



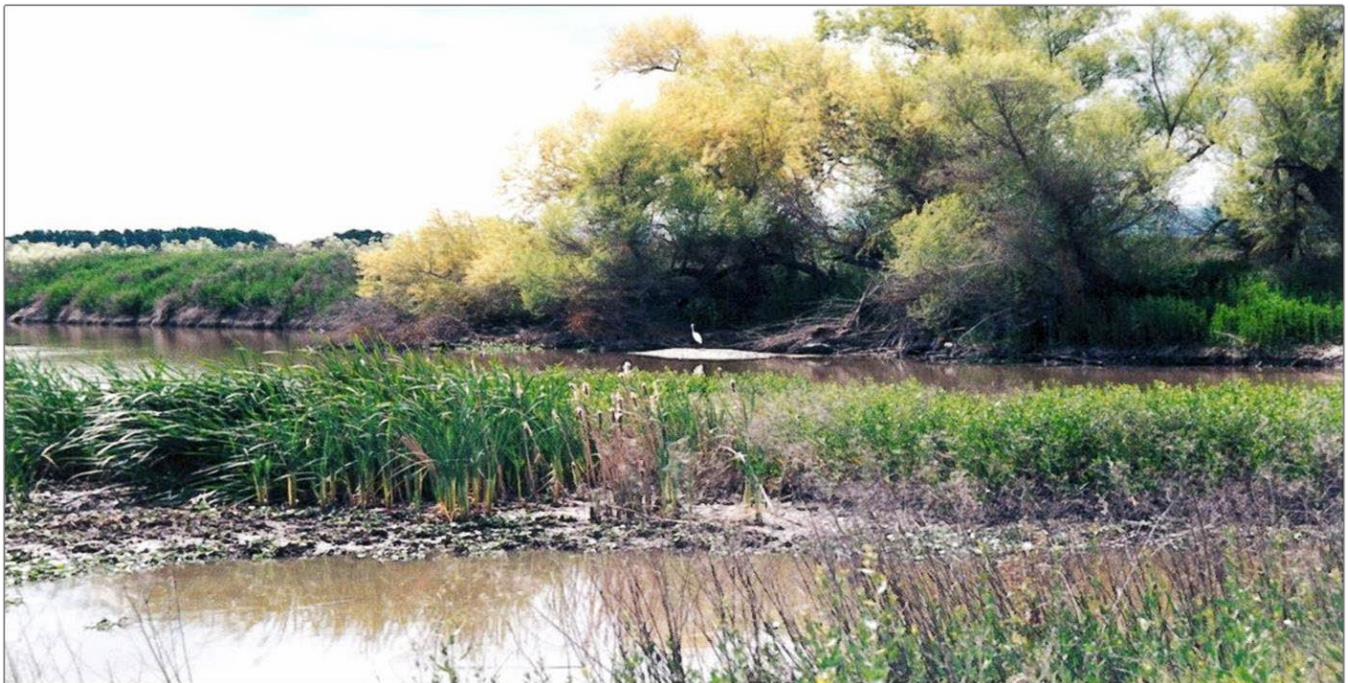
— BUREAU OF —  
RECLAMATION

Management Agency Agreement

# Fiscal Year 2025 Annual Work Plan

October 1, 2024–September 30, 2025

California-Great Basin Region



## **Mission Statements**

The U.S. Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated Island Communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

# Contents

	Page
Purpose.....	1
Reclamation Staff Resources .....	5
Fiscal Year (FY) 2025 Goals and Objectives .....	7
Detailed Description of FY 2025 Goals for the RTMP.....	8
Goal 1. Provide funding for maintaining and improving forecasting tools ..	8
Goal 2. Maintain forecasting tools and methods .....	9
Goal 3: Provide flow and salinity forecasts .....	10
Goal 4: Coordinate with stakeholders.....	10
Goal 5: Provide technical support.....	11
Goal 6: Maintain monitoring stations .....	11
Goal 7: Participate in CV-SALTS .....	12
Funding and Status of the Monitoring Program .....	13
References.....	15

# Tables

Table 1. Reclamation Staff Involved in the RTMP .....	5
Table 2. Reclamation Goals.....	7
Table 3. FY 2025 Proposed Reclamation Funding.....	13
Table 4. Status of Monitoring Stations .....	13

# Figures

Figure 1. TMDL Subareas for Salt Load Management in the LSJR Basin .....	3
--	---

This page intentionally left blank

# Abbreviations and Acronyms

Action Plan	Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River, July 9, 2008 (updated November 2010)
Basin Plan	1994 Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4th Edition (updated April 2016)
CALFED	California Bay-Delta Authority
CDEC	California Data Exchange Center
CV Water Board	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability Stakeholder Group
D-1641	State Water Resources Control Board Revised Water Right Decision 1641
DWR	California Department of Water Resources
EC	electrical conductivity
GWD	Grassland Water District
LSJR	Lower San Joaquin River
MAA	Management Agency Agreement
NWIS	National Water Information System
PTMS	Program to Meet Standards
QA	Quality Assurance
Reclamation	United States Bureau of Reclamation
RTMP	Real-Time Management Program
SJR	San Joaquin River
SJVDA	San Joaquin Valley Drainage Authority
TMDL	Total Maximum Daily Load
USACE	United States Army Corps of Engineers

