●	●			
Matching Water Quality to Use	●	●	●			
Pollution Prevention		●	●		●	
Salt and Salinity Management		●	●		●	
Urban Stormwater Runoff Management		●	●	●	●	
Practice Resource Stewardship						
Agricultural Land Stewardship	●		●	●	●	
Ecosystem Restoration	●	●	●	●	●	
Forest Management*		●	●	●	●	
Land Use Planning and Management	●		●	●	●	
Recharge Areas Protection		●	●	●		
Sediment Management		●	●	●	●	●
Watershed Management	●	●	●	●	●	●
People and Water						
Economic Incentives	●	●	●	●	●	●
Outreach and Engagement	●	●	●	●	●	●
Water and Culture	●		●		●	
Water-Dependent Recreation			●	●	●	
Improve Flood Management						
Flood Management			●	●	●	●
Other Strategies						
Crop Idling for Water Transfers*	●	●			●	

Resource Management Strategies	Water Demand	Water Supply	Water Quality	Flood Management	Ecosystem and Habitat	Hydropower
Dewvaporation or Atmospheric Pressure Desalination*		●				
Fog Collection*		●				
Irrigated Land Retirement*	●	●				
Rainfed Agriculture*	●				●	
Waterbag Transport/Storage Technology*		●	●		●	

*These strategies were not included when developing objectives or evaluating projects as they either do not apply to the WSJ IRWMP Region, or would not be considered in the Region unless all other RMSs had been exhausted, as discussed in Chapter 4.

13.5 Plans for Future Data Gathering

As climate change continues to impact the Region, it is vital that data be gathered to help the Region react appropriately to climate change impacts. Robust data collection practices will help the Region plan for future changes and will provide a basis for prioritizing and identifying high-priority projects that will provide adaptation or mitigation benefits. The general strategy for climate change data gathering is to align this specific data collection need with the overall data management process for the Region. As part of IRWM project implementation, different types of data will be collected to track project performance and meet monitoring program requirements. Table 13-6 provides detail on the types of data that may be collected during project implementation in order to support the Region's efforts to adapt to and mitigate climate change.

Table 13-6: Data Gathering Strategy to Assess Climate Change Impacts

Climate Change Vulnerability Category	Potential Data to be Gathered
Water Demand	• Water meter data (municipal, commercial, industrial) • Groundwater use (municipal and agricultural) • Demand projections • Population projections
Water Supply	• Groundwater elevation data • Streamflow (especially seasonal low flows) • Reservoir levels
Water Quality	• Groundwater quality (e.g., salinity, TDS, arsenic, nitrate) • Surface water quality (e.g., turbidity, temperature, dissolved oxygen) • Household water quality, particularly in DACs
Flood Management	• Streamflow measurements • Area flooded during storm events • Value of assets in floodplain
Ecosystem and Habitat	• Fish surveys • Animal and plant surveys • Habitat surveys (e.g., to assess streambed quality) • Volume of water provided for environmental uses
Hydropower	• Kilowatt hours produced • Frequency of power generation

Chapter 14 References

AECOM. 2011. *Groundwater Management Plan (GMC) for the Northern Agencies in the Delta-Mendota Canal Service Area*. GMP Update. Published in July, revised in November 2011.

AECOM. 2014. *Groundwater Management Plan (GMC) for the Southern Agencies in the Delta-Mendota Canal Service Area*. GMP Update. Published in 2011, revised in Dec 2014.

American Society of Civil Engineers (ASCE). 2006. *Guidelines for Cloud Seeding to Augment Precipitation*. Second Edition. Reston (VA): American Society of Civil Engineers. [ASCE Manual No. 81.] 200 pp.

Banta-Carbona Irrigation District. 2013. *Water Management Plan*. December 30.

California Air Resources Board (CARB). 2017. *California's 2017 Climate Change Scoping Plan.* Available at: https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf

California Assembly. 2014a. *Assembly Bill No. 1249*. *Integrated regional water management plans: nitrate, arsenic, perchlorate, or hexavalent chromium contamination.* Approved by Governor, filed with Secretary of State in September 2014.

California Assembly. 2014b. *Assembly Bill No. 1471*. *Water Quality, Supply, and Infrastructure Improvement Act of 2014.* Approved by Governor, filed with Secretary of State in August 2014.

California Assembly. 2014c. *Assembly Bill No. 1739*. *Sustainable Groundwater Management Act.* Approved by Governor, filed with Secretary of State in September 2014.

State of California. 2008. *Executive Order S-13-08* from the Office of Governor Edmund G. Brown Jr.

California Climate Action Team (CAT), Water-Energy Sector Sub Group. 2009. Water-Energy Sector Summary, AB 32 Scoping Plan, GHG Emissions Reduction Strategies. March 4.

California Department of Water Resources (DWR). 2006a. *San Joaquin Valley Groundwater Basin Tracy Subbasin*. California's Groundwater Bulletin 118. January 20th. Accessed February 1, 2017. Available at: http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/5-22.15.pdf.

DWR. 2006b. *San Joaquin Valley Groundwater Basin Delta-Mendota Subbasin*. California's Groundwater Bulletin 118. January 20th. Accessed February 1, 2017. Available at: http://www.water.ca.gov/pubs/groundwater/bulletin_118/basindescriptions/5-22.15.pdf.

DWR. 2006c. *San Joaquin Valley Groundwater Basin Westside Subbasin*. California's Groundwater Bulletin 118. January 20th. Accessed February 1, 2017. Available at: http://www.dwr.water.ca.gov/groundwater/bulletin118/basindescriptions/5-22.09.pdf.

DWR. 2006d. *San Joaquin Valley Groundwater Basin Kings Subbasin*. California's Groundwater Bulletin 118. January 20th. Accessed February 23, 2017. Available at: http://www.water.ca.gov/groundwater/bulletin118/basindescriptions/5-22.08.pdf.

DWR. 2009. *California Water Plan Update 2009 - Integrated Water Management*. DWR Bulletin 160-09.

DWR. 2011. *Climate Change Handbook for Regional Water Planning.* Prepared by CDM for the U.S. Environmental Protection Agency Region 9 and the California Department of Water Resources. November.

DWR. 2013. *California Water Plan 2013 Update.* July.

DWR. 2016. *Proposition 1 Integrated Regional Water Management Grant Program Guidelines*. July.

DWR. N.d. *EDA Mapping Tool.* Accessed on September 19, 2018. Available at https://gis.water.ca.gov/app/edas/

California Environmental Protection Agency – Air Resources Board. 2008. *Sustainable Communities Act, SB 375, Chapter 728, Statutes of 2008*. Approved by Governor September 30, 2008. Filed with Secretary of State September 30, 2008. September 30th.

California Natural Resources Agency (CNRA). 2009. *2009 California Climate Adaption Strategy.*

CNRA. 2012. California Adaptation Planning Guide. July 2012.

CNRA. 2014. *Safeguarding California: Reducing Climate Risk. An update to the 2009 California Climate Adaptation Strategy.* July.

California Senate. 2007. *Senate Bill No. 97. Chapter 185*. Approved by Governor, filed with Secretary of State on August 24th, 2007. August 24th.

California Senate. 2009. *Senate Bill No. SBx7 6.* Approved by Governor, filed with Secretary of State on November 6, 2009.

California Senate. 2014. *Senate Bills No. 1168 and 1319. Sustainable Groundwater Management Act.* Approved by Governor, filed with Secretary of State in September 2014.

Central California Irrigation District. 2014. *Water Management Plan.* June.

Columbia Canal Company. 2012. *Agricultural Water Management Plan.* December 13.

Congressional Budget Office (CBO). 2009. *Potential Impacts of Climate Change in the United States.* May.

Cook. 1976. *History of St. John the Evangelist Episcopal Church.* San Joaquin Historian. January.

Del Puerto Water District. 2017. *Water Management Plan*. September 28.

Dyett & Bhatia Urban and Regional Planners. 2007. *City of Los Banos 2030 General Plan*. Draft Environmental Impact Report. September.

Environmental Protection Agency (EPA). 2009. *Mandatory Reporting of Greenhouse Gases Rule (74FR56260, Reporting Rule)*. October 30th.

Erler & Kalinowski, Inc. (EKI). 2016. *City of Tracy 2015 Urban Water Management Plan*. June.

ESA. 2014. Regional Flood Management Plan for the Mid San Joaquin River Region. November 2014.

Firebaugh Canal Water District. 2014. *Water Management Plan.* June.

Fresno Planning and Development Department. 2002. *2025 Fresno General Plan and related Draft Environmental Impact Report No. 10130*. Research Conservation Element, Chapter 4 02-02-02. February 1. 127-160 pp.

Gouveia Engineering, Inc. 2016. *City of Newman 2015 Urban Water Management Plan*. July.

Izbicki, John A. et al. 2015. Cr(VI) Occurrence and Geochemistry in Water from Public-Supply Wells in California. Applied Geochemistry. 63: 203-217.

Maloney, AB and Bolton, HE. 1945. *Fur Brigade to the Bonaventura: John Work's California Expedition, 1832-1833 for the Hudson's Bay Company*. The Pacific Northwest Quarterly: Vol. 36, No.4. October. 347-349 pp.

Merced County. 2013. *2030 Merced County General Plan.* Water Element. June. W-1 – W-8 pp.

Moser, Susanne, Julia Ekstrom and Guido Franco. 2012. Our Changing Climate 2012, Vulnerability & Adaptation to the Increasing Risks from Climate Change in California. A Summary Report on the Third Assessment from the California Climate Change Center. CEC-500-2012-007. July.

Mosley, John. *Natural Resources Specialist/GIS Coordinator, Bureau of Indian Affairs Pacific Region*. 26 Jan 2017. Personal communication.

Los Banos, City of. 2009. *City of Los Banos 2030 General Plan Update.* July.

Luhdorff & Scalmanini Consulting Engineers. 2015. *Western San Joaquin River Watershed Groundwater Quality Assessment Report.* March.

National Research Council (NRC). 2012. *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future.* July.

Nolte. 2009. *Merced County General Plan Update: Qualitative Comparison of Water Supply and Demands in Merced County.* Draft. November.

Null, Sarah E., Joshua H. Viers, and Jeffery F. Mount. 2010. Hydrologic Response and Watershed Sensitivity to Climate Warming in California's Sierra Nevada. April 1.

Panoche Water District. 2014. *Water Management Plan.* March.

Patterson, City of. 2010. *City of Patterson 2010 General Plan.* November 30.

Patterson Irrigation District. 2016. *Water Management Plan/Agricultural Water Management Plan*. January 15.

Provost & Pritchard Consulting Group. 2012. *San Luis Water District 2011/2012 Water Management Plan.* December 19.

Provost & Pritchard. 2016a. *City of Los Banos 2015 Urban Water Management Plan*. July.

Provost & Pritchard. 2016b. *James Irrigation District Water Management Plan 2015*. Prepared for U.S. Bureau of Reclamation Mid-Pacific Region. August.

RMC Water and Environment. 2016. *City of Patterson 2015 Urban Water Management Plan.* June.

San Luis & Delta-Mendota Water Authority (SLDMWA). 2014. *Bringing Flows into Focus.* Summary of the Water Resources Control Board 2012 Workshops. March. San Luis & Delta-Mendota Water Authority. 2003. *Westside Integrated Resources Management Plan*. Draft. October.

State Water Resources Control Board (SWRCB). 2018. *Bay-Delta Plan Update: Lower San Joaquin River and Southern Delta.* September 4. Accessed on September 9, 2018 Available at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/bay_delta_plan/water_quality_control_planning/

Stoddard & Associates. 1999. *Westside Water Supply Gap Analysis.* Presented in the 2003 Westside Integrated Resources Management Plan.

Summers Engineering, Inc. 2018. *San Joaquin Valley Drainage Authority Westside San Joaquin River Water Quality Coalition (WSJRWC) Surface Water Quality Management Plan.* May.

United States Bureau of Reclamation (USBR). "Central Valley Project Improvement Act". Public Law 102-575.

USBR. 2005. *Public Draft, Central Valley Project, West San Joaquin Division, San Luis Unit, Long-Term Water Service Contract Renewal Environmental Impact Statement and Appendices*. September.

USBR. 2016. *Central Valley Project (CVP) Water Contractors.* March. Accessed September 5, 2018. Available at: https://www.usbr.gov/mp/cvp-water/docs/latest-water-contractors.pdf

USBR. 2017. *Delta-Mendota Canal/California Aqueduct Intertie (Intertie).* August. Accessed September 5, 2018. Available at https://www.usbr.gov/mp/intertie/index.html.

USBR. 2018. *Central Valley Project Water Supply. CVP Historical Water Allocations.* Accessed October 26, 2018 at https://www.usbr.gov/mp/cvp-water/.

United States Census Bureau. 2015. *Population Estimates Program*. Accessed February 2, 2017. Available at: www.census.gov/quickfacts.

United States Climate Change Science Program (CCSP). 2008. Weather and Climate Extremes in a Changing Climate. Regions of Focus: North American, Hawaii, Caribbean and U.S. Pacific Islands. Synthesis and Assessment Product 3.3. June.

Unites States Environmental Protection Agency (USEPA). 2012. National Water Program 2012 Strategy: Response to Climate Change. December.

USEPA. 2015. Climate Ready Water Utilities Adaptation Strategies Guide for Water Utilities. EPA 817-K-15-001. February.

USEPA. 2016. CREAT Climate Scenarios Projection Map. Data from CREAT 3.0. Interactive map available at https://epa.maps.arcgis.com/apps/MapSeries/index.html?appid=3805293158d54846a29f750d63c6890e. Last updated July 2016.

United States Geological Survey (USGS). 1971. Geology, Hydrology, and Water Quality of the Tracy-Dos Palos Area.

USGS. 2017. *Groundwater Quality in the Western San Joaquin Valley, California*. April. Available at https://pubs.usgs.gov/fs/2017/3028/fs20173028.pdf

West Stanislaus Irrigation District. 2014. *West Stanislaus Irrigation District Water Management Plan*. August.

Westlands Water District. 2012. *Water Management Plan.* April 19.

WRIME. 2007. *Upper Kings Basin Integrated Regional Water Management Plan (IRWMP)*. Prepared for Upper Kings Basin Water Forum and Kings River Conservation District. July.

San Luis & Delta-Mendota Water Authority

2019
Westside-San Joaquin Integrated Regional Water Management Plan

APPENDICES | January 2019



Prepared by:

WOODARD &CURRAN

Appendix A – Publication Records

MERCED SUN-STAR | ENTERPRISE
CHOWCHILLA NEWS | Chronicle | Atwater Signal | Vida

AFFIDAVIT OF PUBLICATION

Account #	Ad Number	Identification	PO	Cols	Lines
624948	0003686423	NOI TO WSJ IRWMP WORKSHOP KAITLIN PALYS	WSJ IRWMP WORKSHOP KAITLI	2	31

Attention:

PROVOST & PRITCHARD CONSULTING GROUP
2505 ALLUVIAL AVE
CLOVIS, CA 93611

NOTICE OF INTENT OF THE WESTSIDE-SAN JOAQUIN REGIONAL WATER MANAGEMENT GROUP TO PREPARE AN UPDATE TO THE WESTSIDE-SAN JOAQUIN INTEGRATED REGIONAL WATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that the Westside-San Joaquin Regional Water Management Group intends to prepare an update of the Westside-San Joaquin Integrated Regional Water Management Plan (WSJ IRWMP) (formerly named the Westside-San Joaquin Integrated Water Resources Plan). The WSJ IRWMP is intended to encourage collaboration among participants to integrate regional strategies for management of water resources. The WSJ IRWMP update will ensure continued compliance with the most recent State IRWM guidelines released in 2016.

