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United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
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Sacramento, CA 95825-1898

MAR - 3 2014

IN REPLY REFER TO:

MP-740
ENV-8.00

Mr. James Brownell
Associate Engineering Geologist
Regional Water Quality Control Board
Central Valley Region
11020 Sun Center Drive, #200
Rancho Cordova, CA 95670

Subject: Bureau of Reclamation Quarterly Activity and Monitoring Report - 10/01/13 to 12/31/13

Dear Mr. Brownell:

Please find enclosed the *Quarterly Activity and Monitoring Report* for the fourth quarter of 2013. The report summarizes Reclamation's activities relative to its salinity control plan and fulfills the quarterly reporting requirement in the Management Agency Agreement.

We value the contribution and continued collaboration from your agency as we strive to address the salinity issues in the San Joaquin River. If you have any questions, please contact Mr. Michael Mosley at 916-978-5119 or mmosley@usbr.gov.

Sincerely,

Jobaid Kabir
Chief, Decision and Analysis

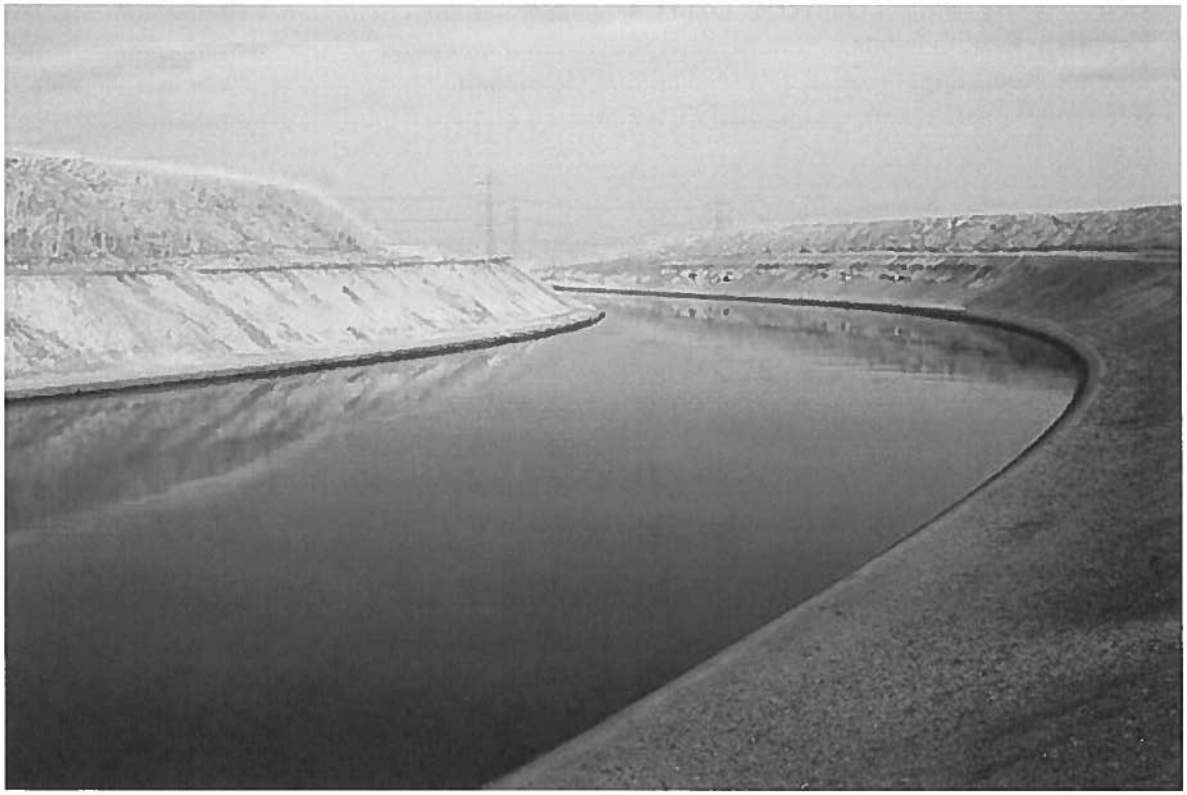
Enclosure

RECLAMATION

Managing Water in the West

Quarterly Activity and Monitoring Report
October 1 – December 31, 2013

In compliance with the "Management Agency Agreement between the Central Valley Regional Water Quality Control Board and the United States Bureau of Reclamation" executed on December 22, 2008