USGS	United States Geological Survey
μS/cm	Micro Siemens Per Centimeter
WARMF	Watershed Analysis Risk Management Framework
WQOs	Water Quality Objectives

# Purpose

Reclamation, in response to the passage of the “Water Supply, Reliability, and Environmental Improvement Act” (Public Law 108-361), which includes the California Bay-Delta Authority (CALFED), has initiated implementation of the Program to Meet Standards (PTMS). This program intends to provide greater flexibility in meeting existing water quality standards for the Central Valley Project. Reclamation currently utilizes the CALFED funding authorization for the PTMS, which includes the Real-Time Management Program (RTMP).

The Central Valley Regional Water Quality Control Board’s (CV Water Board) Salt and Boron Total Maximum Daily Load (TMDL) for the Lower San Joaquin River (LSJR) was approved and placed into effect on July 28, 2006. In response to the Salt and Boron TMDL, Reclamation drafted a memorandum entitled “Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River” on July 9, 2008, and updated it in November 2010 (Action Plan). Reclamation subsequently entered into a management agency agreement (MAA) with the CV Water Board on December 22, 2008. The Action Plan was created to accompany the MAA and provide details of Reclamation-planned activities to comply with the TMDL-based water quality control plan objectives. Figure 1 shows seven TMDL subareas for salt load management in the LSJR Basin.

A Reclamation compliance plan and a compliance report were prepared in May 2010 to provide the methodology used for the activities described in the Reclamation Action Plan. These documents contain information regarding the technical analysis, computation, and methodology utilized for each Reclamation activity. The 2008 MAA was updated in December 2014. It is consistent with Reclamation’s focus on developing the basic infrastructure that supports the RTMP for the LSJR. The annual work plan continues the work that was initiated in the Reclamation Action Plan and summarizes annual planned activities to be conducted by Reclamation in conjunction with each element outlined in the MAA. This Work Plan includes support of Phase 3 and Phase 4 activities listed in the RTMP Framework document, approved by the CV Water Board in December 2014.

The primary purpose of the CV Water Board–approved RTMP is to implement salinity management activities to meet seasonal quantitative salinity objectives at Vernalis, Crows Landing, and Maze Road Bridge.<sup>1</sup> The Basin Plan amendment, establishing the Crows Landing

---

<sup>1</sup> An amendment to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins was adopted by the CV Water Board on 6/9/17 and approved by the State Water Resources Control Board on 1/9/18, by the Office of Administrative Law on 4/19/18, and by the USEPA on 12/17/18. The amendment established new water quality objectives (WQOs) for the San Joaquin River, Reach 83 (from the mouth of the Merced River to Airport Way Bridge) of 1,550 microsiemens per centimeter ( $\mu\text{S}/\text{cm}$ ) during most years, and 2,470  $\mu\text{S}/\text{cm}$  during extended dry periods. During extended dry periods a maximum annual average of 2,200  $\mu\text{S}/\text{cm}$  will apply. The amendment also includes a performance goal of 1,350  $\mu\text{S}/\text{cm}$ . The existing WQOs of 700  $\mu\text{S}/\text{cm}$  (April to August) and 1,000  $\mu\text{S}/\text{cm}$  (September to March) will remain in effect. Crows Landing and Maze Road Bridge are the two compliance points for the new WQOs.

compliance monitoring station, was undertaken to protect beneficial uses, including irrigation supply in the LSJR from the mouth of the Merced River to Airport Way Bridge near Vernalis. The U.S. Environmental Protection Agency (USEPA) approved the Basin Plan amendment on December 17, 2018. The amendment went into effect in January 2020. The RTMP is also designed to encourage export of surface-water salt loads in accordance with the provisions in the Basin Plan during times of high river assimilative capacity for salt, to reduce reliance on the New Melones Reservoir for dilution flows to the LSJR, and to establish an organizational approach for the continuing development, implementation, and coordination of the RTMP.

---

For the purposes of the RTMP, forecast efforts will focus on meeting the new WQOs at Crows Landing and Maze Road together with the WQOs at Airport Way Bridge near Vernalis.