All interested persons are invited to attend a public workshop scheduled from 2:00 PM to 4:00 PM on Wednesday, June 13, 2018 at the San Luis & Delta-Mendota Water Authority's Administration Office located at 842 6th Street, Los Banos, CA 93635 for the purpose of notifying and informing the public about opportunities to participate in the update of the WSJ IRWMP. This meeting is an opportunity for residents to learn about the State's IRWM Program, to see a presentation summarizing the IRWMP update process, and to learn how they can participate in the Plan Update and submit projects or comments for incorporation into the Plan. The Call for Projects will also be discussed as project solicitation will occur from approximately May 23, 2018 through July 12, 2018. Information related to the public workshop and the update of the WSJ IWRMP will be posted at the San Luis & Delta-Mendota Water Authority (SLDMWA) website: http://www.sldmwa.org/integrated-regional-water-management-plan/. If you have any questions, please call Andrew Garcia at SLDMWA (209) 832-6229 any weekday from 8:00 a.m. to 5:00 p.m.
MER- 3686423 5/30, 6/6

Declaration of Publication
2015.5 C.C.P.

STATE OF CALIFORNIA)
) ss.
County of Merced)

I am a citizen of the United States; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the principal clerk of the printer of the Merced Sun-Star, a newspaper of general circulation, printed and published in the city of Merced, County of Merced, and which newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Merced, State of California, under the date of July 14, 1964 Case Number 33224 that the notice, of which the annexed is a printed copy, has been published in each regular and entire issue of said newspaper and not in any supplement thereof on the following dates, to wit:

May 30, 2018, June 06, 2018

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Merced, California on:

Date: 6th, day of June, 2018

Cynthia A. Hitchcock

Signature

NOTICE OF PUBLIC WORKSHOP FOR THE WESTSIDE-SAN JOAQUIN REGIONAL WATER MANAGEMENT GROUP'S UPDATE TO THE WESTSIDE-SAN JOAQUIN INTEGRATED REGIONAL WATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that the public draft of the 2018 Westside-San Joaquin Integrated Regional Water Management Plan (WSJ IRWMP) is available for review. A copy of the WSJ IRWMP can be obtained on the San Luis and Delta-Mendota Water Authority's (SLDMWA) website at http://www.sldmwa.org/integrated-regional-water-management-plan/ on or after October 29, 2018. The comment period will close on December 14, 2018. To request a hard copy of the WSJ IRWMP or if you have any questions, please call Andrew Garcia at SLDMWA (209) 832-6229 any weekday from 8:00 a.m. to 5:00 p.m. Comments may be submitted electronically to Mr. Garcia at andrew.garcia@sldmwa.org.

All interested persons are invited to attend the second public workshop for the 2018 WSJ IRWMP scheduled for December 6, 2018 at 1:30 p.m. at the SLDMWA Boardroom, 842 6th St, Los Banos, CA 93635. The intent of this workshop is to enable any interested persons to learn about and participate in the review of the 2018 Draft WSJ IRWMP and to solicit comments on the draft document. This workshop is an opportunity for residents to learn about the State's IRWM Program, see a presentation summarizing the Draft WSJ IRWMP, discuss its future implementation, and provide comments. Information related to the public workshop and the update of the WSJ IRWMP will be posted at the SLDMWA website at http://www.sldmwa.org/integrated-regional-water-management-plan/. If you have any questions, please contact Andrew Garcia at SLDMWA using the information provided above.
MER- 3957976 11/21, 28

Notice of Intent to adopt the WSJ IRWMP to be inserted.

Appendix B – WSJ IRWMP Adoption Records

Adopting Resolutions to be inserted.

Appendix C – SLDMWA Member Agencies

San Luis Delta-Mendota Water Authority Member Agencies by Division

Division 1: Delta Division – Upper DMC

1) Banta-Carbona Irrigation District
2) Byron-Bethany Irrigation District
3) City of Tracy
4) Del Puerto Water District
5) Patterson Irrigation District
6) Westside Irrigation District
7) West Stanislaus Irrigation District

Division 2: San Luis Unit – SLC

8) Panoche Water District
9) Pleasant Valley Water District
10) San Luis Water District
11) Westlands Water District

Division 3: Exchange Contractors and Refuges

12) Central California Irrigation District
13) Columbia Canal Company
14) Firebaugh Canal Water District
15) Grassland Water District
16) Henry Miller Reclamation District #2131

Division 4: San Felipe Division

17) San Benito County Water District
18) Santa Clara Valley Water District

Division 5: Delta Division – Lower DMC & Mendota Pool

19) Broadview Water District
20) Eagle Field Water District
21) Fresno Slough Water District
22) James Irrigation District
23) Laguna Water District
24) Mercy Springs Water District
25) Oro Loma Water District
26) Pacheco Water District
27) Reclamation District 1606
28) Tranquillity Irrigation District
29) Turner Island Water District

Appendix D – Project Solicitation and Prioritization

Appendix D - Project Information and Prioritization

Appendix D contains materials summarizing the projects submitted during the 2018 WSJ IRWMP project solicitation period, as well as information on project prioritization and scoring.

Project Name	Responsible Agency	Project Status	Project Type	Project Description	Score
Althea Avenue Bridge Replacement	Central California Irrigation District	Ready to Proceed	Flood Management / Stormwater	The Althea Avenue bridge crosses the Delta Mendota Canal in western Fresno County. This area has been impacted by land subsidence. The replacement of the bridge is a mutual benefit to the County of Fresno the San Luis & Delta Mendota Water Authority (including its member agencies) and the general public. The proposed project will restore the flow capacity in the canal and provide safer driving conditions for the public.	Medium
Russell Avenue Bridge Replacement	Central California Irrigation District	Ready to Proceed	Flood Management / Stormwater	The Russell Avenue bridge crosses the Delta Mendota Canal in western Fresno County. This area has been impacted by land subsidence. The replacement of the bridge is a mutual benefit to the County of Fresno the San Luis & Delta Mendota Water Authority (including its member agencies) and the general public. The proposed project will restore the flow capacity in the canal and provide safer driving conditions for the public.	Medium
Del Puerto Canyon Reservoir	Del Puerto Water District	Planning	Water Supply / Demand	The Del Puerto Canyon Reservoir (DPCR) Project will construct a 270 foot tall earthfill dam at the mouth of Del Puerto Canyon providing 85000 AF of storage for Del Puerto Water District Central California Irrigation District Patterson Irrigation District and West Stanislaus Irrigation District. Water would be pumped into the DPCR from the Delta-Mendota Canal (DMC) during wet years when excess water is available and discharged back to the DMC during dry periods. Minimal seasonal storm flows through Del Puerto Canyon would be captured by the DPCR and discharged perennially to Del Puerto Creek.	High
North Valley Regional Recycled Water Program	Del Puerto Water District	Ready to Proceed	Water Supply / Demand	DPWD in cooperation with the City of Turlock is implementing the North Valley Regional Recycled Water Program (NVRRWP). The primary objective is to use recycled water from the cities for use by 1) customers within and served by DPWD and 2) South of Delta Central Valley Project Improvement Act-designated Wildlife Refuges. The project is a pipeline from Turlock's Harding Drain Bypass pipeline to the City of Modesto WPCF. At the WPCF flows from the two cities will combine and be pumped through a pipeline to the DMC which is already constructed. DPWD provides water to approximately 45000 acres of productive farmland in western San Joaquin Stanislaus and Merced Counties. DPWD's current sole source of water is from a contract with the U.S. Bureau of Reclamation which provides up to 140210 AFY of Central Valley Project (CVP) water. However DPWD's annual CVP water allocation has been significantly reduced since the 1990's sometimes receiving 0% of its allocation in recent years.	High
Orestimba Creek Recharge and Recovery Project (OCRRP)	Del Puerto Water District	Ready to Proceed	Water Supply / Demand	Phase 1 is a pilot project that includes the construction of two 10-acre ponds enlarging the existing canal to convey 10 cfs construct two (2) monitoring wells (250 feet deep) and construction of one (1) production well scheduled for construction soon. Phase 2 includes the construction of 60 acres of additional recharge ponds a diversion point out of Orestimba Creek pipelines from Orestimba Creek and the Delta-Mendota Canal to the recharge facilities and 5 recovery wells and associated appurtenances and pipelines along the project site between the DMC and the Eastin Water District boundary and along the CCID Main Canal. The project would receive flood flows from both the San Joaquin and Kings Rivers together with surface water from Orestimba Creek CCID and/or Del Puerto Water District (DPWD). The DMC as well as a proposed pipeline from Orestimba Creek would be used to convey the water to the project site.	High
Grassland Bypass Project Capacity Enlargement	Panoche Drainage District	Planning	Flood Management / Stormwater	The Grassland Bypass Project currently is limited to a capacity of 100 cfs. Storm flows in the past have exceeded this capacity resulting in the discharge of excess flows of storm water mixed with shallow drainage flows (containing salt and selenium) into wetland supply channels contaminating the water supply for private state and federal wildlife preserves. The proposed project will increase the capacity of the Grassland Bypass Channe (GBC)l to 300 cfs by enlarging the inlet and outlet connections of the system. Maximum historic storm flows are approximately 250 cfs. The project will: 1) Add a new culvert at the inlet of the GBC 2) Cleanout and enlarge the 4 mile GBC 3) Add a new culvert at the connection of the GBC to the San Luis Drain (SLD) 4) Enlarge the out of the SLD to Mud Slough North. Coordinates listed are for the inlet to the GBC.	Low

Projects submitted during Call for Projects from 5/23/2018 to 7/12/2018.

Project Name	Responsible Agency	Project Status	Project Type	Project Description	Score
Delta-Mendota Canal Subsidence & Conveyance Capacity Study	San Luis & Delta-Mendota Water Authority	Planning	Water Supply / Demand	The Delta-Mendota canal has subsided historically by varying degrees along length of the canal. . Subsidence of an intermediate section of the DMC reduces the ability of the canal to deliver water to water agencies in and below the affected area. Resolution of this subsidence problem is a subset of future capacity correction if necessary. It is assumed that the DMC could have restricted flow capacity due to subsidence and the reduction in capacity must be determined. Restricted flow capability has water delivery and economic impacts. - The subsidence and conveyance capacity study would take place along the entire length of the Delta-Mendota Canal. - The Delta-Mendota Subbasin area including the Water Authority its member agencies along with a large portion of the 23 Groundwater Sustainability Agencies in the area will be affected. - The resources within the project boundary is CVP allocated water and other water deliveries. - No potential obstacle to limitation besides budget	Low
Delta-Mendota Canal Turnout Flowmetering Improvement Pilot Program	San Luis & Delta-Mendota Water Authority	Ready to Proceed	Water Supply / Demand	Because of the current inability to accurately measure water usage through each of the turnouts along the DMC there are water losses at each of these turnouts meaning water is being over-delivered. Farmers are receiving more than allotted and more than they are paying for. The water conserved through this project will either increase allocation to south of delta ad service contractors or kept in storage at the San Luis Reservoir. New flow meter will be installed in 10 turnouts along the DMC. Each new flow meter will be equipped with a data logger capable of transmitting data through a cell phone line giving near real time water usage. Data will be received electronically on a daily basis and be immediately available for water accounting. Remote data retrieval will save man hours and eliminate the possibility of human error and improve accuracy of measurements taken. Ultimately this project will reduce losses in the Delta Mendota Canal System.	Medium
Groundwater Monitoring Program: Multi-Well Aquifer Monitoring	San Luis & Delta-Mendota Water Authority	Planning	Non-Infrastructure	The monitoring sites will be constructed using the mud-rotary method and will be completed to a depth of about 500 fett below land surface. During the drilling operation cores will be collected in each borehole in the Corcoran clay and in other major clay units. After the Borehole has been drilled at each site it will be completed with three 2-inch diameter PVC piezometers. One piezometer will be installed at the water table a second installed in the aquifer system above the Corcoran Clay and a third piezometer will be installed in the aquifer system below the Corcoran Clay. A hydrologist should be onsite during the entire construction process to analyze and long the drill cuttings interpret the borehole geophysical logs and provide the final monitoring-site design. The USGS recommends that pressure transducers be installed in each piezometer to electronically measure hourly water-level changes at the site.	Medium
Kaljian Drainwater Reuse Project	San Luis Water District	Planning	Water Supply / Demand	The Project is located within the San Luis Water District approx. 9 miles south of the City of Los Banos. Within Project proximity are the Kaljian System; Charleston Drainage District comprised of the Charleston and A-Bar Drainage Ditches; San Luis Canal; Delta-Mendota Canal; and Pacheco Lift Canal. Project improvements include: re-grading and/or installing lift pumps within the drainage ditches; construction of a turnout and pipeline; modification of the Kaljian pump structure; restoration of the Fitji and Kaljian pump stations Kaljian pipeline and 1st Lift Canal. The Project will reclaim drain water from the Charleston Drainage District for blending and permit conveyance of other supplies for beneficial use. Project will augment the District's supply and increase reliability enable the conveyance of flood water for beneficial use reduce poor quality drain water discharges to the San Joaquin River (SJR) system and free up capacity in the SJR Water Quality Improvement Project.	Medium

Projects submitted during Call for Projects from 5/23/2018 to 7/12/2018.