Delta-Mendota Canal near Tracy, California

February 14, 2014

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Abbreviations and Acronyms

Action Plan	Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River November 2008
Authority	San Luis & Delta-Mendota Water Authority
Basin Plan	Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4th Edition
BMP	Best Management Practices
BO	Biological Opinion
CALFED	California Bay-Delta Authority
CCID	Central California Irrigation District
CDEC	California Data Exchange Center
CDFW	California Department of Fish and Wildlife
Corps	U.S. Army Corps of Engineers
CVO	Central Valley Operations
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CV Water Board	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long Term Sustainability
DMC	Delta-Mendota Canal
DSS	Decision Support System
DWR	California Department of Water Resources
EC	electrical conductivity
GBP	Grassland Bypass Project
GDA	Grassland Drainage Area
GOES	Geostationary Operational Environmental Satellites
GRCD	Grassland Resource Conservation District
GWD	Grassland Water District
LBNL	Lawrence Berkeley National Laboratory
LSJR	Lower San Joaquin River
MAA	Management Agency Agreement
µS/cm	micro Siemens per centimeter
mg/L	milligram(s) per liter (parts per million)
Reclamation	United States Bureau of Reclamation
RTMP	Real Time Management Program

Service	U.S. Fish and Wildlife Service
SJR	San Joaquin River
SJRIP	San Juan Recovery Implementation Program
TAF	thousand acre-feet
TDS	total dissolved solids
TMDL	total maximum daily load
VAMP	Vernalis Adaptive Management Plan
WARMF	Watershed Analysis Risk Management Framework
WARMF – SJR	Watershed Analysis Risk Management Framework San Joaquin River
WDR	Waste Discharge Requirement
WQO	water quality objective
WRDP	Westside Regional Drainage Plan
WSI	Water Supply Index
YSI	Yellow Springs Instrument Company

Purpose

The Central Valley Regional Water Quality Control Board's (CV Water Board) Salt and Boron Total Maximum Daily Load (TMDL) was approved and placed into effect on July 28, 2006. In response to the Salt and Boron TMDL, the United States Bureau of Reclamation (Reclamation) developed the salinity management plan, *Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River* (Action Plan) and entered into a Management Agency Agreement (MAA) with the CV Water Board on December 22, 2008. The MAA describes the actions Reclamation will take to meet the obligations allocated to it by the Salt and Boron TMDL for the Lower San Joaquin River (LSJR). The MAA states, in part:

> Reclamation will submit quarterly reports to the Regional Water Board by 45 days after the end of the calendar quarter. The quarterly reports will include a summary of activities conducted by Reclamation during the quarter in conjunction with each element included in their Action Plan, including activities related to developing a Real Time Management Program. In addition Reclamation will include data collected relevant to DMC load evaluation.

The "Quarterly Activity and Monitoring Report" summarizes the activities conducted by Reclamation in conjunction with each element outlined in its Action Plan. The Action Plan describes Reclamation's past, current and planned practices and procedures to mitigate and manage adverse impacts of salt and boron imported into the San Joaquin Basin via the Delta Mendota Canal (DMC) in order to help achieve compliance with the objectives contained in the CV Water Board's *Water Quality Control Plan for the Sacramento River and the San Joaquin River Basins – 4th Edition* (Basin Plan).

Organization of Quarterly Report

The quarterly report provides a synopsis of the various activities associated with each element identified in the Action Plan. Action categories include Flow, Salt Load Reduction, and Mitigation. For each action a brief description and list of activities are identified. The quarterly report includes calculations of salt loads based on DMC deliveries and calculations of assimilative capacity provided through dilution flows. The calculation methods used in this report are provisional, and some elements in this report do not include estimations of benefits at this time. Reclamation submitted the *Compliance Monitoring and Evaluation Plan* to the CV Water Board (Reclamation 2010) which outlines the criteria and methodology for determining DMC loads and credits.

A. Flow Actions

Reclamation agreed to provide mitigation and dilution flows to meet the Vernalis salinity and boron objectives. Historically, Reclamation provided dilution flows from the New Melones Project and through purchases for the Vernalis Adaptive Management Plan (VAMP). The dilution flow provision in the VAMP expired recently; stakeholders within the watershed are currently negotiating a new agreement to replace the VAMP. Flow actions include but are not limited to: dilution flows from New Melones Reservoir, water acquisitions, and recirculation.