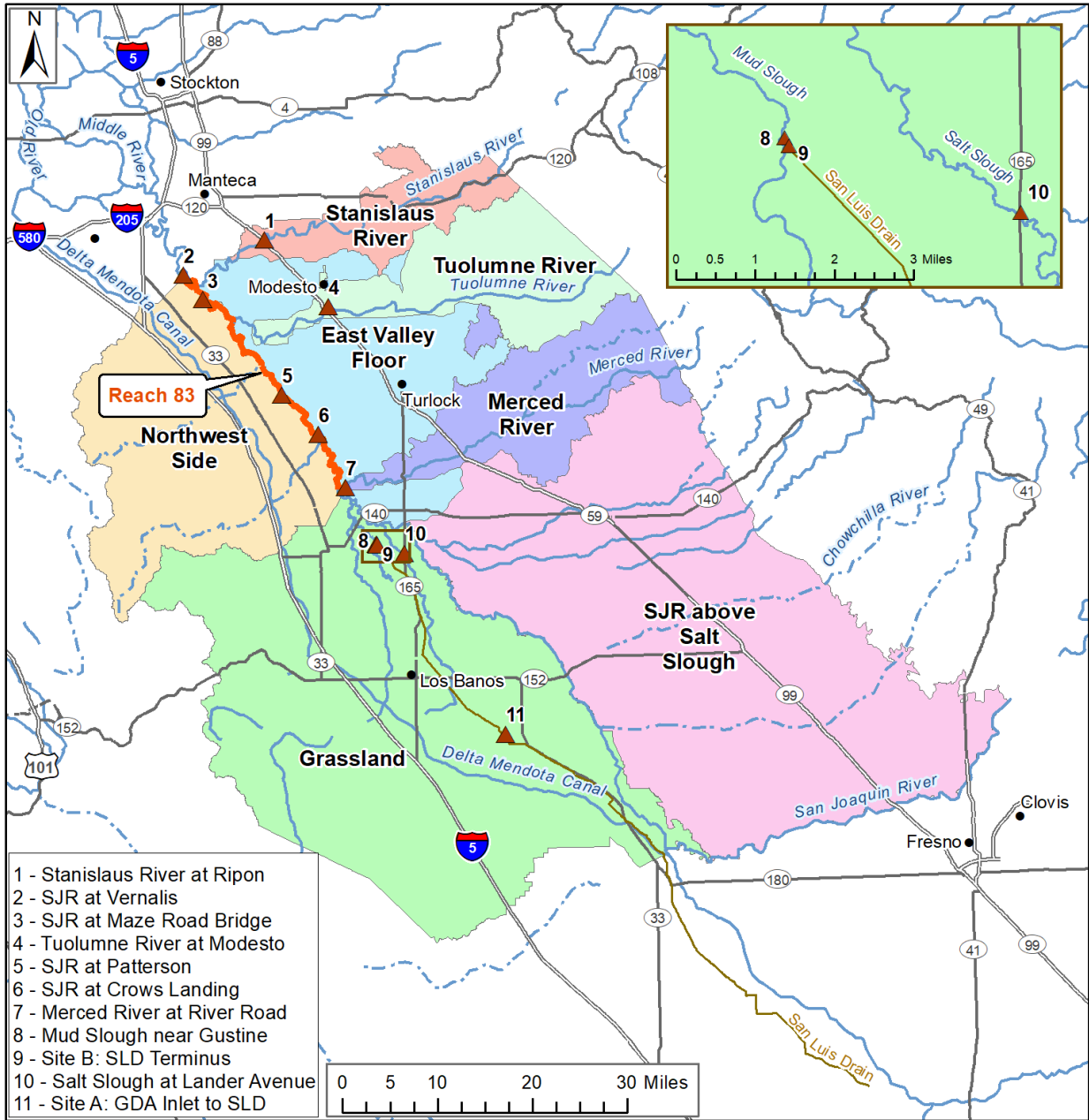


Figure 1. TMDL Subareas for Salt Load Management in the LSJR Basin

Reclamation has no role in recommending stakeholder drainage release schedules and salinity management practices within the Basin. Rather, Reclamation’s primary role is developing decision support tools to provide forecasts of salinity in the San Joaquin River at Maze Road Bridge, Crows Landing, and Vernalis compliance monitoring locations. Salinity forecasts extend two weeks into the future, which was suggested as a good compromise between model predictive uncertainty and stakeholders’ ability to undertake timely actions during periods of potential 30-day running average salinity exceedance.

In addition to its commitment to the RTMP, Reclamation performs a variety of salinity management activities within the San Joaquin watershed, such as the Grassland Bypass Project; the WaterSMART Grant Program; the New Melones Plan of Operations; and the Westside Regional Drainage Plan.

# Reclamation Staff Resources

Table 1 lists Reclamation staff resources utilized in the Salt and Boron Control Program on the LSJR.

Table 1. Reclamation Staff Involved in the RTMP

<b>Name</b>	<b>Role</b>
Jobaid Kabir	Program Management
Grace Windler	Regional Water Quality Coordinator
Jun Wang	Watershed Analysis Risk Management Framework (WARMF) Modeler
James Lu	Regression Modeler
Junaid As-Salek	Contracting Support

This page intentionally left blank

# Fiscal Year (FY) 2025 Goals and Objectives

All the activities and technical support planned for FY 2025 are intended to provide resources, information, and support to LSJR stakeholders who wish to participate in the RTMP.