Project Name	Responsible Agency	Project Status	Project Type	Project Description	Score
Los Banos Creek Recharge and Recovery	San Luis Water District	Under Design	Water Supply / Demand	The Los Banos Creek Recharge and Recovery Project is located in and adjacent to Los Banos Creek (LBC) south of Los Banos between the San Luis Canal and Central California Irrigation District's (CCID) Outside Canal. The project proposes to develop a recharge basin convert three rock quarry pits to temporary storage/recharge basins construct 3 storage recovery sump pumps construct 6 shallow groundwater recovery wells a bridge crossing of Los Banos Creek and a weir located just downstream of the outside canal. Project flood and surplus irrigation supply would be perked and temporarily stored in the pits/basin for beneficial use and flood mitigation purposes. Project beneficiaries include San Luis Water District CCID Grassland Water District regional groundwater users including the City of Los Banos Delta-Mendota SubBasin's SGMA GSAs. Water resources within the project boundaries include the Delta-Mendota Canal Los Banos Creek and CCID's outside canal.	High
Little Salado Creek Groundwater Recharge and Flood Control Basin	Stanislaus County	Under Design	Water Supply / Demand	Construction of a stormwater detention basin to partially divert retain and percolate up to 270 cubic feet per second (cfs) of flow from Little Salado Creek. This basin will be located in the future Crows Landing Industrial Business Park and will have a capacity of 380 acre-feet.	Medium
Terra Linda River Ranch Recharge Project	TBD--likely Southern DM GSA	Under Design	Water Supply / Demand	The project consists of a percolation basin located south of the Mendota Pool and adjacent to the Fresno Slough. The basin will be enclosed by earthen berms. Diversion structures from Fresno Slough are already in place. Flood waters from the Kings River will be delivered via the Fresno Slough. The land is currently farmed so environmental impacts will be minimal. The project will supplement efforts of the Southern DM GSA ("the GSA") to achieve groundwater sustainability. The GSA is the most likely public partner for the project. The project proponent is the majority landowner within "Management Area B" of the GSA. The project has been discussed with County/GSA staff but no determination has been made as to the degree of public participation at this time. The project will decrease groundwater salinity levels and can be managed to benefit domestic wells/City of Mendota. Project can also be managed as habitat for giant garter snake.	High
West Stanislaus Irrigation District Fish Screen Project	West Stanislaus Irrigation District	Ready to Proceed	Water Supply / Demand	The Proposed Project/Action consists of the following elements which are described in more detail below: (1) cone screens located at the mouth of the existing intake canal; (2) a low-lift pump station at the same location; (3) approximately 2100 feet of underground pipeline from the proposed pump station to the intake canal; (4) sediment removal and management along the length of the intake canal; (5) upgrading of existing roads along the intake canal; (6) two wildlife crossings of the intake canal one of which would also allow flood conveyance; (7) facilities for providing late fall-water deliveries to the Refuge; and (8) a flood connectivity structure to support the USFWS's management of the Refuge for floodplain reconnection; WSID will not operate the spillway structure as part of this project. The project footprint measures approximately 26.7 acres with an additional approximately 57.8 acres within areas designated operations and access routes.	High
West Stanislaus Irrigation District Pumping Plant 3 & 4 Modernization	West Stanislaus Irrigation District	Planning	Water Supply / Demand	This project would replace 95 year old existing pumps pump impellors and motors. There are a total of thirteen 250 HP units that will be replaced. This project would also improve hydraulic inefficiencies replace leaking discharge lines and incorporate SCADA for automatic control of the pumping plant.	Medium
Aquifer Storage and Recovery Project	Westlands Water District	Under Design	Water Supply / Demand	The proposed Aquifer Storage and Recovery (ASR) program will allow for temporary storage in the Westside Subbasin's aquifers. The District's ASR program consists of obtaining a permit from the Regional Water Quality Control Board and developing an on-farm operations plan and rehabilitating/retrofitting wells. The ASR program will target wells where the Corcoran Clay Layer is present and will provide up to 100,000 AF in aquifer storage South of the Delta. Operations includes injecting filtered surface water into the upper and lower aquifers for storage which is later recovered for use. Proposed water types include capturing flood flows and water types at risk for spill in the San Luis Reservoir.	Medium

Project Name	Responsible Agency	Project Status	Project Type	Project Description	Score
Broadview Water District Drainage Water Treatment Project	Westlands Water District	Planning	Water Supply / Demand	This pilot project is being conducted in cooperation with a Westlands water user. The pilot project will extract groundwater from the Upper Aquifer using a private well and the water will be treated to remove dissolved solids from the product water. The goal is to produce product water with a total dissolved solids concentration equivalent to the water quality in the San Luis Canal. The water user will pump the product water into Lateral 7, and use the treated reject water to grow Jose Tall Wheat Grass on District owned land. The pilot project will not only evaluate the costs of treating Upper Aquifer groundwater, but also the feasibility of using District owned land to manage the treated reject water. In addition to the water supply benefits, this project will also track the reduction in shallow groundwater levels around the groundwater well and Jose Tall Wheat grass.	Medium
Cantua Creek Groundwater Replenishment Project	Westlands Water District	Planning	Water Supply / Demand	Westlands Water District (WWD) is proposing the Cantua Creek Groundwater Replenishment Project, proposed location is north of Mt. Whitney Avenue and .75 miles west of Derrick Avenue. The Project consists of an approximately 20-acre recharge basin, conveyance, and a groundwater well to recover the stored water as needed. Based on the soil types and nearby infiltration tests groundwater recharge is favorable. The recharge basin will convey and store excess flood flows which are available approximately every 4 or 5 years surplus water and any other type of eligible water available from local water conveyance facilities. This project will provide regional benefits, reduce groundwater overdraft, and enhance WWD's groundwater sustainability effort.	Medium
Crescent Canal Project	Westlands Water District	Planning	Water Supply / Demand	Westlands Water District (WWD) is proposing the Crescent Canal Project (Project) to enhance water supply reliability of WWD. The Crescent Canal is 22 miles long, and flows northwest from the Main Diversion off the Kings River. The purpose of the Project is to capture flood flows from the Kings River via the Crescent Canal and deliver flood flows in WWD to meet demands. The proposed Project improvements include Crescent Canal banks and structure, modifications, pipelines connecting the Crescent Canal to the WWD laterals, and construction of up to four reservoirs in WWD. The proposed Project will improve Crescent Canal's capacity to 330 cfs provide 15,500 AF in storage and results in average water supply of up to 13,500 AF.	Medium
Lateral 13 Intertie Project	Westlands Water District	Under Design	Water Supply / Demand	Westlands Water District's (WWD) Lateral 13 Intertie Project (Project) connects Lateral 13 to the Tranquility Irrigation District's (TID) Slough Canal for water supply reliability. WWD is proposing to convey transfers (up to 8,500 AF) from TID via the Project. The Lateral 13 Intertie is located at the intersection of Dinuba Avenue and Amador Avenue. The proposed pipeline intertie would connect TID with two sub laterals on WWD's Lateral 13 which are located 1 mile and 1.5 miles west of TID. The Project includes a third pipeline connection from WWD's Lateral 13 to 14 to increase operational flexibility of the Project. Replacement of TID's Lift Station #5, addition of a new tank, and two new booster pumps within Lateral 13 conveyance system are required to implement the proposed project effective and sustainable.	Medium
Lateral Inter-Connection Project	Westlands Water District	Under Design	Water Supply / Demand	Westlands Water District (WWD) is proposing the Lateral Inter-Connection project which connects laterals 4, 5, and 6 to achieve a higher efficiency distribution system for the area meet water demands and provide operational flexibility. Laterals 4, 5, and 6 run along North Ave Central Ave and American Ave respectively. The proposed interconnection Project consists of upgrading PP6-2 to reverse flow into the San Luis Canal and of two pipelines parallel to San Bernardino Ave connecting to Laterals 4 and 6 and Washoe Ave connecting all three laterals.	Medium
Panoche Creek Groundwater Replenishment Project	Westlands Water District	Planning	Water Supply / Demand	Westlands Water District (WWD) is proposing the Panoche Creek Groundwater Replenishment Project, proposed location is north of Mountain View Avenue and east of Newcomb Avenue. The project consists of a recharge basin conveyance, and a groundwater well to recover the stored water, as needed. Based on the soil types and nearby infiltration tests groundwater recharge is favorable in the area. The proposed project consists of conveying excess flood flows which are all available approximately every 4-5 years surplus water and any other type of eligible water available from local water conveyance facilities to a proposed recharge basin that will percolate into the groundwater aquifers for future use. This project will provide regional benefits, reduce groundwater overdraft, and enhance WWD's groundwater sustainability effort.	Medium

Project Name	Responsible Agency	Project Status	Project Type	Project Description	Score
Pasajero Groundwater Replenishment Project	Westlands Water District	Planning	Water Supply / Demand	Westlands Water District (WWD) is proposing the Pasajero Groundwater Replenishment Project, located near the city of Coalinga just north of Los Gatos Creek. The project location is 1.75 miles north of W. Jayne Avenue and .5 miles west of Interstate-5. The project is located on District owned land in the Los Gatos Creek watershed also known the Arroyo Pasajero. The project consists of a 60-acre recharge basin, conveyance, and a groundwater well to recover the stored water, as needed. Based on the soil types and nearby infiltration tests the Pasajero Groundwater Replenishment Project capacity is up to 10800 Acre-feet(AF) over a 6-month period. The recharge basin will store excess flood flows which are available approximately every 4-5 years surplus water and any other type of eligible water available. Giving WWD a reliable water source for drought resiliency. This project will provide regional benefits, reduce groundwater overdraft, and enhance WWD's groundwater sustainability effort.	Medium
Pumping Plant 7-1 Variable Frequency Drive Project	Westlands Water District	Ready to Proceed	Water Supply / Demand	Westlands Water District (WWD) is proposing the Pumping Plant 7-1 (PP7-1) VFD Improvement Project to improves energy and water use efficiencies during the low flow conveyance. The project site is located on Adams Avenue approximately 2.5 miles east of Highway 33 in Fresno County. PP7-1 currently has four 25 cubic feet per second (cfs) pumps. When demands are less than the 25 cfs pumped water is recirculated back to the channel with a modulating globe valve that regulate discharge into Lateral 7 resulting an inefficient use of energy. To improve the low flow conveyance WWD proposes to install a new 350 hp Low Flow pump (2 to 13 cfs) 2300-volt variable-frequency drive switchgear main metering and motor control center system to increase low flow efficiency. This improvement will yield a lower operational cost and energy usage.	High
Conceptual Projects					
Lift Canal Rehabilitation Project	Banta-Carbona Irrigation District	Conceptual	Water Supply / Demand	The Banta-Carbona Irrigation District (BCID) is situated south of the Delta between the San Joaquin River and the Delta Mendota Canal and is located entirely within San Joaquin County. BCID's northern boundary is near the City of Tracy and the southern boundary is on the San Joaquin-Stanislaus County line near the community of Vernalis. BCID delivers San Joaquin River water for agricultural purposes to lands west of the San Joaquin River. The concept explores the feasibility of replacing BCID's aging lift canal including its seven main line pumping plants with a 400 cfs pipeline and a single pump station located just downstream of BCID's Fish Screen on the San Joaquin River. This project would extend the full capacity of the proposed 400 cfs pipeline to the Delta-Mendota Canal.	N/A
Newman LID Water Quality and Conservation Project	City of Newman	Conceptual	Flood Management / Stormwater	The City of Newman has acquired and is proposing to develop 103 acres located near E. Inyo and Canal School Road to treat storm water agricultural tail water and urban water runoff such as nuisance water from parks and landscaped areas through a Low Impact Development (LID). The City plans to develop 78 acres for water treatment implementing LID applications such as vegetated swales constructed wetlands and bio retention basins. The project will include a trail system with educational signs for LID application. The remaining 25 acres will be used for the storage of the treated water which can be used for irrigation of city land maximizing groundwater recharge and water conservation by recycling and reusing treated water. The project will reduce discharge of sediment/pollutants; improve the quality of urban water runoff; re-use treated water for irrigation; and provide an attractive recreational area for use by residents with the added benefit of creating a natural habitat	N/A
Salado Creek Flood Management and Repair Project	City of Patterson	Conceptual	Flood Management / Stormwater	Widening of Salado Creek from the Delta Mendota Canal to the city limits and repair creek from damaged obtained during flood in February 2017. Prior to the February 2017 damage the original scope read: Widening of Salado Creek from Delta Mendota Canal (DMC) to the City Limits. Involves widening of Salado Creek from the Delta Mendota Canal (DMC) to the City limits which is approximately 6000 feet in length. The width of Salado Creek would be widened to accommodate 710 cubic feet per second to match the City's Storm Dain Master Plan sizing requirements. Additionally the project would also limit the DMC to the City Limits.	N/A
Salado Creek Landscape and Pedestrian Path Project	City of Patterson	Conceptual	Flood Management / Stormwater	Salado Creek Landscape and Pedestrian Path Project-This project involves revising the landscaping along the creek to reduce water consumption and introduce Non-potable water for irrigation. (The purpose of the landscaping is to help prevent overgrowth provide rodent control provide aesthetics incorporate LID to help with water quality flood control).	N/A

Projects submitted during Call for Projects from 5/23/2018 to 7/12/2018.

Project Name	Responsible Agency	Project Status	Project Type	Project Description	Score
Patterson Wellhead Treatment	City of Patterson	Conceptual	Water Supply / Demand	Although the MCL has since been rescinded it is anticipated the SWRCB will approve a new MCL for Chromium 6. If this occurs all seven of the city's potable wells would be out of compliance. This project would provide wellhead treatment for all of the system's seven (7) wells with either RCF SBA or WBA technology. A feasibility study was conducted as part of the city's Corrective Action Plan (CAV).	N/A
Storm Drainage Enhancements along Salado Creek	City of Patterson	Conceptual	Flood Management / Stormwater	Installation of reinforced pipeline under the California Northern Railroad wooden bridge to improve storm drainage flooding and water quality along Salado Creek. The inlet structure of the 96 Cured in Place Pipe (CIPP) just downstream of the California Northern Railroad (CNRR) wooden bridge has a limited capacity and includes a debris collection grate at the pipe inlet that is too small. These conditions contribute to frequent flooding within and upstream of this area and prevent the available capacity into the 96" CIPP from being fully utilized. The inlet structure needs to be enlarged at this location to reduce flooding and opt provide discharge capacity."	N/A
Percolation Ponds for Stormwater Capture and Recharge	City of Patterson	Conceptual	Flood Management / Stormwater	PP-1 Construct percolation ponds to capture and infiltrate storm water from Del Puerto Creek. The ponds should cover roughly 14 acres. Sizing of the percolation ponds was based on existing infiltration rate data and will be updated when field investigations are complete. The percolation pond project can be phased so that the ponds are constructed over a few years allowing for the increase of aquifer recharge capacity.	N/A
New Tertiary Filtration System at WQCF	City of Patterson	Conceptual	Water Supply / Demand	Construct a new tertiary filtration system at the WQCF to produce Title 22 compliant recycled water. This train will divert a portion of the total WQCF flow (roughly 1.5 MGD) for additional treatment and distribution through the city's non-potable system.	N/A
South Side Reservoir Pump Relocation	Patterson Irrigation District	Conceptual	Water Supply / Demand	Patterson Irrigation District (PID) has an existing recirculation system that captures tailwater agricultural drainage water and operational fluctuations and diverts it into their South Side Reservoir (SSR). This project will relocate the pump station from upstream of the SSR to inside the SSR and raise the embankment of the SSR by 1.5 feet. Raising the embankments of the SSR by 1.5 feet will increase its storage capacity by approximately 20 acre-feet to an approximate total storage of 65 acre-feet. This will allow for approximately 45 cfs of storm and flood water to be diverted off the San Joaquin River and stored for later use in the SSR. This water can be routed through the District's existing recirculation system and into the (SSR) for beneficial use as needed. Water stored in the SSR can be conveyed to meet demands in Laterals 2S 3S and 4S as opposed to just the lowest regions of 3S.	N/A
PID Groundwater Bank Phase 1 - Feasibility	Patterson Irrigation District	Conceptual	Non-Infrastructure	Patterson Irrigation District wants to conduct a District-wide conceptual level feasibility study to evaluate if a groundwater bank is a viable option to pursue. Phase 1 of this project is the feasibility study. If it is determined that a groundwater banking project is feasible Phase 2 will involve the design and construction of the groundwater bank. A groundwater bank project could provide many benefits to Patterson ID and the surrounding regions. The project can: provide for more reliable water supply south of the Delta improve regional self-reliance for water promote the needs of the disadvantaged community of Patterson maximize the utility of regional aquifers while improving sustainability minimize the impacts of significant storm events capture stormwater for higher beneficial use protect and enhance the quality of water supply increase operational flexibility and enhance water conservation water use efficiency and sustainable water use.	N/A
PID Groundwater Bank Phase 2 - Design and Construction	Patterson Irrigation District	Conceptual	Water Supply / Demand	Patterson Irrigation District wants to conduct a District-wide conceptual level feasibility study to evaluate if a groundwater bank is a viable option to pursue. If it is determined that a groundwater banking project is feasible in Phase 1 Phase 2 will involve the design and construction of the groundwater bank. A groundwater bank project could provide many benefits to Patterson ID and the surrounding regions. The project could: provide for more reliable water supply south of the Delta improve regional self-reliance for water promote the needs of the disadvantaged community of Patterson maximize the utility of regional aquifers while improving sustainability minimize the impacts of significant storm events capture stormwater for higher beneficial use protect and enhance the quality of water supply increase operational flexibility and enhance water conservation water use efficiency and sustainable water use.	