1. New Melones Reservoir Operations – Provision of Dilution Flow

Brief Description: In the Flood Control Act of October, 1962, Congress reauthorized and expanded the New Melones unit (P.L. 87-874) to a multipurpose unit to be built by the U.S. Army Corps of Engineers (Corps) and operated by the Secretary of the Interior as part of the Central Valley Project (CVP), thus creating the New Melones Unit. The multipurpose objectives of the unit include flood control, irrigation, municipal and industrial water supply, power generation, fishery enhancement, water quality improvement, and recreation. Since June of 2009, New Melones has been operated to meet the National Marine Fisheries Service Biological Opinion (BO) to Reclamation on the effects of the continued operation of the CVP and the California State Water Project on the various runs of Chinook salmon, Central Valley steelhead, and green sturgeon, and their designated critical habitat.

The Sacramento and San Joaquin River Basin Plan was amended in 2004 to include a Control Program for Salt and Boron Discharges into the LSJR. Items 12 and 13 of the Salt and Boron Control Program state:

> Item 12. Salt loads in water discharged into the LSJR or its tributaries for the express purpose of providing dilution flow are not subject to load limits described in this control program if the discharge:
>
> a. complies with salinity water quality objectives for the LSJR at the Airport Way Bridge near Vernalis;
> b. is not a discharge from irrigated lands; and
> c. is not provided as a water supply to be consumptively used upstream of the SJR at the Airport Way Bridge near Vernalis.
>
> Item 13. Entities providing dilution flows, as described in item 12, will obtain an allocation equal to the salt load assimilative capacity provided by this flow. This dilution flow allocation can be used to:
>
> 1) Offset salt loads discharged by this entity in excess of any allocation or; 2) trade, as described in item 10. The additional dilution flow allocation provided by dilution flows will be calculated as described in Table IV-8 (CV Water Board 2004c).

Activities

- Reclamation continues to operate its facilities to comply with State Water Board D-1641, the applicable Biological Opinions and the Stanislaus River at Ripon monitoring station dissolved oxygen criteria.

Quantification Methodology: Table IV-8 (CV Water Board 2004c) states that dilution flow allocations are calculated as follows:

$A_{dil} = Q_{dil} * (C_{dil} - WQO) * 0.8293$

Where:

A_{dil} = dilution flow allocation in thousand tons[1] of salt per month
Q_{dil} = dilution flow volume in thousand acre-feet (TAF) per month – above base flows
C_{dil} = dilution flow electrical conductivity (EC) in micro-Siemens per centimeter (µS/cm)
WQO = salinity water quality objective for the LSJR at Airport Way Bridge near Vernalis in µS/cm

Table 1 lists data and monthly calculations for the past quarter. Data for flow releases from Goodwin Dam, the Stanislaus River "design flows," and salinity at Orange Blossom Bridge are used to calculate the monthly dilution flow allocations. The water-year type is estimated based on the 75% probability of exceedance found in California Department of Water Resources (DWR) Water Supply Index Forecasts (http://cdec.water.ca.gov/cgi-progs/iodir/WSI) for the San Joaquin Valley. The 75% exceedance forecast for May 1, 2013 is 1.6, which classifies 2013 as a critically dry year.

Dilution Flow Allocation: WY2013 classified as a Critical year.

Table 1: Goodwin Dam Monthly Dilution Flow Allocation

	Goodwin Dam Flow (GDF) [a] TAF	Base Design Flow (DF) [b] TAF	Q_{dil}, TAF GDF-DF=Q_{dil}	WQO [c], µS/cm	C_{dil} (monthly average EC at Orange Blossom Bridge) [d], µS/cm	Dilution Flow Allocation, A_{dil}, tons
Oct-13	35	8	27	1000	68	-20869
Nov-13	15	13	2	1000	68	-1546
Dec-13	13	13	0	1000	68	0

Source: Reclamation 2013a
[a] http://www.usbr.gov/mp/cvo/reports.html
[b] Reclamation 2010 Compliance Monitoring and Evaluation Plan
[c] CV Water Board 2004a and 2004b Appendix 1: Technical TMDL Report
[d] http://cdec.water.ca.gov/cgi-progs/staSearch