Table 2. Reclamation Goals

FY 2025 Goals
<p><b>Goal 1. Provide funding for maintaining and improving forecasting tools</b></p> <ul style="list-style-type: none"> <li>• Contract with Systech Water Resources, Inc. for improvements to the WARMF forecasting model. Specific improvements planned for 2024/2025 include the following:</li> <li>• Improve accuracy of daily forecasting of flow and EC through an option to auto-calibrate the model in advance of each forecast</li> <li>• Develop real-time data quality assurance capability in a data pre-processor using methodology developed at Berkeley Laboratory. Provide access through the existing WARMF model user interface</li> <li>• Perform routine model database updates with daily data from the SJVDA westside stations, westside diversion stations and eastside drainage and operational spill monitoring stations</li> <li>• Contract with Water Resources Systems for technical expert services from Dr. Nigel Quinn</li> <li>• Continued support to the United States Geological Survey (USGS) for operation and maintenance of upgraded monitoring stations at Mud and Salt Slough that include acoustic Doppler sensors for backwater flow estimation</li> <li>• Support the USGS for operation and maintenance of flow and EC monitoring stations on the mainstem of the San Joaquin River</li> </ul>
<p><b>Goal 2. Maintain and improve forecasting tools and methods</b></p> <ul style="list-style-type: none"> <li>• Continue to assess WARMF and Regression model accuracy for forecasting SJR flow and salinity</li> <li>• Recalibrate WARMF model using most available hydrology, water quality, and managed flow data</li> <li>• Improve WARMF model performance for daily forecasting by using current real time SJR watershed and tributary data</li> <li>• Continue working with stakeholders to improve access to District flow and salinity data to enhance WARMF forecasting reliability</li> <li>• Encourage progress toward real-time data access which can be utilized for daily forecasting</li> </ul>
<p><b>Goal 3. Provide flow and salinity forecasts</b></p> <ul style="list-style-type: none"> <li>• Using the WARMF and Regression models, continue to provide 14-day forecasts of flow and salinity at Vernalis, Maze Road Bridge, and Crows Landing compliance monitoring stations daily</li> <li>• Assess model results daily to provide most reliable model-based forecast to stakeholders</li> </ul>
<p><b>Goal 4: Coordinate with stakeholders</b></p> <ul style="list-style-type: none"> <li>• Provide occasional technical briefings on WARMF model forecasting in conjunction with regular SJVDA RTMP Steering Committee meetings</li> <li>• Participate in wetland real-time salinity management coordination meetings led by Grassland Water District that involve refuge water managers, wetland management consultants, and agency personnel</li> <li>• Encourage continued participation in the real-time management program by East Valley Floor stakeholders – primarily Modesto and Turlock Irrigation Districts</li> </ul>

<b>FY 2025 Goals</b>
<ul style="list-style-type: none"> <li>• Convene quarterly MAA meetings with the CV Water Board and other interested parties to share updates and ongoing work</li> </ul>
<p><b>Goal 5: Provide technical support</b></p> <ul style="list-style-type: none"> <li>• Provide technical support to stakeholders, upon request, for designing and installing sensor networks and following real-time drainage data quality assurance protocols</li> <li>• Provide technical support to stakeholders for troubleshooting flow and water quality monitoring instrumentation and telemetry</li> <li>• Provide assistance to stakeholders in writing grant proposals for funding to enhance the RTMP initiative</li> </ul>
<p><b>Goal 6: Maintain monitoring stations</b></p> <ul style="list-style-type: none"> <li>• Provide technical support and assist with grant applications for managed wetland real-time water quality implementation activities support complementary real-time monitoring activities in the adjoining State and Federal refuges</li> </ul>
<p><b>Goal 7: Participate in Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS)</b></p> <ul style="list-style-type: none"> <li>• Continue participation in the CV-SALTS Optimization &amp; Prioritization Study as part of the Basin's new Salt Control Program</li> <li>• Share WARMF model database and provide periodic data updates to CV-SALTS consultants developing CV-SWAT watershed planning model</li> <li>• Provide technical support to CV-SALTS data and modeling small focus group on matters related to model and algorithm selection and data synthesis</li> <li>• Provide policy and administrative agency support to CV-SALTS small policy focus group on matters related to salinity management areas and stakeholder acceptance and consensus building</li> <li>• Attend regularly scheduled meetings of CV-SALTS Executive Committee.</li> <li>• Convene technical meetings as needed on topics and issues discussed by the CV-SALTS Executive Committee</li> </ul>

## Detailed Description of FY 2025 Goals for the RTMP

### Goal 1. Provide funding for maintaining and improving forecasting tools

Reclamation will continue funding Systech Water Resources, Inc. to provide continuous technical support for maintenance of the WARMF model and to improve model accuracy and reliability. As outlined above, the tasks for FY 2025 include further refinement of the autocalibration feature in the WARMF model to improve forecast accuracy by recalibrating key model parameters to match real-time observations in advance of each forecast. Another important model enhancement will be the development of real-time data quality assurance (QA) capability as a model pre-processor using algorithms developed at Berkeley Laboratory and recently published in a peer reviewed American Society of Civil Engineers journal. Using a common QA tool prior to importing model data can streamline and enhance reliability of daily forecasts. Access to the QA tool will be provided through the existing WARMF model user interface. This tool will also save time during routine model database updates with daily data from the San Joaquin Valley Drainage Authority (SJVDA) westside stations, westside diversion stations, and eastside drainage and operational spill monitoring stations.