Projects submitted during Call for Projects from 5/23/2018 to 7/12/2018.

Project Name	Responsible Agency	Project Status	Project Type	Project Description	Score
Technical Assistance Project	San Luis & Delta-Mendota Water Authority	Conceptual	Non-Infrastructure	The Technical Assistance Project will be submitted for Category 1 funding for the Delta-Mendota Subbasin. The proposed work plan associated with the project include activities that serve and directly benefit Severely Disadvantaged Communities (SDACs) and are related to the planning and development of the six Groundwater Sustainability (Plans) GSPs for the Subbasin. The Technical Assistance Project will create a technical assistance fund accessible by SDACs to support active participation in regional groundwater sustainability planning efforts leading to a more inclusive and effective stakeholder engagement process. This project will provide direct funding SDAC community members to participate in GSP development activities and/or to hire a consultant with the sole purpose of representing their interests.	
Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal - Phase 1.1. Prefeasibility Analysis	San Luis & Delta-Mendota Water Authority	Conceptual	Water Supply / Demand	Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal: Development of pumping facilities to enable reverse flowing of the DMC and inter-connecting the CCID Outside and Main Canals to the DMC to convey flood water from the Mendota Pool to the San Luis Reservoir for storage and/or direct use or exchange. An analysis was made of up to 1000 cfs reverse flow in the DMC and 500 cfs of connections from CCID's system to the DMC. Wet year deliveries could reach over 200000 acre-feet with an average annual amount of 68000 acre-feet when combined with CCID Intertie. The estimated average annual yield is 68000 AF/yr at capital cost of $200 Million (USBR Cost Basis). (costs are 2013 and need to be brought up to 2018). Phase 1: Prefeasability Analysis: A potential upstream and downstream impacts analysis is needed to better understand the impacts to water rights holders and potential water rights holders.	N/A
Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal - Phase 2. CCID Outside Canal s/o Check 14	San Luis & Delta-Mendota Water Authority	Conceptual	Water Supply / Demand	Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal: Development of pumping facilities to enable reverse flowing of the DMC and inter-connecting the CCID Outside and Main Canals to the DMC to convey flood water from the Mendota Pool to the San Luis Reservoir for storage and/or direct use or exchange. An analysis was made of up to 1000 cfs reverse flow in the DMC and 500 cfs of connections from CCID's system to the DMC. Wet year deliveries could reach over 200000 acre-feet with an average annual amount of 68000 acre-feet when combined with CCID Intertie. The estimated average annual yield is 68000 AF/yr at capital cost of $200 Million (USBR Cost Basis). (costs are 2013 and need to be brought up to 2018) Phase 2. CCID Outside Canal South of Check 14: This phase is related to the CCID Outside Canal (South of Check 14) activities' contribution to the total Project.	N/A
Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal - Phase 3. DMC Pumpback	San Luis & Delta-Mendota Water Authority	Conceptual	Water Supply / Demand	Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal (DMC): Development of pumping facilities to enable reverse flowing of the DMC and inter-connecting the CCID Outside and Main Canals to the DMC to convey flood water from the Mendota Pool to the San Luis Reservoir for storage and/or direct use or exchange. An analysis was made of up to 1000 cfs reverse flow in the DMC and 500 cfs of connections from CCIDÃ¢â‚¬â„¢s system to the DMC. Wet year deliveries could reach over 200000 acre-feet with an average annual amount of 68000 acre-feet when combined with CCID Intertie. The estimated average annual yield is 68000 AF/yr at capital cost of $200 Million (USBR Cost Basis). (costs are 2013 and need to be brought up to 2018) Phase 3. DMC Pumping - is related to the pump back activities along the DMC component of the Project.	N/A

Project Name	Responsible Agency	Project Status	Project Type	Project Description	Score
Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal - Phase 1.2. Pilot Project	San Luis & Delta-Mendota Water Authority	Conceptual	Water Supply / Demand	Floodwater Utilization by Reverse Flow of the Delta-Mendota Canal: Development of pumping facilities to enable reverse flowing of the DMC and inter-connecting the CCID Outside and Main Canals to the DMC to convey flood water from the Mendota Pool to the San Luis Reservoir for storage and/or direct use or exchange. An analysis was made of up to 1000 cfs reverse flow in the DMC and 500 cfs of connections from CCID's system to the DMC. Wet year deliveries could reach over 200000 acre-feet with an average annual amount of 68000 acre-feet when combined with CCID Intertie. The estimated average annual yield is 68000 AF/yr at capital cost of $200 Million (USBR Cost Basis). (costs are 2013 and need to be brought up to 2018) Phase 1.5 involves a Pilot Project with temporary pumps at 4 checks to convey floodwaters to the O'Neil Forebay.	N/A
Generic Data Management System Framework and Santa Nella County Water District Data Management System Project	Santa Nella Water District with Assistance from San Luis & Delta-Mendota Water Authority	Conceptual	Non-Infrastructure	The Generic Data Management System Framework and Santa Nella County Water District Data Management System Project grant proposal is developed for Category 1 funding in the Delta-Mendota Subbasin. The proposed work plan includes activities that serve and directly benefit Severely Disadvantaged Communities (SDACs) and are related to the Westside San-Joaquin IRWM Region. The Project includes the development of a data management system and operations and maintenance of this system to better assist monitoring and management of efforts associated with GSP efforts. The project provides financial assistance to SDACs that would otherwise not have the resources to fully maintain and contribute to the data management system.	N/A
West Stanislaus Irrigation District Lateral 4-North Recapture and Recirculation Reservoir	West Stanislaus Irrigation District	Conceptual	Water Supply / Demand	This project consists of purchasing a 7 acre parcel currently not in agricultural production or any other production. A reservoir would be design for construction on the parcel. The reservoir would collect operational spill from two distribution laterals and irrigation tailwater and stored for reliable use downstream. Estimated recapture amounts is roughly 1800 AF. This project would also provide flexible water delivery service to users during time of drought or in times of capacity constraints. The project will also improve water quality to downstream users because the water collected would mostly come from Delta-Mendota Canal deliveries and mix with water coming from the San Joaquin River usually of lesser quality than Delta-Mendota Canal water.	N/A

	Step 1: Eligibility Check				Step 2: Evaluation													
Project Title	Project is located in Region/ has benefits within Region	Project meets Regional Objective	Project meets Statewide Priority	Project meets at least 2 RMS	1: Contribution to Plan Objectives	2: Relation to RMS	3: Technical Feasibility	4: Benefits to DACs	5: Benefits to Native American Tribal Communities	6: Environmental Justice Considerations	7: Costs and Financing (Local Funding Match)	8: Economic Feasibility	9: Project Status	10: IRWMP Implementation (Regional/ Interagency Project)	11: Climate Change Adaptation	12: Climate Change Mitigation	13: Plan Adoption	Overall Project Score[1]
Althea Avenue Bridge Replacement	✓	✓	✓	✓	Medium	Low	High	Low	Low	Medium	High	Low	High	High	Medium	Low	High	Medium
Aquifer Storage and Recovery Project	✓	✓	✓	✓	Medium	Medium	High	Low	Low	Medium	Medium	Medium	Medium	Medium	High	Medium	High	Medium
Broadview Water District Drainage Water Treatment Project	✓	✓	✓	✓	Medium	Low	High	Low	Low	Medium	Low	Low	Low	Medium	Medium	Low	High	Medium
Cantua Creek Groundwater Replenishment Project	✓	✓	✓	✓	High	Medium	High	Low	Low	Medium	Low	Medium	Low	Medium	High	Low	High	Medium
Crescent Canal Project	✓	✓	✓	✓	Medium	Low	High	Low	Low	Medium	Low	Low	Low	Medium	High	Low	High	Medium
Del Puerto Canyon Reservoir	✓	✓	✓	✓	High	High	High	Low	Low	Medium	Medium	Low	Low	High	High	Low	High	High
Delta-Mendota Canal Subsidence & Conveyance Capacity Study	✓	✓	✓	✓	Medium	Low	Medium	Low	Low	Medium	Medium	Medium	Low	Medium	Medium	Low	High	Low
Delta-Mendota Canal Turnout Flowmetering Improvement Pilot Program	✓	✓	✓	✓	Medium	Low	High	Low	Low	High	Low	Medium	High	Medium	Medium	Low	High	Medium
Grassland Bypass Project Capacity Enlargement	✓	✓	✓	✓	Medium	Medium	Medium	Low	Low	Medium	Medium	Low	Low	Medium	Medium	Low	High	Low
Groundwater Monitoring Program: Multi-Well Aquifer Monitoring	✓	✓	✓	✓	Medium	Medium	High	Medium	Low	High	Medium	Medium	Low	Medium	High	Medium	High	Medium
Kaljian Drainwater Reuse Project	✓	✓	✓	✓	High	Medium	High	Low	Low	Medium	Medium	Low	Low	Medium	High	Low	High	Medium
Lateral 13 Intertie Project	✓	✓	✓	✓	Medium	Low	High	Low	Low	Medium	Low	Low	Medium	Medium	High	Low	High	Medium
Lateral Inter-Connection Project	✓	✓	✓	✓	Medium	Low	High	Low	Low	Medium	Medium	Low	Medium	Medium	High	Low	High	Medium
Little Salado Creek Groundwater Recharge and Flood Control Basin	✓	✓	✓	✓	High	High	High	Low	Low	Medium	Low	Medium	Medium	Medium	Medium	Low	High	Medium
Los Banos Creek Recharge and Recovery	✓	✓	✓	✓	High	Medium	High	Low	Low	Medium	High	Low	Medium	High	High	High	High	High
North Valley Regional Recycled Water Program	✓	✓	✓	✓	High	Low	High	High	Low	High	High	Low	High	High	Medium	Low	High	High
Orestimba Creek Recharge and Recovery Project (OCRRP)	✓	✓	✓	✓	High	High	High	Low	Low	Medium	Medium	Medium	High	High	High	Low	High	High
Panoche Creek Groundwater Replenishment Project	✓	✓	✓	✓	High	Medium	High	Low	Low	Medium	Low	Medium	Low	Medium	High	Low	High	Medium
Pasajero Groundwater Replenishment Project	✓	✓	✓	✓	High	Medium	High	Medium	Low	Medium	High	Medium	Medium	Medium	High	Low	High	Medium
Pumping Plant 7-1 Variable Frequency Drive Project	✓	✓	✓	✓	Medium	Low	High	Low	Low	High	High	Low	High	Medium	High	Medium	High	High
Russell Avenue Bridge Replacement	✓	✓	✓	✓	Medium	Low	High	Low	Low	Medium	High	Low	High	High	Medium	Low	High	Medium
Terra Linda River Ranch Recharge Project	✓	✓	✓	✓	High	Medium	High	High	Low	High	High	Medium	Medium	High	Medium	Low	High	High
West Stanislaus Irrigation District Fish Screen Project	✓	✓	✓	✓	High	High	High	Medium	Low	High	Medium	Medium	High	Medium	Medium	Medium	High	High
West Stanislaus Irrigation District Pumping Plant 3 & 4 Modernization	✓	✓	✓	✓	High	Low	High	High	Low	Medium	High	Medium	Medium	Medium	Low	Medium	High	Medium

1. The project prioritization method awarded a score of Low for projects with 0-2 High scores in Step 2, a score of Medium for projects with 3-5 High scores in Step 2, and a score of High for projects with 6 or more High scores in Step 2.

Projects submitted during Call for Projects from 5/23/2018 to 7/12/2018.

Westside-San Joaquin Project Prioritization Methodology

Step 1: Eligibility Check

Eligibility Requirements	
✓	Project is located within the Westside-San Joaquin Region
✓	Project meets at least one Regional objective
✓	Project fulfills at least one Statewide Priority
✓	Project fulfills at least two Resource Management Strategies

Step 2: Evaluation

Criterion 1: Contribution to Plan Objectives	
High	Project received 45 or more points
Medium	Project received 11-44 points
Low	Project received 10 or fewer points

Criterion 1 Score Calculation Detail

The 14 WSJ IRWMP Objectives are ranked in order of priority. Each objective has a point value according to its priority level – Objective A is worth 14 points, Objective B is worth 13 points, etc. For every objective met, a project would receive the corresponding number of points. The total number of points then translates to a score of High, Medium, or Low as shown above.

Criterion 2: Relation to Resource Management Strategies (RMS)	
High	Project addresses 9 or more strategies
Medium	Project addresses 5 to 8 strategies
Low	Project addresses 0 to 4 strategies

Criterion 3: Technical Feasibility	
High	Documents exist demonstrating the technical feasibility of the project (feasibility study)
Medium	The project is of a type that is generally technically feasible
Low	No information provided

Criterion 4: Benefits to Disadvantaged Community (DAC) Water Issues	
High	Project provides direct benefits to DACs
Medium	Project provides indirect benefits to DACs
Low	No benefits to DACs

Criterion 5: Benefits to Native American Tribal Communities	
High	Project provides direct benefits to Native American Tribal Communities
Medium	Project provides indirect benefits to Native American Tribal Communities
Low	No benefits to Native American Tribal Communities

Criterion 6: Environmental Justice (EJ) Considerations	
High	Project will not have EJ impacts
Medium	Project's EJ impacts are uncertain
Low	Project will have EJ impacts

Criterion 7: Project Costs and Financing (relative to local funding match)	
High	Local funding match has been secured/Match not Required (DAC or SDAC project)
Medium	Potential source of local funding match has been identified
Low	Potential source of local funding match has not been identified

Criterion 8: Economic Feasibility	
High	Benefit:cost ratio is greater than 2
Medium	Benefit:cost ratio is between 1 and 2
Low	Benefit:cost ratio is less than 1

Criterion 8 Score Calculation Detail
Benefit:cost (B:C) Ratio scores are calculated by dividing the benefit score by the cost score. The benefit and cost scores are assigned as follows:

Benefit: The benefit score will be determined based on the total points scored by the project in the other categories. Benefit scores will be assigned based on the project score as follows:

Number of Objectives Met	Benefit Score
Project addresses 9 to 12 objectives	3
Project addresses 5 to 8 objectives	2
Project addresses 0 to 4 objectives	1

Cost: Present value (PV) cost of project will be calculated based on the capital cost, annual O&M cost (assumed to be 10% of total construction cost unless otherwise provided), and project lifespan, using a 6% discount rate (per DWR's Economic Analysis Handbook). Cost scores will be assigned based on the PV cost as follows:

PV Cost	Cost Score
<= $2 million	1
> $2 million, <= $20 million	2
> $20 million	3

Criterion 9: Project Status	
High	Project status is listed as Ready to Proceed
Medium	Project status is listed as Under Design
Low	Project status is listed as Planning or Conceptual
Note: DAC projects are exempt from this criterion and will automatically receive a Medium score if they are not considered ready to proceed.	