2. Water Acquisitions

Brief Description: The Central Valley Project Improvement Act (CVPIA) signed into law on October 30, 1992, modified priorities for managing water resources of the CVP. CVPIA altered the management of the CVP to make fish and wildlife protection, restoration, and enhancement

[1] This is a typographical error in the Basin Plan Amendment. The units are actually tons.

have equal priority with agriculture, municipal and industrial, and power uses. To meet water acquisition needs under the CVPIA, the U.S. Department of the Interior developed a Water Acquisition Program, a joint effort by Reclamation and the U.S. Fish and Wildlife Service (Service). The program's purpose is to acquire water supplies to meet the habitat restoration and enhancement goals of the CVPIA and to improve Interior's ability to meet regulatory water quality requirements.

Activities

- Reclamation did not acquire any additional water this quarter.

Quantification Methodology: The discussion on dilution flow allocation presented under New Melones Reservoir Operations is pertinent here as well. Please refer to the Table IV-8 (CV Water Board 2004c) dilution allocation formula stated for the Table 1 calculation above.

3. DMC Recirculation Pilot Studies – Provision of Dilution Water

Brief Description: The DMC Recirculation Project studied the feasibility of using CVP flows to provide dilution water for salinity management. As part of the project studies, Reclamation conducted three pilot recirculation studies in 2004, 2007, and 2008. The pilot studies pumped water from the Delta at Tracy and conveyed it through the DMC to the Newman Wasteway, where it is then conveyed to the LSJR. The "Delta-Mendota Canal Recirculation Feasibility Study, Plan Formulation Report" is complete and available at http://www.usbr.gov/mp/dmcrecirc/docs/final/index.html.

Activities

- No new activities related to this project occurred in 2013.

B. Salt Load Reduction Actions

Reclamation is under a court order to provide drainage to its San Luis Unit, on the Westside of the Lower San Joaquin Valley. As part of this effort, Reclamation historically supported the Westside Regional Drainage Plan (WRDP) through grants and in-kind services. Salt Load Reduction Actions include the Grassland Bypass Project (GBP), implementation of the WRDP, and the following conservation programs: Water Conservation Field Services Program, WaterSMART Program (formerly Water 2025 Grants Program), and the California Bay Delta Authority (CALFED) Bay-Delta Water Use Efficiency Program.

1. Grassland Bypass Project

Brief Description: The GBP is a multi-agency stakeholder project currently based upon the 2009 Use Agreement[2] between the Reclamation and the San Luis and Delta-Mendota Water Authority

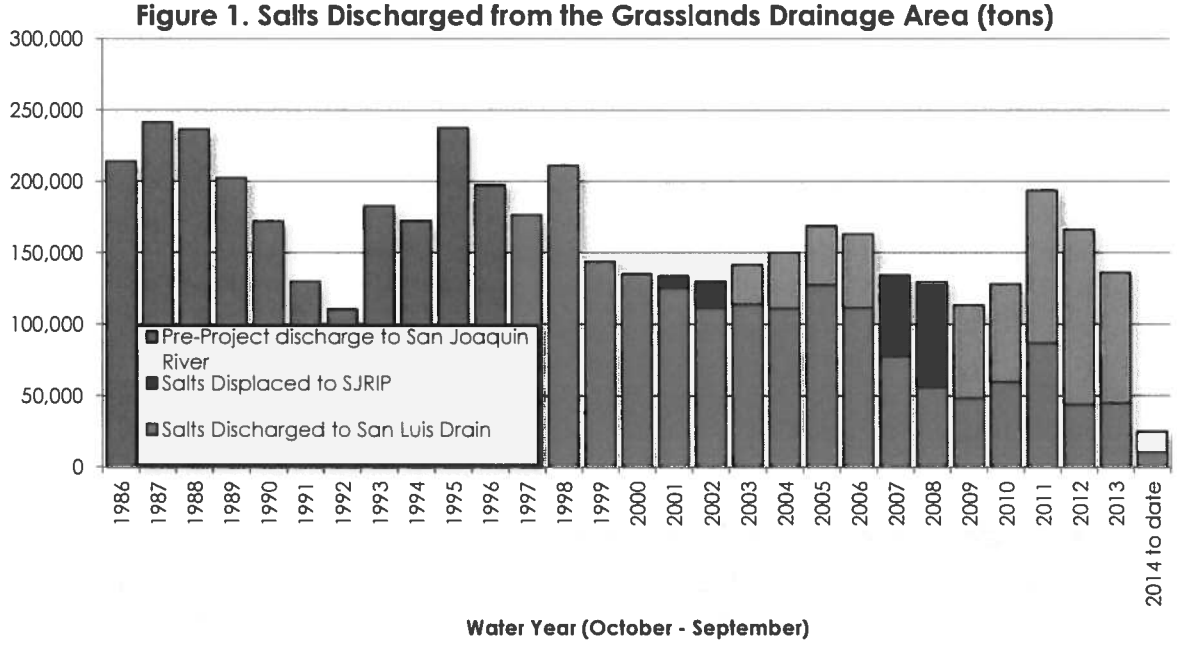
[2] U.S. Bureau of Reclamation and the San Luis and Delta-Mendota Water Authority, December 22, 2009. Agreement for Continued Use of the San Luis Drain for the Period January 1, 2010 through December 31, 2019. Agreement No. 10-WC-20-3975