Reclamation will continue to provide funding to Dr. Nigel Quinn through a cooperative agreement with Grassland Water District (GWD) for technical support on real-time monitoring activities and as a stakeholder liaison for the successful implementation of the RTMP. He will oversee GWD monitoring activities as well as monitoring activities by the SJVDA, weekly diversion data provided by Patterson and West Stanislaus Irrigation Districts, and quarterly flow and EC data provided from eastside drainage stations operated by Turlock and Modesto Irrigation Districts. These data supplement the existing WARMF model observation database and are critical for reliable model autocalibration.

Reclamation will continue financial support to the USGS for operation and maintenance of five monitoring stations along the main stem of the San Joaquin River. The stations are:

1. 11261500 - SAN JOAQUIN R FREMONT FORD CA
2. 11273400- SAN JOAQUIN R ABOVE NEWMAN CA
3. 11274550 - SAN JOAQUIN R NR CROWS LANDING CA
4. 11262900 - MUD SLOUGH NR GUSTINE CA
5. 11261100 - SALT SLOUGH A HWY 165 NR STEVINSON CA

The USGS received funding to upgrade the Mud and Salt Slough monitoring stations with acoustic Doppler transducer technology in mid-2022. This upgrade was commissioned to improve the accuracy of flow measurement and eliminate backwater episodes where high flows in the San Joaquin River reduce discharges into the river while artificially increasing stage in both sloughs. These conditions often produce over-estimates of flow that must be corrected in the data record during data quality control processing. The USGS has completed installation of the Mud Slough acoustic Doppler transducer although the agency technicians are still struggling with sedimentation issues that compromise the accuracy of the velocity readings taken with the instrument. The installation at Salt Slough will commence in the spring of 2024, likely after major wetland drawdown has concluded and flow in the conveyance has subsided.

## **Goal 2. Maintain forecasting tools and methods**

Using the WARMF and Regression models, Reclamation will continue to produce 14-day forecasts of flow and salinity at Vernalis, Maze Road Bridge, and Crows Landing compliance monitoring stations. Either WARMF or Regression model forecasts are produced daily depending on conditions in the river and the time of year. Under circumstances that cause water quality conditions in the SJR to deviate from the inverse relationship between flow and EC, the WARMF model is typically substituted for the Regression model for making forecasts. Such circumstances can include flood events and periods of wetland pond drawdown where a period of high flow from the state, federal and private seasonal wetland is associated with degraded water quality.

Reclamation will periodically assess the forecasting accuracy of both the WARMF and Regression models by comparing their performance with observations of flow and salinity. These assessments will be used to update previous reports on the same topic.

Reclamation continues to develop automated methods for data retrieval from various sources to minimize the time taken to update the WARMF model and reduce potential error associated with manual data processing. These data will likely improve the model performance and aid eventual technology transfer to stakeholders since stakeholders typically react positively and with greater interest when their own data is been used in the model. The SJVDA has indicated it will become more involved in WARMF model-based forecasting which will help expand access to stakeholder flow and salinity data, which will in turn improve the reliability and accuracy of WARMF model-based forecasts.

Reclamation continues to maintain and improve WARMF model reliability through the following tasks:

- Adjust WARMF model flow and EC values as close as possible to the observed values on the day the forecast is run using an automated calibrator
- Upgrade the WARMF Hydrologic Simulation Algorithm to simulate backwater effects
- Update the Reclamation Regression model algorithms to account for system changes that can affect the relationship between EC and total dissolved solids. This relationship is directly related to the ionic composition of SJR water which is a blend of a chloride dominated east-side runoff and irrigation return flows and the more sulphate dominated west-side return flows – the greater the percent contribution of evaporated Delta water supply in the SJR the higher the EC to total dissolved solids ratio
- Improve the algorithm to predict seepage loss in the mainstem SJR more accurately
- Interpolate gaps in daily weather data obtained from the California Irrigation Management Information System to improve WARMF model reliability

### **Goal 3: Provide flow and salinity forecasts**

Since FY 2018 Reclamation has used the California Nevada River Forecast Center’s flow forecasts for both WARMF and Regression model-based forecasts of SJR water quality at the compliance monitoring stations.

Using the WARMF and Regression models, Reclamation will continue to produce 14-day forecasts of flow and EC at the Vernalis, Maze Road Bridge, and Crows Landing compliance monitoring stations. As previously stated, under conditions in which the inverse relationship of flow and EC in the SJR persist, Regression forecasts substitute for WARMF model forecasts. Only one modeling of flow and salinity forecasts is posted on the Reclamation PTMS website. WARMF model flow and salinity outputs for additional points on the SJR are available to stakeholders upon request.