Criterion 10: Strategic Consideration for IRWM Plan Implementation	
High	Project provides benefits on a regional scale and involves multiple agencies or community groups
Medium	Project provides benefits on a regional scale or involves multiple agencies or community groups

Low	Project does not provide benefits on a regional scale nor involve multiple agencies or community groups

Criterion 11: Climate Change Adaptation	
High	Project addresses 2 or 3 climate change adaptation questions
Medium	Project addresses 1 climate change adaptation question
Low	Project addresses 0 climate change adaptation questions

Criterion 12: Reducing GHG Emission as Compared to Project Alternatives	
High	Project addresses all 3 climate change mitigation questions
Medium	Project addresses 1 or 2 climate change mitigation questions
Low	Project addresses no climate change mitigation questions

Criterion 13: Plan Adoption	
High	Project sponsor will adopt Westside-San Joaquin IRWMP
Medium	Project sponsor may adopt Westside-San Joaquin IRWMP
Low	Project sponsor will not adopt Westside-San Joaquin IRMWP

Step 3: Prioritize Projects

Overall Project Prioritization	
High	Project received 6 or more “Highs” in Step 2
Medium	Project received 2 to 5 “Highs” in Step 2
Low	Project received 0 or 1 “Highs” in Step 2

		Output from Opti		Overall Project Score
Non-Concept Projects	**Project Proponent**	**Project addresses critical water supply and water quality needs of DACs?**	**Explanation (required if "Yes," optional if "No"):**	
Althea Avenue Bridge Replacement	Central California Irrigation District	Yes	The Althea Avenue bridge crosses the Delta Mendota Canal in western Fresno County. This area has been impacted by land subsidence. The replacement of the bridge is a mutual benefit to the County of Fresno the San Luis & Delta Mendota Water Authority (including its member agencies) and the general public. The proposed project will restore the flow capacity in the canal and provide safer driving conditions for the public including Disadvantaged Communities that are within CCID and SLDMWA .	Medium
North Valley Regional Recycled Water Program	Del Puerto Water District	Yes	The ongoing drought and reduced CVP allocations have created a water crisis in the area to be served by the NVRRWP. DPWD provides irrigation water to approximately 45000 acres of highly productive farmland in Stanislaus San Joaquin and Merced Counties. As a south of the Sacramento-San Joaquin Delta user DPWD has experienced significant shortages and decreased reliability in the quantity of CVP water it has received in recent years under the terms of its federal service contract. Contractual limitations have the following impacts to the District and its customers: Increased land fallowing and shift Increased groundwater pumping which is unreliable in many areas and lacks the quality requirements for cropping Higher per unit delivery costs Economic hardship for users and local communities Crop loss and permanent crop damage The NVRRWP will address the critical water supply need of the DACs in the DPWD service area by delivering recycled water from Modesto & Turlock.	High
Pasajero Groundwater Replenishment Project	Westlands Water District	Yes	Huron located 6 miles east of the project site is a severely disadvantaged community that could benefit from the implementation of this project. The project may provide a more reliable water supply to the area. While Huron is not groundwater dependent the proposed recharge basin may reduce flooding potential in that area.	Medium
Russell Avenue Bridge Replacement	Central California Irrigation District	Yes	The proposed project will restore the flow capacity in the canal and provide safer driving conditions for the public including Disadvantaged Communities that are within CCID and SLDMWA .	Medium
Terra Linda River Ranch Recharge Project	TBD--likely Southern DM GSA	Yes	Project will decrease existing groundwater salinity levels and can be managed to benefit domestic wells/City of Mendota.	Medium
West Stanislaus Irrigation District Pumping Plant 3 & 4 Modernization	West Stanislaus Irrigation District	Yes	This project will improve water supply reliability to agricultural areas of the disadvantaged communities of Westley and Grayson.	Medium

Infrastructure Life Spans
for Use in Benefit-Cost Analyses

Item	Life Expectancy	Source
Water Treatment Plants	20 to 50 years	USEPA, Sustainable Infrastructure for Water and Wastewater, http://www.epa.gov/waterinfrastructure/basicinformation.html#five
Pipes	15 to >100 years	USEPA, Sustainable Infrastructure for Water and Wastewater, http://www.epa.gov/waterinfrastructure/basicinformation.html#five
Reservoirs and Dams	50 to 80 years	USEPA, Clean Water and Drinking Water Infrastructure Gap Analysis Report, September 2002
Treatment Plants - Concrete Structures	60 to 70 years	USEPA, Clean Water and Drinking Water Infrastructure Gap Analysis Report, September 2002
Treatment Plants - Mechanical and Electrical	15 - 25 years	USEPA, Clean Water and Drinking Water Infrastructure Gap Analysis Report, September 2002
Trunk Mains	65 to 95 years	USEPA, Clean Water and Drinking Water Infrastructure Gap Analysis Report, September 2002
Pumping Stations - Concrete Strctures	60 to 70 years	USEPA, Clean Water and Drinking Water Infrastructure Gap Analysis Report, September 2002
Pumping Stations - Mechanical and Electrical	25 years	USEPA, Clean Water and Drinking Water Infrastructure Gap Analysis Report, September 2002
Distribution	60 to 95 years	USEPA, Clean Water and Drinking Water Infrastructure Gap Analysis Report, September 2002
Interceptors	90 to 100 years	USEPA, Clean Water and Drinking Water Infrastructure Gap Analysis Report, September 2002
Force Mains	25 years	USEPA, Clean Water and Drinking Water Infrastructure Gap Analysis Report, September 2002
Collections	80 to 100 years	USEPA, Clean Water and Drinking Water Infrastructure Gap Analysis Report, September 2002
Groundwater wells	30 to 50 years	Experience; Roscoe Moss *Case Study Increased Well Efficiency, Extended Lifetime and Reduced Maintenance through Selection of Stainless Stell Casing and Well Screen*
Pumps in new wells	10 years	Roscoe Moss *Case Study Increased Well Efficiency, Extended Lifetime and Reduced Maintenance through Selection of Stainless Stell Casing and Well Screen*
Study	5 years	
invasive species removal	3 to 5 years	
site restoration	50 to 100 years	

Simluated Benefit-Cost (B:C) Analysis and Scores

Project Title	Althea Avenue Bridge Replacement	Aquifer Storage and Recovery Project	Broadview Water District Drainage Water Treatment Project	Cantua Creek Groundwater Replenishment Project	Crescent Canal Project	Del Puerto Canyon Reservoir	Delta-Mendota Canal Subsidence & Conveyance Capacity Study
Responsible Agency	Central California Irrigation District	Westlands Water District	Westlands Water District	Westlands Water District	Westlands Water District	Del Puerto Water District	San Luis & Delta-Mendota Water Authority
Project Status	Ready to Proceed	Under Design	Planning	Planning	Planning	Planning	Planning
Year Basis for Estimates (2018?)[1]	2018	2018	2018	2018	2018	2018	2018
Estimated Project Life (Years)[2]	60	25	25	100	95	100	20
Capital Cost: $	$ 7,500,000.00	$ 1,500,000.00	$ 4,700,000.00	$ 1,430,000.00	$ 45,745,000.00	$ 491,300,000.00	$ 85,000.00
Annual O&M Cost: $	$ 750,000.00	$ 160,000.00	$ 470,000.00	$ 115,000.00	$ 214,800.00	$ 2,300,000.00	$ 8,500.00
Possible Funding Sources:	Caltrans, CCID, SLDMWA, Fresno County	Westlands Water District	Westlands/Available Grant Funding			WIIN	San Luis & Delta-Mendota Water Authority EO&M budget
Source of Local funding secured							
Potential source of local funding identified	✓	✓				✓	✓
Potential local funding source not identified			✓	✓	✓		
Total Capital Cost (2018$)[3]	$7,500,000	$1,500,000	$4,700,000	$1,430,000	$45,745,000	$491,300,000	$85,000
Annual O&M Cost (2018$)[3,4]	$750,000	$160,000	$470,000	$115,000	$214,800	$2,300,000	$8,500
Life of Project[2]	60	25	25	100	95	100	20
Present Value Cost[5]	$19,621,071	$3,545,337	$10,708,177	$3,341,018	$49,310,880	$529,520,356	$182,494
Cost Score[6]	2	2	2	2	3	3	1
# of Benefits (Objectives checked)	2	5	4	8	4	6	3
Benefits Score[7]	1	2	1	2	1	2	1
Relative B:C Ratio[8]	0.5	1	0.5	1	0.333333333	0.666666667	1
Economic Feasibility Score[9]	Low	Medium	Low	Medium	Low	Low	Medium

Footnotes:

1. If no year is indicated, 2018 was assumed.
2. If no life was noted, the top of the range from the infrastructure lifespan reference sheet was selected. If a range was submitted, the top end of the range was selected.
3. Costs that were not originally provided in 2018 dollars were converted to 2018 dollars using the ENR CCI for San Francisco (annual averages used).
4. Assumes 10% of capital costs when O&M costs were not provided.
5. Discount factor of 6% assumed (based on previous IRWM guidance).
6. 1 point if PV < $2M, 2 points if $2M < PV < $20M, 3 points if PV > $20M.
7. 1 point if 4 or fewer objectives checked, 2 points if 5 to 8 objectives checked, and 3 points if 9 or more objectives checked.
8. Benefits score divided by cost score; generally, B:C > 1 preferred as the benefits outweigh the costs.
9. High: B:C ratio >2; Medium B:C ratio 1-2; Low B:C ratio <1

Projects submitted during Call for Projects from 5/23/2018 to 7/12/2018.

Simluated Benefit-Cost (B:C) Analysis a

Project Title	Delta-Mendota Canal Turnout Flowmetering Improvement Pilot Program	Grassland Bypass Project Capacity Enlargement	Groundwater Monitoring Program: Multi-Well Aquifer Monitoring	Kaljian Drainwater Reuse Project	Lateral 13 Intertie Project	Lateral Inter-Connection Project	Little Salado Creek Groundwater Recharge and Flood Control Basin
Responsible Agency	San Luis & Delta-Mendota Water Authority	Panoche Drainage District	San Luis & Delta-Mendota Water Authority	San Luis Water District	Westlands Water District	Westlands Water District	Stanislaus County
Project Status	Ready to Proceed	Planning	Planning	Planning	Under Design	Under Design	Under Design
Year Basis for Estimates (2018?)[1]	2018	2018	2018	2018	2018	2018	2018
Estimated Project Life (Years)[2]	25	20	15	95	95	95	100
Capital Cost: $	$ 681,120.00	$ 1,885,000.00	$ 550,000.00	$ 16,500,000.00	$ 9,175,389.00	$ 8,556,000.00	$ 7,710,000.00
Annual O&M Cost: $	$ 6,000.00	$ 40,000.00	$ -	$ 1,520,000.00	$ 300,000.00	$ 120,000.00	$ 771,000.00
Possible Funding Sources:	WaterSMART: Water and Energy Efficiency Grants for FY2018		State grant funding - IRWM grant program possible matching			Water Rates Bonds	
Source of Local funding secured							
Potential source of local funding identified		✓	✓	✓		✓	
Potential local funding source not identified	✓				✓		✓
Total Capital Cost (2018$)[3]	$681,120	$1,885,000	$550,000	$16,500,000	$9,175,389	$8,556,000	$7,710,000
Annual O&M Cost (2018$)[3,4]	$6,000	$40,000	$0	$1,520,000	$300,000	$120,000	$771,000
Life of Project[2]	25	20	15	95	95	95	100
Present Value Cost[5]	$757,820	$2,343,797	$550,000	$41,733,417	$14,155,669	$10,548,112	$20,522,128
Cost Score[6]	1	2	1	3	2	2	3
# of Benefits (Objectives checked)	3	3	2	7	4	4	10
Benefits Score[7]	1	1	1	2	1	1	3
Relative B:C Ratio[8]	1	0.5	1	0.666666667	0.5	0.5	1
Economic Feasibility Score[9]	Medium	Low	Medium	Low	Low	Low	Medium

Footnotes:

1. If no year is indicated, 2018 was assumed.
2. If no life was noted, the top of the range from t
3. Costs that were not originally provided in 2018
4. Assumes 10% of capital costs when O&M costs
5. Discount factor of 6% assumed (based on previ
6. 1 point if PV < $2M, 2 points if $2M < PV < $20
7. 1 point if 4 or fewer objectives checked, 2 poin
8. Benefits score divided by cost score; generally,
9. High: B:C ratio >2; Medium B:C ratio 1-2; Low B

Projects submitted during Call for Projects from 5/23/2018 to 7/12/2018.

Simluated Benefit-Cost (B:C) Analysis a

Project Title	Los Banos Creek Recharge and Recovery	North Valley Regional Recycled Water Program	Orestimba Creek Recharge and Recovery Project (OCRRP)	Panoche Creek Groundwater Replenishment Project	Pasajero Groundwater Replenishment Project	Pumping Plant 7-1 Variable Frequency Drive Project	Russell Avenue Bridge Replacement
Responsible Agency	San Luis Water District	Del Puerto Water District	Del Puerto Water District	Westlands Water District	Westlands Water District	Westlands Water District	Central California Irrigation District
Project Status	Under Design	Ready to Proceed	Ready to Proceed	Planning	Planning	Ready to Proceed	Ready to Proceed
Year Basis for Estimates (2018?)[1]	2018	2018	2018	2018	2018	2018	2018
Estimated Project Life (Years)[2]	50	50	50	100	100	25	60
Capital Cost: $	$ 9,116,373.53	$ 35,150,000.00	$ 7,923,450.00	$ 1,430,000.00	$ 4,276,880.00	$ 1,788,696.00	$ 7,500,000.00
Annual O&M Cost: $	$ 911,637.35	$ 350,000.00	$ 500,000.00	$ 115,000.00	$ 340,000.00	$ 25,000.00	$ 750,000.00
Possible Funding Sources:	Office of Emergency Services (FEMA)	SRF, WRFP, WIIN, ratepayers	HMGP		WaterSMART Drought Response Program		CCID, SLDMWA, Fresno County, CalTrans
Source of Local funding secured	✓	✓				✓	
Potential source of local funding identified			✓		✓		✓
Potential local funding source not identified				✓			
Total Capital Cost (2018$)[3]	$9,116,374	$35,150,000	$7,923,450	$1,430,000	$4,276,880	$1,788,696	$7,500,000
Annual O&M Cost (2018$)[3,4]	$911,637	$350,000	$500,000	$115,000	$340,000	$25,000	$750,000
Life of Project[2]	50	50	50	100	100	25	60
Present Value Cost[5]	$23,485,474	$40,666,651	$15,804,380	$3,341,018	$9,926,846	$2,108,280	$19,621,071
Cost Score[6]	3	3	2	2	2	2	2
# of Benefits (Objectives checked)	7	5	6	9	10	4	2
Benefits Score[7]	2	2	2	3	3	1	1
Relative B:C Ratio[8]	0.666666667	0.666666667	1	1.5	1.5	0.5	0.5
Economic Feasibility Score[9]	Low	Low	Medium	Medium	Medium	Low	Low

Footnotes:

1. If no year is indicated, 2018 was assumed.
2. If no life was noted, the top of the range from t
3. Costs that were not originally provided in 2018
4. Assumes 10% of capital costs when O&M costs
5. Discount factor of 6% assumed (based on previ
6. 1 point if PV < $2M, 2 points if $2M < PV < $20
7. 1 point if 4 or fewer objectives checked, 2 poin
8. Benefits score divided by cost score; generally,
9. High: B:C ratio >2; Medium B:C ratio 1-2; Low B

Projects submitted during Call for Projects from 5/23/2018 to 7/12/2018.