(Authority) to manage and reduce the volume of agricultural drain water produced within the Grassland Drainage Area (GDA), and to use a 28-mile segment of the San Luis Drain to convey this drain water to Mud Slough, a tributary of the SJR. The GBP removed agricultural drainage water from most wetland water supply conveyance channels, facilitated drainage management that maintains the viability of agriculture in the GDA, and promoted continuous improvement in water quality in the SJR.

Activities

- The load of salts discharged from the GDA has been significantly reduced through the implementation of the Grassland Bypass Project in 1996 and the development of the San Joaquin River Improvement Project (SJRIP) in 2002.
- The reduction of salts is the result of activities conducted by the Grassland Area Farmers including source control in the GDA, tail water recycling, and displacement of agricultural drainage water across the SJRIP re-use area.
- Figure 1 shows the progressive reduction of salts from the GDA.[3] Prior to 1996, the average annual load of salts discharged from the GDA was over 190,000 tons per year. For Water Year 2013, we estimate that 44,270 tons of salts were discharged to the San Luis Drain and 91,730 tons were displaced to the SJRIP. Preliminary data for WY 2014 (October – December 2013) indicate that just under 15,000 tons of salts have been displaced to the SJRIP, with less than 11,000 tons of salts entering the San Luis Drain.

Figure 1. Salts Discharged from the Grasslands Drainage Area (tons)