### **Goal 4: Coordinate with stakeholders**

Reclamation has been conducting informational meetings jointly with the SJVDA and the RTMP Steering Committee to solicit feedback on Reclamation tool-building activities and help guide the SJVDA’s own decision support activities that include forecast model development. Starting



in FY 2020, Reclamation began to periodically attend quarterly SJVDA stakeholder meetings that included members of the RTMP Steering Committee. Reclamation will continue to attend these stakeholder meetings when possible to provide WARMF model development updates and results during FY 2025. Reclamation benefits from continued collaboration with eastside and westside San Joaquin Basin stakeholders in RTMP activities and encourages input from cooperating water districts and interested stakeholders to improve disseminate of flow and salinity forecasts for meeting RTMP goals..

### **Goal 5: Provide technical support**

There has been a significant need for real-time data quality assurance processing tools for several decades. There is also great interest in developing software tools or routines that parse these data that have undergone quality assurance checks as input to decision support models such as the WARMF model. A toolbox was developed by Berkeley Laboratory personnel that was embedded in the U.S. Army Corps of Engineers (USACE) public domain hydrologic data management software platform HEC-DSSVue as well as a stand-alone CRON routine on the commercial HOSTGATOR cloud web server platform. The HEC-DSSVue software was developed by the USACE to visualize time series data used in their hydraulic and water resource management models quickly and efficiently, requiring minimal data storage. The embedded real-time QA capability uploads time series data and screens for data that is missing, falls outside upper and lower bounds, and that exceeds user defined rate of change criteria between adjacent values in the time series. The software then provides the ability to create synthetic time series data that can be substituted for erroneous or missing values. Data from the SJVDA's westside stations and GWD have processed using these software routines and entered into HEC-DSSVue based databases. The parallel application of the software on the commercial HOSTGATOR platform was abandoned in early 2023 owing to the high annual cost of maintaining server access, the computer support skills needed to navigate the server software, and the lack of interest among San Joaquin Basin stakeholders to embrace the technology. Large entities such as Turlock, Modesto, and Merced Irrigation Districts employ dedicated staff to operate their hydrologic data management systems using commercial systems such as WISKI, HYDSTRA, and AQUARIUS which also perform the basic data QA functions but at higher cost.

Reclamation continues to provide technical support to stakeholders interested in collaborating on various aspects of the RTMP including real-time data QA for flow and EC and water quality sensor network development. Reclamation also encourages collaboration on innovative research and development opportunities and can help with writing grant proposals, especially those relevant to the current CV-SALTS Prioritization & Optimization Study and Salt Control Program. Reclamation manages several federally funded grant programs some of which are specifically tailored for collaborative work with stakeholders on water and water quality related issues.

### **Goal 6: Maintain monitoring stations**

Reclamation has supported operations and maintenance of monitoring stations installed and maintained by GWD for more than a decade. During FY 2025 Reclamation has pledged continuation of this support and will continue to work with GWD to ensure easy access and efficient use in WARMF model-based forecasts. Reclamation also continues to support the

GWD HydroMetCloud web portal that provides access to flow and EC data at more than 30 stations in the district. GWD has received positive wetland stakeholder feedback on this web portal and assurances significant stakeholder reliance on these data.

### **Goal 7: Participate in CV-SALTS**

During FY 2025 Reclamation will continue participation in various aspects of the CV-SALTS-led planning initiatives. Reclamation is a permanent agency member of the CV-SALTS Executive Committee and had been active on the Lower San Joaquin River Subcommittee that reported directly to the CV-SALTS Executive Committee. The Lower San Joaquin River Subcommittee disbanded upon the ratification of adaptive EC objectives upstream of Vernalis to protect riparian diverters along Reach 83 of the SJR. Reclamation has been and continues to be involved in the dedicated small focus groups dealing with policy issues and technical issues related to the selection, data needs, and maintenance of watershed models such as the CV-SWAT model. CV-SWAT was selected as the tool of choice for the development of Salt Management Regions and Salt Management Areas as part of the ongoing Prioritization & Optimization Study. The dedicated policy and regulatory small group will provide direction for the implementation of newly adopted water quality objectives (WQOs) for the LSJR and other Basin Plan amendments.

A new area of potential collaboration with Reclamation staff is the management of the San Joaquin River Improvement Project (SJRIP) facility in Panoche Drainage District and the potential use of the selenium treatment plants adjacent to SJRIP – both funded and facilitated by Reclamation. The SJRIP is a dedicated reuse area for subsurface agricultural drainage from 100,000 acres of selenium impacted land in the Grasslands Agricultural Basin where forage crops are grown to offset the operation and maintenance costs of the facility. The SJRIP could become an exemplar for CV-SALTS as a salinity management area dedicated for salt disposal. There are few cogent examples of this type of operation in the Central Valley. Although Berkeley Laboratory and California State University Fresno have been experimenting with remote sensing methods and soil salinity mapping to better understand soil salinity dynamics and improve long-term management of soil forage fertility at the facility for the past decade – significant additional research will be necessary before this salinity management option can be reliably prescribed by CV-SALTS in a long-term management plan.