Simluated Benefit-Cost (B:C) Analysis a

Project Title	Terra Linda River Ranch Recharge Project	West Stanislaus Irrigation District Fish Screen Project	West Stanislaus Irrigation District Pumping Plant 3 & 4 Modernization
Responsible Agency	TBD--likely Southern DM GSA	West Stanislaus Irrigation District	West Stanislaus Irrigation District
Project Status	Under Design	Ready to Proceed	Planning
Year Basis for Estimates (2018?)[1]	2018	2017	2011
Estimated Project Life (Years)[2]	30	80	50
Capital Cost: $	$ 3,500,000.00	$ 36,000,000.00	$ 6,000,000.00
Annual O&M Cost: $	$ 350,000.00	$ 46,000.00	$ 270,000.00
Possible Funding Sources:	under review	Federal and State Grants	Grant funds
Source of Local funding secured			
Potential source of local funding identified		✓	
Potential local funding source not identified	✓		✓
Total Capital Cost (2018$)[3]	$3,500,000	$36,607,984	$7,086,226
Annual O&M Cost (2018$)[3,4]	$350,000	$46,777	$318,880
Life of Project[2]	30	80	50
Present Value Cost[5]	$8,317,691	$37,380,229	$12,112,371
Cost Score[6]	2	3	2
# of Benefits (Objectives checked)	7	9	6
Benefits Score[7]	2	3	2
Relative B:C Ratio[8]	1	1	1
Economic Feasibility Score[9]	Medium	Medium	Medium

Footnotes:

1. If no year is indicated, 2018 was assumed.
2. If no life was noted, the top of the range from t
3. Costs that were not originally provided in 2018
4. Assumes 10% of capital costs when O&M costs
5. Discount factor of 6% assumed (based on previ
6. 1 point if PV < $2M, 2 points if $2M < PV < $20
7. 1 point if 4 or fewer objectives checked, 2 poin
8. Benefits score divided by cost score; generally,
9. High: B:C ratio >2; Medium B:C ratio 1-2; Low B

Projects submitted during Call for Projects from 5/23/2018 to 7/12/2018.

Project Name:

Description:

Contact:

Partner(s):

Total Cost: $

Last Update: Tuesday Sep 18, 2018

Instructions Project Information Eligibility Project Description

Instructions Top

The Westside-San Joaquin Integrated Regional Water Management (IRWM) Region has initiated an update of the Westside-San Joaquin Integrated Regional Water Management Plan (WSJ IRWMP) (formerly named the Westside-San Joaquin Integrated Water Resources Plan). The Region is seeking projects to be included in the 2018 WSJ IRWMP. The WSJ Region is an official IRWM planning region approved by the California Department of Water Resources (DWR).

If you have a project that you would like to be included in the 2018 WSJ IRWMP, please complete the Project Information, Eligibility, and Project Description tabs.

For consideration and inclusion in the WSJ IRWMP, project information forms MUST BE submitted by 5:00 PM on July 12, 2018.

Instructions

Please provide the most complete project information possible. Projects may be at any stage of development, from conceptual to shovel-ready. Construction projects, planning projects (such as paper studies or outreach projects), feasibility studies, and pilot studies are all eligible for inclusion in the WSJ IRWMP. Required fields are indicated with red asterisks throughout the project information form. Not all fields are required, but blank fields may result in a lower score as the project will not be fully assessed against project prioritization methodology. The project may be saved before submitting, so you can work on it over multiple sessions.

Thank you for your participation. If you have questions or comments, please visit our website at http://www.sldmwa.org/integrated-regional-water-management-plan/ or contact Andrew Garcia, Associate Civil Engineer, at the San Luis & Delta-Mendota Water Authority, at andrew.garcia@sldmwa.org or (209) 832-6229.

Important Items to Note Regarding Future Grant Funding

This project solicitation process is for the purpose of compiling projects to be included in the WSJ IRWMP, not for the purpose of applying to DWR for IRWM grant funding at this time. Per DWR's IRWM Guidelines, all project proponents with projects included in an IRWM grant application must adopt the IRWMP. At this time, DWR anticipates having an IRWM Implementation Grant solicitation in late 2018. In order to be eligible for grant funding, the WSJ IRWMP must be reviewed and approved by DWR through the Plan Review Process (PRP). In order for projects to be eligible for funding, they must be included in the adopted IRWMP. Submitting your project for consideration for inclusion in the WSJ IRWMP now will make it eligible for future IRWM grant cycles. However, inclusion of your project in the IRWMP will not guarantee that it is included in a grant application or that it receives grant funding. Projects submitted for consideration through this project solicitation process will be prioritized; only the top-ranked projects and those meeting required application criteria (as stipulated in individual Proposal Solicitation Packages released by DWR prior to grant solicitations) will likely get submitted for IRWM implementation grant funding. Projects may move up through the ranking process over time as they are further developed or as DWR and/or the WSJ Region's goals and objectives, and program preferences change.

Please be aware of the following as it relates to receiving future grant funding. This is a high-level summary of eligibility requirements. Full eligibility requirements can be found in the 2016 IRWM Planning Guidelines.

Plan Adoption: Proponents of projects included in an IRWM Implementation proposal must adopt the IRWM Plan. **Public Utilities and Mutual Water Companies:** A project proposed by a public utility that is regulated by the Public Utilities Commission or a mutual water company shall have a clear and definite public purpose and shall benefit the customers of the water system and not the investors (Water Code §79712 (b)(1)). **Nitrate, Arsenic, Perchlorate, or Hexavalent Chromium Contamination:** Water Code §10544.5 requires the Regional Water Management Group, in areas that have nitrate, arsenic, perchlorate, or hexavalent chromium contamination, to include in the grant application information regarding how a project or projects in the application help to address the contamination or an explanation why the application does not include that kind of project or projects. **Climate Change:** Water Code §79742(e) requires applicants seeking Proposition 1, Chapter 7, project funding to demonstrate that the IRWM Plan that the applicants project implements contributes to addressing the risks in the region to water supply and water infrastructure arising from climate change. **Groundwater Management Plan Compliance:** Due to the recent passage of the Sustainable Groundwater Management Act (SGMA), there will be a transition period between groundwater management plans (GWMPs) and SGMA. Therefore, the 2016 Proposition 1 IRWM Guidelines note that grant eligibility will have to consider both GWMP eligibility and Groundwater Sustainability Agency (GSA)/Groundwater Sustainability Plan (GSP) progress. For groundwater management and recharge projects and for projects with potential groundwater impacts, the applicant or the project proponent responsible for such projects must demonstrate that they comply with the following regulations:
Water Code §10720 et seq.: Groundwater project proponents must demonstrate that their project is consistent with SGMA efforts in the basin. Groundwater Management Plan compliance for groundwater projects or other projects having a direct effect on groundwater levels or quality, the applicant or project proponent must meet one of the following conditions (Water Code §10753.7 (b)(1):
They conform to the requirements of an adjudication of water rights in the subject groundwater basin They have prepared and implemented a GWMP in compliance with CWC §10753.7 They participate or consent to be subject to a GWMP, basin-wide management plan, or other IRWM program or plan that meets the requirements of CWC §10753.7(a) For projects located in low or very low priority groundwater basins without an existing GWMP, the proposal commits to adopting a GWMP compliant with Water Code §10753.7 or a GSP compliant with Water Code §10727 et seq.
Water Code § 10920 Compliance: For high and medium priority basins without a California Statewide Groundwater Elevation Monitoring (CASGEM) monitoring entity, grant applicants and project proponents that have been identified as potential monitoring entities will not be eligible for grant funding. Counties whose jurisdictions include unmonitored high and medium priority basins will not be eligible for grant funding. If the entire service area of the grant applicant or the individual project

proponents service area is demonstrated to be a DAC, the project will be considered eligible. **SB 985 and Stormwater Resource Plans:** A stormwater resource plan must be prepared, compliant with Water Code §10562 (b) (7), to receive grants for stormwater and dry weather runoff capture projects. **Requirements for Urban Water Suppliers:** An Urban Water Supplier is a supplier, either publicly or privately owned, that provides water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually (CWC § 10617). Urban water suppliers must comply with the following:
Urban Water Management Planning Act Compliance Water suppliers who were required by the Urban Water Management Planning Act (CWC § 10610 et seq.) to submit an Urban Water Management Plan (UWMP) to DWR must have submitted a complete UWMP to be eligible for IRWM Grant Program funding. Applicants and project proponents that are urban water suppliers and have projects that would receive funding through the IRWM grant program must have a complete UWMP by the time a grant is awarded to be eligible to receive funding. In order to be eligible for funding, urban water supplies must comply with the requirements of Part 2.55 (commencing with §10608) of Division 6, related to sustainable water use and demand reduction. SB X7-7 Compliance Requires all water suppliers to increase water use efficiency and sets an overall goal of reducing per capita water use by 20% by December 31, 2020. Urban water suppliers must prepare an Urban Water Management Plan (UWMP) that includes documentation of compliance with interim water use targets. In order to qualify for funding, urban water suppliers must have a UWMP approved by DWR. CWC § 529.5 Compliance - Requires on or after January 1, 2010, any urban water supplier applying for state grant funds for wastewater treatment projects, water use efficiency projects, drinking water treatment projects, or for a permit for a new or expanded water supply, shall demonstrate that they meet the water meter requirements in CWC § 525 et seq.
Requirement for Agricultural Water Suppliers: In accordance with CWC §10608.56, an agricultural water supplier is ineligible for funding unless it complies with requirements of Part 2.55 (commencing with §10608) of Division 6. This requires that the agricultural water supplier measure the volume of water delivered, adopt a pricing strategy based at least partially on quantity delivered, and implement additional efficient management practices. The supplier must prepare an Agricultural Water Management Plan (AWMP) which must be approved by DWR in order to qualify for funding. SB X7-7 also requires preparation of an AWMP for grant eligibility.
Requirement for Surface Water Diverters: A diverter of surface water is not eligible for a water grant or loan awarded or administered by the State unless it complies with surface water diversion reporting requirements outlined in Part 5.1 (commencing with §5100) of Division 2 of the Water Code.

Project Information Top

Project Information

Project Title: *

Project Location: *

Responsible Agency: *

Responsible Agency Contact: *

Title: *

Address: *

Phone: * Ext:

Email: *

Other Participating Agencies (if applicable):

Eligibility Top

Eligibility

In order to be considered for inclusion in the Westside-San Joaquin Integrated Regional Water Management Plan (WSJ IRWMP), the project must meet at least one WSJ IRWMP Objective, at least one Statewide Priority, and address at least two Resource Management Strategies. If your project does not meet these minimum requirements it will not be included in the Plan Update.

WSJ IRWMP Objectives*

Please check all that apply. The project must address at least one WSJ IRWMP Objective in order to be eligible for inclusion in the Plan Update. For every selected Objective, please describe how your project advances that Objective.

☐ Objective A: Provide for more reliable water supply south of the Delta.
☐ Objective B: Improve regional self-reliance for water through investment in water use efficiency, water recycling, advanced water technologies, local and regional water supply projects, and improved regional coordination of local and regional water supply efforts.
☐ Objective C: Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation.
☐ Objective D: Provide potential for environmental and habitat improvement, including wetlands.
☐ Objective E: Promote projects that meet the needs of disadvantaged communities.
☐ Objective F: Promote and enhance water conservation, water use efficiency, and sustainable water use.
☐ Objective G: Promote and enhance water recycling.
☐ Objective H: Maximize utility of Regional aquifers while improving sustainability.
☐ Objective I: Minimize risk of loss of life, infrastructure, and resources caused by significant storm events by utilizing uncontrolled flow beneficially.
☐ Objective J: Capture stormwater for higher beneficial use whenever practicable.
☐ Objective K: Develop Regional solutions that protect and enhance the quality of water supply, particularly in disadvantaged communities that are unable to meet water quality standards.
☐ Objective L: Consider recreational potential in project development.
☐ Objective M: Minimize energy consumption and associated GHG emissions, including use of renewable energy when appropriate.
☐ Objective N: Promote projects that increase operational flexibilities and supply management tools.

Statewide Priorities*

Please check all that apply. The project must address at least one statewide priority in order to be eligible for inclusion in the Plan Update. For more detailed information on the statewide priorities, please see pages 8-10 of the 2016 IRWM Planning Guidelines.

- ☐ Make Conservation a California Way of Life
- ☐ Increase Regional Self-Reliance and Integrated Water Management Across All Levels of Government
- ☐ Achieve the Co-Equal Goals for the Delta
- ☐ Protect and Restore Important Ecosystems
- ☐ Manage and Prepare for Dry Periods
- ☐ Expand Water Storage Capacity and Improve Groundwater Management
- ☐ Provide Safe Water for All Communities
- ☐ Increase Flood Protection
- ☐ Increase Operational and Regulatory Efficiency
- ☐ Identify Sustainable and Integrated Financing Opportunities

Resource Management Strategies*

Please select all that apply to your project. The project must address at least two Resource Management Strategies in order to be eligible for inclusion in the Plan Update.

- ☐ Agricultural Water Use Efficiency
- ☐ Urban Water Use Efficiency
- ☐ Conveyance — Delta
- ☐ Conveyance — Regional/local
- ☐ System Reoperation
- ☐ Water Transfers
- ☐ Conjunctive Management & Groundwater
- ☐ Desalination — Brackish & Seawater
- ☐ Precipitation Enhancement
- ☐ Recycled Municipal Water
- ☐ Surface Storage — CALFED
- ☐ Surface Storage — Regional/Local
- ☐ Drinking Water Treatment and Distribution
- ☐ Groundwater and Aquifer Remediation
- ☐ Sediment Management
- ☐ Matching Quality to Use
- ☐ Pollution Prevention
- ☐ Salt and Salinity Management
- ☐ Urban Stormwater Runoff Management
- ☐ Agricultural Land Stewardship
- ☐ Economic Incentives (Loans, Grants and Water Pricing)
- ☐ Ecosystem Restoration
- ☐ Forest Management
- ☐ Land Use Planning and Management
- ☐ Recharge Area Protection
- ☐ Water-Dependent Recreation
- ☐ Watershed Management
- ☐ Flood Management
- ☐ Outreach and Engagement
- ☐ Water and Culture
- ☐ Crop Idling for Water Transfers
- ☐ Dewvaporation or Atmospheric Pressure Desalination
- ☐ Fog Collection
- ☐ Irrigated Land Retirement
- ☐ Rainfed Agriculture
- ☐ Waterbag Transport/Storage Technology

Project Description Top

Project Description

Please provide a description of your project, including the project location, area and/or entities that will be affected by or will benefit from your project, related water and environmental resources within the project boundaries, and any potential obstacles to implementation. Further documentation (such as project studies) may be uploaded after the project has been submitted to supplement, but not replace, the information

in this form.*

Project Location

Project Coordinates: Enter decimal latitude and longitude below or

Latitude: * Longitude: *

Project Area:

File Name

Project Status

Select a project status from the dropdown list below. Project Status options are defined as follows:

Conceptual: Project concept not included in any documents to date **Planning:** Project concept included in a planning document to date **and** project-specific planning document has been initiated and/or prepared (e.g. Recycled Water Facilities Plan) **Under Design:** Project design has started but is not yet complete (e.g. Basis of Design Report, pre-design, 30%, 60%, 90%, or Final Design) **Ready to Proceed:** 100% plans and specs complete

For **non-construction** projects (e.g. paper study), please use the following definitions:

Conceptual: Project concept not included in any documents to date **Planning:** Project concept included in a planning document to date **Under Design:** Work plan/scope is in draft form **Ready to Proceed:** Final work plan/scope exists

Project Status: * Select

Project Type

Select a project type from the dropdown list below. (Non-infrastructure projects may include plan development, education, monitoring, research, etc.)
Project Type: * Select

Readiness to Proceed

Please discuss project readiness and anticipated start date. Include a description of the status of design, bid package, permitting, and securing required matching funds.*

Environmental Documentation

Describe the environmental documentation required (e.g. Environmental Impact Report or Negative Declaration) for the proposed project and the status of the required documentation. If environmental documentation is required but has not been started, please provide the estimated

timeframe for completing the required documentation. *

Multi-Entity Integration and Benefits

Is your project linked to or combined with another project? If yes, please describe the linked / integrated projects and other possible project participants. Describe entities that benefit from the project and describe the benefits to each entity.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Does the project provide benefits on a regional scale? If yes, please describe how the benefit(s) will have a regional impact.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Technical Feasiblity

Is the project technically feasible? If yes, please explain.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Do you have background information, studies or other documentation (including author and year) that detail the technical feasibility of the project? If yes, please explain.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Economic Feasibility

Please provide estimated project costs (capital, operations and maintenance, and replacement) and estimated project life. If no annual O&M costs are provided, the annual O&M cost will be assumed to be 10% of the project cost. Project cost information is not required but must be provided in order to receive points for economic feasibility. If no cost information is provided, the lowest score will be awarded for the Economic Feasibility criterion.

Capital Cost: $

Annual O&M Cost: $

Replacement Costs, Description of Equipment to be Replaced, & Frequency of Replacement (e.g., every 5 years):

Estimated Project Life (Years) (click here for a list of general infrastructure life spans):

Cost Basis (if not 2018 dollars):

Possible Funding Sources:

Has a source of local funding match been identified and/or secured for the project?*

- ☐ Local funding match has been secured / Match Not Required (DAC or SDAC Project)
- ☐ Potential source of local funding match has been identified.
- ☐ Potential source of local funding match has not been identified.

Dependence on the Sacramento-San Joaquin Delta

Will the project help reduce dependence on the Sacramento-San Joaquin Delta for water supply? If yes, describe how this will be achieved.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Disadvantaged Communities

Will the project help address critical water supply and water quality needs of disadvantaged communities (DACs)? If yes, describe how this will be achieved. (The DAC status of communities may be determined using DWRs DAC Mapping Tool, available at https://gis.water.ca.gov/app/dacs/. DACs may be identified at the census designated place, census tract, or block group level. A community may also be considered a DAC if an income survey has been completed demonstrating that the community meets DAC criteria.).

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Environmental Justice

Environmental justice can be defined as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. Environmental justice seeks to redress inequitable distribution of environmental burdens (e.g. pollution, industrial facilities) and access to environmental goods (e.g. clean water and air, parks, recreation, nutritious foods, etc.).

Have the environmental justice impacts of the projects been evaluated? If yes, describe the potential impacts or benefits and efforts to mitigate environmental justice concerns.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Native American Tribal Communities

Will the project benefit Federally- or State-recognized Native American Tribal communities? If yes, describe how Native American Tribal communities will benefit.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Climate Change Adaptation

Climate change adaptation includes activities to adjust to the actual or expected future climate.

Does the project help the water system adapt to vulnerabilities to climate change effects? If yes, describe how adaptation(s) are achieved.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Does the project provide adaptation to changes in the amount, intensity, timing, quality, and/or variability of runoff and recharge? If yes, describe how adaptation is achieved.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Does the project provide an adaptation to sea level rise (either direct or indirect adaptations)? If yes, describe how adaptation is achieved.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Climate Change Mitigation

Climate change mitigation includes activities to reduce and stabilize the levels of greenhouse gases in the atmosphere.

Does the project consider the contribution of the project to reducing greenhouse gas emissions as compared to project alternatives? If so, describe how this was considered.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Does the project consider the ability of the project to help the Westside-San Joaquin Region reduce greenhouse gas emissions as new projects

are implemented over the 20-year planning horizon? If so, describe how this was considered.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

Does the project reduce energy consumption and/or greenhouse gas emissions? If yes, describe how energy consumption or emissions are reduced.

☐ No ☐ Yes *

Explanation (required if Yes, optional if No):

WIWRP Update Adoption

Does the responsible agency plan to formally adopt the WSJ IRWMP Update (e.g., at a city council or board of directors meeting)? If the responsible agency is a nonprofit organization, does it plan to follow an equivalent process to formally approve or accept the plan?

☐ No ☐ Yes *

* Minimum Required Information for Project Submission

Appendix E – Stanislaus Multi-Agency Regional Stormwater Resource Plan Executive Summary

Stanislaus Multi-Agency Regional Stormwater Resource Plan Executive Summary to be inserted.

Appendix F – Stakeholder Contact List

Westside-San Joaquin IRWM Region Stakeholder Contact List

Stakeholder Organization	Contact Name	Email
Adams Ashby Group	Paul Ashby	pashby@adamsashbygroup.com
Aliso Water District	Roy Catania	
Aliso Water District GSA	Rick Iger	riger@ppeng.com
Aliso WD/Wonderful Orchards	Kimberly Brown	kimberly.brown@wonderful.com
Alta Irrigation District	Chad Wegley	cw@altaid.org
American River Basin	Rob Swartz	rswartz@rwah2o.org
Angiola Water District	Matthrew Hurley	mhurley@angiolawd.org
Azcal Management Co.	Ted Sheely	tsheely@azcal.net
Ballico Community Water Service District	Manuel Jimenez	manuelj1976@yahoo.com
Ballico-Cortez Water District	Victor Yamamoto	
Banta-Carbona ID	David Weisenberger	bcid@inreact.com; dweisenberger@banta-carbona.org
Banta-Carbona ID	James McLeod	
Blewett Mutual Water Company	Richard Bettencourt	
Britz/Colusa	Quentin Kiggens	
Britz/Colusa; Britz/Five Point System	Joey Sagariballa	joeys@britzinc.com
Broadview WD	Jose Gutierrez	jgutierrez@westlandswater.org
Broadview WD	Thomas Birmingham	tbirmingham@westlandswater.org
Bureau of Reclamation (Central Valley Operations Office)	Jeff Rieker	jrieker@usbr.gov
Byron Bethany ID/CVPSA	Rick Gilmore	R.gilmore@bbid.org; rgilmore@bbid.org
California Division of Drinking Water - District 23 (Fresno)	Jose Robledo	Jose.Robledo@waterboards.ca.gov
Cantua Creek Vineyards, IV, LLC	Frank Canela	
Cardno	Mark Horne	Mark.Horne@cardno.com
Casaca Vineyards	Bobbie Kinser	casaca.vineyards@unwiredbb.com
Central California ID	Chris White	cwhite@ccidwater.org
Central California ID	Jarrett Martin	jmartin@ccidwater.org
Central California ID	Tracey Rosin	trosin@ccidwater.org
Central Delta Water Agency	Dante John Nomellini	
Central Delta-Mendota Multi-Agency GSA	Amy Montgomery	amontgomery@sncwd.com
Central Delta-Mendota Multi-Agency GSA	Bill Soares	wjsoares@jfbri.com
Central Delta-Mendota Multi-Agency GSA	Christine Guzman	chguzman@co.fresno.ca.us
Central Delta-Mendota Multi-Agency GSA	Danny Wade	danny@trqid.com
Central Delta-Mendota Multi-Agency GSA	Frances Mizuno	frances.mizuno@sldmwa.org
Central Delta-Mendota Multi-Agency GSA	Juan Cadena	jcadena@panochewd.org
Central Delta-Mendota Region Multi-Agency GSA	Aaron Barcellos	aaron@abarag.com
Central Valley Regional Water Quality Control	Bethany Soto	bethany.soto@waterboards.ca.gov
Chowchilla Water District	Doug Welch	dwelch@cwdwater.com
Chowchilla-Red Top Resource Conservation District	Jeannie Habben	

City of Avenal	Fernando Santillan	fsantillan@cityofavenal.com
City of Avenal	Melissa Whitten	avenalcm@cityofavenal.com
City of Dos Palos	Garth Pecchenino	garth.pecchenino@qkinc.com
City of Dos Palos GSA	Ricky Marshall	rmarshall1959@comcast.net
City of Firebaugh	Ben Gallegos	Bgallegos@ci.firebaugh.ca.us
City of Firebaugh	Mario Gouveia	mgouveia@gouveiaengineering.com
City of Gustine	Doug Dunford	ddunford@cityofgustine.com
City of Gustine WSA	Steve Wright	
City of Huron	Jack Castro	
City of Los Banos	Mark Fachin	mark.fachin@losbanos.org
City of Los Banos	Royal Lloyd	royal.lloyd@losbanos.org
City of Mendota	Cristian Gonzalez	Cristian@cityofmendota.com
City of Mendota	Vince Dimaggio	vincedimaggio@cityofmendota.com
City of Newman	Michael Holland	mholland@cityofnewman.com; mgouveia@gouveiaengineering.com
City of Patterson	Ken Irwin	kirwin@ci.patterson.ca.us
City of Patterson	Maria Encinas	mencinas@ci.patterson.ca.us
City of Patterson GSA	Fernando Ulloa	fulloa@ci.patterson.ca.us
City of Patterson GSA	Mike Willett	mwillett@ci.patterson.ca.us
City of San Joaquin	Elizabeth Nunez	elizabethn@cityofsanjoaquin.org
City of Tracy	Steve Bayley	steveb@ci.tracy.ca.us
Coit Ranch Corporation	William Coit	coitranch@hotmail.com
Columbia CC	Randy Houk	rghccc@sbcglobal.net
Community of Crows Landing and Community of Grayson	Connie Payan	connieepayan@gmail.com; connie@livingstoncity.com
Community Water Center	Heather Lukacs	Heather.lukacs@communitywatercenter.org
Consolidated Irrigation District	Phil Desatoff	Pdesatoff@cidwater.com
Contra Costa County Water Agency	Ryan Hernandez	ryan.hernandez@dcd.cccounty.us
County of Fresno/Cantua Creek CDP/Three Rocks	Sebastian Artal	sartal@co.fresno.ca.us
Crows Landing CSD	Ignacio Lopez	nacho892@frontier.com
Crows Landing CSD	Lance Perry	
Crows Landing CSD and Westley CSD	Coleen Sanguinetti	coleen@gvni.com
CV-Salts Coalition	Daniel Cozad	dcozad@intpln.com
Dbeso	Kurtis Keller	
Del Puerto WD	Adam Scheuber	ascheuber@delpuertowd.org
Del Puerto WD	Anthea Hansen	ahansen@delpuertowd.org
Delhi County Water District	Stephany Perry	
Department of Fish and Wildlife	Andy Gordus	andy.gordus@wildlife.ca.gov
Department of Water Resources	Jason Preece	jpreece@water.ca.gov
Diablo WD	Dan Muelrath	dmuelrath@diablowater.org
Dos Palos Y Auction Yard (CDP)		joel@dpyauction.com; joey@dpyauction.com
Eagle Field WD and White Area	Randall Miles	rmh@jfbri.com
East Acres Mutual Water Company		
East Contra Costa County	Maggie Dutton	mdutton@ccwater.com

East Contra Costa County	Mark Seedall	mseedall@ccwater.com
East Contra Costa ID	Pat Corey	patcorey@cwo.com
East Stanislaus IRWM - Steering Committee Member	Jim Alves	jalves@modestogov.com
East Stanislaus Resources Conservation District	Chester Anderson	
Eastin WD	Grant Craven	grant@cravenfarmingco.com
El Solyo WD	Janice Trinkle	elsolyowd@gmail.com
Environmental Defense Fund	Lucia Garcia	agarciabriones@edf.org
Environmental Justice Coalition for Water	Colin Bailey	colin@ejcw.org
ESA (Consultant for SJR RFMP)	Minta Schaefer	
Farmers Water District	Jim Stilwell	jds@logoluso.com
Farmers Water District and Sierra Valley Almonds, LLC	Mark Turmon	mturmon@svalmonds.com
Farming D	Scott Schmidt	
Firebaugh Canal WD	Madison Medeiros	firebaughcanal@sbcglobal.net
Firebaugh CWD	Jeff Bryant	Bryant_Jeff@sbcglobal.net
Firebaugh CWD	Michael Stearns	
Five Points Ranch	Armando Galvan	armando@fivepointsranch.com
Fresno County	Glen Allen	glallen@co.fresno.ca.us
Fresno County Farm Bureau		info@fcfb.org
Fresno Irrigation District	Gary Serrato	gserrato@fresnoirrigation.com
Grassland WD	Mike Gardner	
Grasslands Groundwater Sustainability Agency	Ric Ortega	rortega@gwdwater.org
Gravelly Ford WD	Don Roberts	donroberts717@gmail.com
Griffiths & Masuda	Roger Masuda	rmasuda@calwaterlaw.com
Harris Farms Headquarters Harris Farms South #101-144	Mike Casey	Mike.Casey@harrisranch.com
Helm School	Aurora Ramirez	
Henry Miller R.D. 2131	Chase Hurley	chase@hmrd.net
Henry Miller R.D. 2131	Michael Cannon	
Herum, Crabtree, Suntag LLP	Jeanne Zolezzi	jzolezzi@herumcrabtree.com
James ID	Steve Stadler	sstadler@jamesid.org
James ID	Thomas W. Chaney	
James Irrigation District; Reclamation District 1606	John Mallyon	
Kern County IRWM Region		kernIRWMP@kcwa.com
Kings Basin IRWM Region		
Laguna ID	Scott Sills	scott@lagunaid.com
Las Deltas Mutual Water Co.	Tim Ward	timward49@yahoo.com
Lawer/City of Antioch	Matt Emrick	matthew@mlelaw.com
Linden County Water District	Clifford Powell	rmblrmn@aol.com
Linneman Law, LLP	Phil McMurray	pmcmurray@linnemanlaw.com
Linneman Law/Panoche WD	Gabriel del Gado	gdelgado@linnemanlaw.com
Local Government Commission	Laura Podolsky	
Luhdorff & Scalmanini	Will Halligan	whalligan@lsce.com