The original workplan adopted by Reclamation in 2010 proposed a four-phase implementation plan that ran through 2020. Rather than create a new phase of this plan Reclamation proposes tying future implementation activities to CV-SALTS workflows and reporting on the same - especially relative to the ongoing Prioritization & Optimization Study that is expected to last at least ten years. Since CV-SALTS is a stakeholder driven initiative – this will ensure efficient use of Reclamation’s public funding and enhance Reclamation’s commitment to meeting goals of the CV-SALTS Salt Control Program.

# Funding and Status of the Monitoring Program

Funding amounts listed in Table 3 are subject to allocation by Congress and are to be considered estimates until allocations have been completed. The PTMS allocation is utilized to fund Reclamation activities directly related to salinity in the SJR. The WaterSMART Program also provides salinity management benefits to the SJR and accordingly is listed in Table 3.

The USGS will continue operation and maintenance of Mud Slough, Salt Slough, Crows Landing, Newman, and Fremont Ford monitoring stations needed for WARMF forecasting.

Table 3. FY 2025 Proposed Reclamation Funding

No.	Funding Program	Previous FYs Funded	FY 2025 Allocation
I.	Systech Water Resources Inc. for providing WARMF technical support	2019-2024	\$750,000
-	Grassland Water District (GWD)	2017-2024	N/A
-	Water Resources Systems (contracted through GWD)	Annually	N/A
-	Reclamation Staff Resources	Annually	N/A
II.	WaterSMART Program	2024	TBD

Monitoring stations are located on the LSJR and on the west side of the SJR Basin, as reported in the 2014 SJR RTMP Framework Document. These stations are directly supported by Reclamation and the SJVDA. Their current status and Reclamation’s roles are listed in Table 4.

Table 4. Status of Monitoring Stations

Location	Status
<b>San Joaquin River Stations</b>	
SJR at Lander Avenue	Active. Operated by the California Department of Water Resources (DWR) Reporting data to CDEC.
SJR at Fremont Ford	Active. Operated by the USGS funded by Reclamation. Reports data to NWIS/CDEC.
SJR at Newman	Active. Operated by the USGS funded by Reclamation. Reports data to NWIS/CDEC.
SJR near Crows Landing	Active. Operated by the USGS funded by Reclamation. Reports data to NWIS/CDEC.
SJR at Maze Road Bridge	Active although has been subject to EC sonde reliability issues during 2023. Operated by DWR. Data reported to CDEC. Data can be manually downloaded by DWR when data telemetry is impacted.

Location	Status
<b>Westside Drainage Stations</b>	
Salt Slough at Highway 165 (near Stevenson)	Active. Operated by the USGS funded by Reclamation. Reports data to NWIS/CDEC. To be upgraded with acoustic Doppler in spring 2024 to improve data accuracy and reliability during occasional SJR high flow-induced backwater conditions.
Mud Slough near Gustine	Active. Operated by the USGS funded by Reclamation. Reports data to NWIS/CDEC. Upgraded with acoustic Doppler in late fall 2023 to improve data accuracy and reliability during occasional SJR high flow-induced backwater conditions. Sedimentation fouling problems being addressed at site. Effort to coordinate USGS and GWD flow monitoring at this site.
Orestimba Creek near River Road, Crows Landing	Inactive. Site abandoned by the USGS.
San Luis Drain at Outlet	Active. Operated by the SJVDA. Not reported in CDEC, but sent directly to Reclamation.
Los Banos Creek at Highway 140	Active. Operated by the GWD. Reported to GWD HydroMetCloud web portal.
Marshall-Spanish-Moran Drains	Active. Telemetry and sonde upgraded in 2021-2022. Operated by the SJVDA.
Moran Drain	Active. Telemetry and sonde upgraded in March 2022. Operated by the SJVDA.
Westley Wasteway	Active. Telemetry and sonde upgraded in March 2022. Operated by the SJVDA. New culvert installed in February 2022.
Del Puerto Creek	Active. Site moved to the USGS site 11274630. Lat. 37.487, Long. 121.208. Reports data to NWIS.
Hospital Creek	Active. Telemetry and sonde upgraded in 2021. Operated by the SJVDA.
Ingram Creek	Active. Telemetry and sonde upgraded in 2021. Operated by the SJVDA.
<b>Diversion Monitoring Stations</b>	
Patterson Irrigation District	Reporting weekly via e-mail bulletin for use in forecasting.
West Stanislaus Irrigation District	Reporting weekly via e-mail bulletin for use in forecasting.

# References

- Basin Plan. 1994 Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins, Fourth Edition, California Regional Water Quality Control Board Central Valley Region, updated April 2016.
- Compliance Plan 2010. Compliance Monitoring and Evaluation Plan in Compliance with the “Management Agency Agreement between the Central Valley Regional Water Quality Control Board and the Bureau of Reclamation” executed on December 22, 2008; May 2010.
- Compliance Report 2010. Compliance Monitoring and Evaluation Report, FY 2000 to Present in Compliance with the “Management Agency Agreement Between the Central Valley Regional Water Quality Control Board and the Bureau of Reclamation” executed on December 22, 2008; May 2010.
- CV Water Board 2004a. Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Salt and Boron Discharges into the Lower San Joaquin River Draft Final Staff Report Appendix 1: Technical TMDL Report, Regional Water Quality Control Board Central Valley Region, July 4, 2004.
- CV Water Board 2017. Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins to add Electrical Conductivity Water Quality Objectives in the San Joaquin River Between the Mouth of the Merced River and the Airport Way Bridge Near Vernalis. Regional Water Quality Control Board Central Valley Region, June 9, 2017.
- Dinar A., N.W.T Quinn. 2022. Developing a Decision Support System for Regional Agricultural Nonpoint Salinity Pollution Management: Application to the San Joaquin River, California. *Water* 2022, 14, 2384. <https://doi.org/10.3390/w14152384> .
- Lu J., J. Wang, E. Raley, N.W.T. Quinn and J. Kabir. 2019. An Alternative Approach to Salinity Forecasting in the Lower San Joaquin River. *Modern Environmental Science and Engineering*. ISSN 2333-2581
- Management Agency Agreement 2008 and 2014. Management Agency Agreement Between the Central Valley Regional Water Quality Control Board and the United States Bureau of Reclamation, Mid-Pacific Region. A Cooperative Means of Implementing Relevant Provisions of the Regional Water Board’s Water Quality Control Plan for the Sacramento River and the San Joaquin River Basins – 4th Edition, executed in December 2008 and updated in December 2014.
- Oster, J.D., N.W.T. Quinn, A.L.Diagh, E. Scudiero. 2021. Agricultural subsurface drainage water: an unconventional source of water for Irrigation. In: Qadir, M, Smakhtin, V., Koo-Oshima, S., Edeltraud, E. (Eds.), *Unconventional Water Resources*, Springer Inc.

- Quinn N.W.T. and J. Karkoski. 1998. Potential for real time management of water quality in the San Joaquin Basin, California. *Journal of the American Water Resources Association*, Vol. 36, No. 6, December
- Quinn N.W.T., G. Lee and D. Cozad. 2010. Information technology and decision support tools for stakeholder-driven river basin salinity management. *IEEE Proceedings*, 43rd Annual HICSS Conference, Kawaii, Hawaii, Feb 5-9, 2010.
- Quinn N.W.T., R. Ortega and L. Holm. 2011. Environmental sensor networks and continuous data quality assurance to manage salinity within a highly regulated river basin. *Decision Support Systems in Agriculture, Food and the Environment: Trends, Applications and Advances*. Nediljka Gaurina-Medjimurec, Editor. IGI Global, ISBN 978-1-4666-7336-6.
- Quinn N.W.T, A. Osti, J. Herr, E. Raley and J. Wang. 2018. WARMF-Online – A Web-Based Portal Supporting Real-time Salinity Management in the San Joaquin River Basin. *Open Water*, Vol 1, No. 1. <http://scholarsarchive.byu.edu/openwater/vol4/iss1/4/>
- Quinn N.W.T.; J.D. Oster. 2021. Innovations in sustainable groundwater and salinity management in California’s San Joaquin Valley. *Special Issue on Sustainable Irrigation and the Environment: The Role of Governance*. *Sustainability* 2021, 13(12), 6658; <https://doi.org/10.3390/su13126658>.
- Quinn, N.W.T., V. Sridharan,, J. Ramirez-Avila, S. Imen, H. Gao, R. Talchabhadel, S. Kumar, W. McDonald. 2022. Applications of GIS and remote sensing in public participation and stakeholder engagement for watershed management. In Press. -*Environmental Systems Modelling*, 4, 18149, doi:10.18174/sesmo.18149.
- Quinn, N.W.T.; M.K. Tansey, J. Lu. Comparison of Deterministic and Statistical Models for Water Quality Compliance Forecasting in the San Joaquin River Basin, California. *Water* **2021**, 13, 2661. <https://doi.org/10.3390/w13192661>
- Reclamation Action Plan 2008. Reclamation’s Salinity Management Plan, Actions to Address the Salinity and Boron Total Maximum Daily Load Issues for the Lower San Joaquin River, July 2008 (Updated in November 2010).
- Singh, A., N.W.T Quinn, S.E. Benes and F. Cassel. 2020. Policy-driven sustainable saline drainage disposal and forage production in the western San Joaquin Valley of California. *Sustainability*. *Special Issue on Sustainable Irrigation and the Environment: The Role of Governance*. 12(16), 6362; pp Aug. 7, 2020. <https://doi.org/10.3390/su12166362>
- State Water Board D-1641. Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; A Petition to Change Points of Diversion of the Central Valley Project and the State Water Project in the Southern Delta; and A Petition to Change Places of Use and Purposes of Use of the Central Valley Project. State Water Resources Control Board, March 15, 2000.

Tran, V., S. Helmrich, N.W.T. Quinn, P.A. O'Day. 2023. Operationalizing real-time monitoring data in simulation models using the public domain HEC-DSSVue platform. American Society of Civil Engineers, Journal of Water Resources and Planning, Reston, VA.  
DOI: [10.1061/JWRMD5.WRENG-5728](https://doi.org/10.1061/JWRMD5.WRENG-5728)