Madera	Carl Janzen	CJanzen@madera-id.org
Madera	Sean Smith	SSmith@madera-id.org
Madera County	Annette Kephart	mcWater@madera-county.com
Madera County	Stephanie Anagnoson	stephanie.anagnoson@maderacounty.com
Madera ID	Thomas Greci	Tgreci@madera-id.org
Manufacturer's Council of the Central Valley (MCCV)	Jennifer Shipman	jennifer@mccv.org
MCDC Board Member	Denny Jackman	
Mendota Pool Group	Bill Pipes	bill.pipes@amecfw.com
Merced County	Lacey Kiriakou	lkiriakou@co.merced.ca.us
Merced County	Ron Rowe	rrowe@co.merced.ca.us
Merced County	Steve Maxey	SMaxey@co.merced.ca.us
Merced County Ag Comissioner	David A. Robinson	AgDeptEmail@co.merced.ca.us
Merced County Farm Bureau	Breanne Ramos	bramos@mercedfarmbureau.org
Merced ID	Hicham ElTal	heltal@mercedid.org
Mercy Springs WD	Brad Gleason	bgleason@westhillsfinancial.com
Midway Community Services District	Dora Campos/Abby Hunter	mcsd@dospalos.org
Midway Community Services District		
Murrieta/Hernandez Farms	Tyler Thomas	
Naglee Burk ID	Robert Mehlhaff	
Nature Conservancy	Laura Jensen	
Newman Drainage District	Dennis L. Hay	
North Fork Kings	Eric Osterling	eric@northforkkings.org
Northwestern Delta-Mendota GSA	Walter Ward	wward@envres.org
Oak Flat WD	John Beltran	jbeltran0319@gmail.com
Oakdale ID	Steve Knell	srknell@oakdaleirrigation.com
O'Laughlin & Paris LLP	Valerie Kincaid	vkincaid@olaughlinparis.com
Orchard Restaurant RV Park		
Oro Loma Water District	Steve Sloan	
Pacheco WD	Lance LeVake	
Pacific Gas & Electric		
Panoche WD	Ara Azhderian	azhderian@panochewd.org
Panoche WD	John Bennett	jfb@jfbri.com
Panoche WD	Michael Linneman	
Pappas & Co (Coalinga)	George Pappas	
Patterson ID	Steve Trinta	STrinta@pattersonid.org
Patterson ID	Vince Lucchesi	vlucchesi@pattersonid.org
Patterson Irrigation District GSA	Marc Vanden	mvanden@pattersonid.org
Peck Ranch	David Baker	
Peters Engineering	David Peters	dpeters@peters-engineering.com
Pleasant Valley WD	Rod Stiefvater	rods@rtsagribus.com;
Provost & Pritchard	Joe Hopkins	jhopkins@ppeng.com

Provost & Pritchard	Kait Palys	kpalys@ppeng.com
RD 2031 (aka Elliot)	William Lyons, Jr	
RD 2063 (aka Crows Landing)	Joe Sallaberry	
RD 2091 (aka Chase)	Wendel Trinkler	
RD 2101 (aka Blewett)	James Coddington	
Reclamation District 1606	John Wiersma	jwiersma@hmrd.net
Red Fern Ranch	Steve Fausone	stevef@redfernranches.com
River Islands	Ryan Alameda	ralameda@riverislands.com
River Partners	Maggie Boberg	mboberg@riverpartners.org
Root Creek WD	Julia Berry	juliaberry@sbcglobal.net
Root Creek WD	Nick Bruno	
San Andreas Farms	Stan Nunn	
San Joaquin County	Mike Callahan	mcallahan@sjgov.org
San Joaquin County—Tracy & D-M	Brandon Nakagawa	bnakagawa@sjgov.org
San Joaquin River Exchange Contractors Water Authority	Steve Chedester	stevechedester@sjrecwa.net
San Luis Canal Company	Alejandro Paolini	alejandro@hmrd.net
San Luis WD	Ben Fenters	bfenters@slwd.net
San Luis WD	Lon Martin	lmartin@slwd.net
San Luis WD	William Diedrich	
Self-Help Enterprises	Ilse Lopez-Narvaez	ilsen@selfhelpenterprises.org
Self-Help Enterprises	Maria Herrera	mariah@selfhelpenterprises.org
Self-Help Enterprises	Sal Alhomedi	sala@selfhelpenterprises.org
SLDMWA	Andrew Garcia	andrew.garcia@sldmwa.org
Sommerville Almond Tree Owner	Joginer Singh	
South Delta Water Agency	John Herrick	jherrlaw@aol.com
South Dos Palos County Water District	Jeannine Montes	southdospaloswaterdistrict@hotmail.com
South San Joaquin ID	Peter Rietkerk	prietkerk@ssjid.com
Stanislaus County	Dhyan Gilton	giltond@stancounty.com
Stanislaus County	Matt Machado	machadom@stancounty.com
Stanislaus County Ag Commissioner		agcom50@stancounty.com
Stanislaus County Farm Bureau		programs@stanfarmbureau.org
Stanislaus Local Agency Formation Commission	Sara Lytle-Pinhey	pinheys@stancounty.com
Stantec	Kirsten Pringle	kirsten.pringle@stantec.com
State Water Resources Control Board	Spencer Joplin	Spencer.Joplin@waterboards.ca.gov
Storm Water Consulting, Inc.	James Nelson	jnelson@stormwaterconsulting.com
Summers Engineering, Inc.	Chris Linneman	linneman@summerseng.com
Terra Linda Farms	Joe Coelho	joe@terralindafarms.com
Terra Nova Ranch	Don Cameron	dcameron@terranovaranchinc.com
Tranquility ID	Bill Pucheu	
Tranquility ID	Liz Reeves	liz@trqid.com
Tranquillity Irrigation District	Rodney Wade	Rod@TrqID.com
Tranquillity Public Utility District	Laurie Siliznoff	jandlsiliznoff@outlook.com

Turner Island WD	Donald Skinner	dskinner@wolfseninc.com
Twin Oaks ID; RD 1602 (aka Del Puerto)	Dan Roberts	robertsd@ldschurch.org
Underrepresented community (not covered by IRWM Region)	Jennifer Cozart	jcozart@deldonco.com
Underrepresented community (not covered by IRWM Region)	Jim Lopes	jlopes@cv-access.com
Underrepresented community (not covered by IRWM Region)	Joe Azevedo	jazevedo@yahoo.com
Underrepresented community (not covered by IRWM Region)	John Stockman	stokman5@aol.com
Underrepresented community (not covered by IRWM Region)	Julie Lara	julieb.lara@gmail.com
Underrepresented community (not covered by IRWM Region) Landowner	Jeff Arambel	
US Fish and Wildlife Service (Region 8)	Mike Fris	
Volta Community Services District and Hillsview Homes	Johnny Leonard	info@voltawater.com
Water Wrights	Don Wright	don@waterwrights.net
West Stanislaus ID	Bobby Pierce	bobby.pierce@weststanislausid.org
West Stanislaus ID		wsid2@comcast.net
Westlands WD	Antonio Solorio	asolorio@westlandswater.org
Westlands WD	Dan Pope	dpope@westlandswater.org
Westlands WD	David Vang	dvang@westlandswater.org
Westlands WD	Don Peracchi	
Westlands WD	Kiti Campbell	kcampbell@westlandswater.org
Westlands WD	William Bourdeau	
Westley CSD	Tony Bravo	colleen@gvni.com
Westside Harvesting	Mike Hannah	mikehannah@att.net
Westside ID	David Kaiser	
Westside-San Joaquin	Rebecca Akroyd	rebecca.akroyd@sldmwa.org
White Lake MWC	Leroy DelDon	jcozart@deldonco.com
Widren ID and White Area	Jean Sagouspe	jean@jpprop.org; jps@jpprop.org
Widren Water District GSA	Damian Aragona	damian@jpprop.org
Woodard & Curran	Jennifer Kidson	jkidson@woodardcurran.com
Woodard & Curran	Lindsey Wilcox	lwilcox@woodardcurran.com
Woodard & Curran	Lyndel Melton	lmelton@woodardcurran.com
Woodbridge ID	Anders Christensen	widirrigation@gmail.com
Community member	Burta Herger	bherger@frontier.com
Community member	Chris Kapheim	
Community member	Cruz Ramos	
Community member	Jason Dean	jason-mfi@sbcglobal.net
Community member	Jeff Beecher	jbeecher@farmingd.com
Community member	John Beam	jabenvironmental@gmail.com
Community member	Lauren Layne	Llayne@bakermanock.com
Community member	Marvin Meyers	marvin-mfi@sbcglobal.net
Community member	Mica Nitschke (Home)	micanitschke@gmail.com

Community member	Michael Wackman	michaelkw@msn.com
Community member	Nick Janes	
Community member	Patrick Cerutti	pccerutti@yahoo.com
Community member	Peter Martin	peterm@ccwd.org
Community member	Philip Martin	philmartinfarms@cs.com
Community member	Reid Roberts	reidwroberts@gmail.com
Community member	Roger Skinner	rskinner@lionraisins.com
Community member	Steve Kaiser	stevekaisers@aol.com
Community member	Tony Whitehurst	arwhitehurst@sbcglobal.net
Community member	Vince Roos	vroos@intersectlogic.net

Appendix G – Climate Change Vulnerability Checklist

Westside-San Joaquin IRWM Region Climate Change Vulnerability Assessment Checklist

Category / Vulnerability	Yes	No	Notes
Water Demand			
Are there major industries that require cooling/process water in your planning region?	✓		Agricultural process water is required in the Region.
Does water use vary by more than 50% seasonally in parts of your region?	✓		Water use varies seasonally due to agriculture in the Region.
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?	✓		Crops in the Region would require more water under such conditions.
Do groundwater supplies in your region lack resiliency after drought events?	✓		Due to extensive groundwater use, groundwater levels can be slow to rise after droughts.
Are water use curtailment measures effective in your region?	✓		Water use curtailment measures have generally been effective.
Are some instream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?	✓		No instream flow requirements have been identified in the Region. However, increases in instream flow requirements in the Delta may increase demands on the Delta and potentially impact water supply in the Region.
Water Supply			
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?	✓		Increased wildfires are not a direct threat in the Region due to the agricultural uses that cover most of the Region. However, wildfires outside of the Region could impact water quality in the rivers within the region (e.g., increased turbidity).
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?	✓		Some agencies within the Region hold rights to San Joaquin River water, which can be susceptible to eutrophication due to agricultural nutrient input.
Are seasonal low flows decreasing for some waterbodies in your region? If so, are the reduced low flows limiting the waterbodies' assimilative capacity?		✓	No, current data does not indicate that seasonal low flows are decreasing, with the exception of drought years.

Category / Vulnerability	Yes	No	Notes
Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?	✓		Yes. For example, municipal and domestic supply is identified as a beneficial use for groundwater in the Region's groundwater basins, but arsenic and uranium levels have caused closure of some municipal wells.
Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?		✓	The Region does not observe water quality shifts of a magnitude that impact treatment facility operation.
Sea Level Rise			
Has coastal erosion already been observed in your region?		✓	The Region is not in a coastal area.
Are there coastal structures, such as levees or breakwaters, in your region?		✓	The Region is not in a coastal area.
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?		✓	The Region is not in a coastal area.
Are there climate-sensitive low-lying coastal habitats in your region?		✓	The Region is not in a coastal area.
Are there areas in your region that currently flood during extreme high tides or storm surges?		✓	The Region is not in a coastal area.
Is there land subsidence in the coastal areas of your region?		✓	The Region is not in a coastal area.
Do tidal gauges along the coastal parts of your region show an increase over the past several decades?		✓	The Region is not in a coastal area.
Flooding			
Does critical infrastructure in your region lie within the 200-year floodplain?	✓		Infrastructure such as the Patterson and Newman WWTPs lie just outside the 200-year floodplain. Many levees also exist in the floodplain. [1]
Does part of your region lie within the Sacramento-San Joaquin Drainage District?	✓		Portions of the region along the San Joaquin River lie within this District.

[1] Map of 200-year floodplain is available online via California Department of Water Resources Best Available Maps: http://gis.bam.water.ca.gov/bam/

Category / Vulnerability	Yes	No	Notes
Does aging critical flood protection infrastructure exist in your region?	✓		Aging levees exist in the region.
Have flood control facilities (such as impoundment structures) been insufficient in the past?		✓	Flood control facilities have not been insufficient in the past.
Are wildfires a concern in parts of your region?		✓	Land use in the Region is largely agricultural, and wildfire is not a concern within the Region.
Ecosystem and Habitat Vulnerability			
Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?	✓		Aquatic fish in the Region may be sensitive to sedimentation issues.
Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?	✓		The northernmost extent of the Region includes the City of Tracy, which is within the legal boundary of the Bay-Delta. The Bay-Delta is an estuarine habitat which is sensitive to seasonal freshwater flow patterns.
Do climate-sensitive fauna or flora populations live in your region?	✓		Yes. Aquatic fish are vulnerable to changes in water temperature and other climate change effects (such as turbidity). The Region also includes vernal pool habitats which are sensitive to climate change.
Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?	✓		Endangered or threatened species such as steelhead trout, giant garter snake, and Swainson's hawk exist in the Region. Changes in species distribution are unknown.
Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?	✓		Wetlands in the region attract hunters, naturalists, and bird-watchers.
Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?	✓		There are no instream flow requirements for any rivers in the Region.[2] Rising water temperatures and sedimentation changes may cause additional stressors to aquatic organisms.
Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your		✓	The Region is not in a coastal area.

[2] California Department of Fish and Wildlife Instream Flow Recommendations Map. Available at: https://www.wildlife.ca.gov/Conservation/Watersheds/Instream-Flow/Recommendations

Category / Vulnerability	Yes	No	Notes
region? If so, are coastal storms possible/frequent in your region?			
Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change?	✓		Yes, the northernmost portion of the Region encompasses the City of Tracy, which is within the legal boundaries of the Bay-Delta habitat.[3]
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?	✓		Wetlands do exist within the Region. Some areas are fragmented and some are larger, such as the San Luis National Wildlife Refuge and San Joaquin River National Wildlife Refuge.
Hydropower			
Is hydropower a source of electricity in your region?	✓		The O'Neill Pumping-Generating Plant, about 12 miles west of Los Banos, lifts water from the Delta-Mendota Canal into the O'Neill forebay. The Plant can also operate as a generator and is able to produce up to 24,000 kilowatts per hour.
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?	✓		Energy needs are expected to increase in the future because of increasing temperatures and a corresponding increase in irrigation demands. Plans for hydropower generation facilities are unknown at this time.

Source: Vulnerability assessment checklist adapted from California Department of Water Resources' *Climate Change Handbook for Regional Water Planning* (2009), Appendix B, available at: https://www.water.ca.gov/LegacyFiles/climatechange/docs/Appendix%20B%20Vulnerability%20Assessment%20Checklist-Final.pdf.

[3] US Fish and Wildlife Service, San Francisco Bay-Delta Fish and Wildlife Office. *Jurisdictional Boundary and Legal Delta*. Map available at https://www.fws.gov/sfbaydelta/Maps/BDFWO_Boundary_with_LegalDelta_073015.pdf

Prepared by:

WOODARD &CURRAN
2175 N. California Blvd
Suite 315
Walnut Creek, CA 94596
925.627.4100 ☎