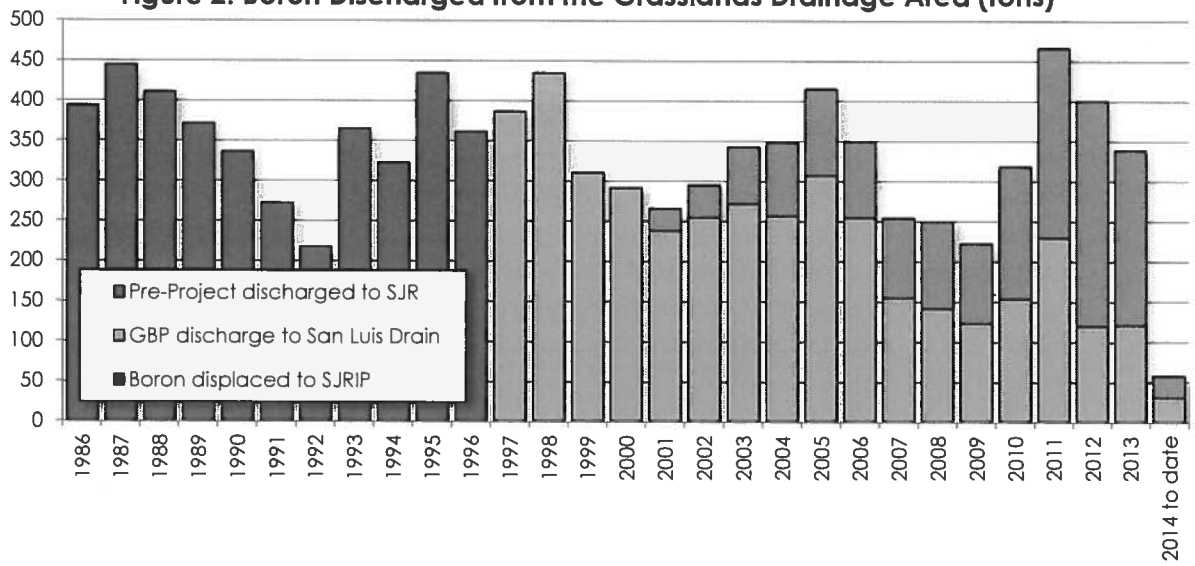


- Figure 2 shows the progressive reduction of boron discharged from the GDA.[4] Prior to 1996, the average annual discharge of boron from the GDA to the SJR was almost 360 tons per year. For Water Year 2013, we estimate that 120 tons of boron were discharged

[3] Source: Reclamation 2013b
[4] Source: Reclamation 2013b

to the San Luis Drain and 218 tons were displaced to the SJRIP. Preliminary data for WY 2014 (October – December 2013) indicate continued reduction and displacement of boron.

Figure 2. Boron Discharged from the Grasslands Drainage Area (tons)



- Reclamation and the Grassland Area Farmers continue to assist CV Water Board staff with the development of a revision of the 2001 Waste Discharge Requirement (WDR)[5] for the discharge of agricultural subsurface drainage water into Mud Slough (north), a tributary of the SJR.
- Reclamation continues to implement the monitoring requirements for the 2001 WDR. Reclamation continues to collect and analyze water samples from nine sites for selenium, boron, salts, nutrients, and molybdenum and continues to operate auto-samplers in the San Luis Drain and in the river at Crows Landing.
- The 2010-2011 GBP Annual Report was published in November 2013. The draft chapters for the 2012 Report are posted on the GBP website that is maintained by the San Francisco Estuary Institute: http://www.sfei.org/gbp. Reclamation is compiling flow and water quality data for the 2013 Report.

2. Westside Regional Drainage Plan

Brief Description: The Westside Regional Drainage Plan (WRDP) is a local stakeholder program developed by integrating all consistent elements of drainage management developed by government and local agencies and private partnerships. The original efforts of the WRDP focused on reducing selenium discharges to the SJR. Success of the original effort prompted a proposal to expand the WRDP to go beyond regulatory requirements and eliminate selenium,

[5] California Regional Water Quality Control Board, Central Valley Region, September 21, 2001. Waste Discharge Requirements No. 5-01-234 for the San Luis & Delta-Mendota Water Authority and the United States Department of the Interior, Grassland Bypass Channel Project (Phase II), Fresno and Merced Counties.

boron, and salt discharges to the SJR, while maintaining productivity of agriculture lands in the San Joaquin valley and enhancing water supplies for the region.

Reclamation provided $39 million in grant funding to implement the WRDP since 2002.

Activities

- Reclamation continues to administer four grants with Panoche Drainage District worth $23 million to implement the WRDP for source control activities, groundwater management, reuse of drain water and salt treatment/disposal. Negotiations have begun on a fifth grant worth $3.8 million.
- Panoche Drainage District has used most of this money to develop the SJRIP through construction of infrastructure, planting salt-tolerant crops, and environmental mitigation. For WY 2013, the District reports that it has displaced 26,127 acre-feet (AF) of agricultural drainage water, 112,160 tons of salts and 265 tons of boron from the river. Absent the SJRIP, this water, salt, and boron would have been discharged to the LSJR.
- Preliminary data for WY 2014 (October – December 2013) indicate continued reductions in boron discharged to the SJR through displacement to the SJRIP.

3. Conservation Efforts

Brief Description: The water use efficiency program includes several grant programs which fund actions to assure efficient use of existing and any new water supplies. Efficiency actions can alter the pattern of water diversions and reduce the magnitude of diversions, providing additional benefits. Efficiency actions can also result in reduced discharge of effluent or drainage and improve water quality. Although Reclamation is unable to quantify the benefits of the various funded projects as related to salinity reduction, the following information is provided to depict the Reclamation's water conservation efforts in the basin. Through WaterSMART and the CALFED Bay-Delta Restoration program, since 2006 Reclamation awarded 82 projects in the San Joaquin Valley that required performance measures. As information is collected from these projects, quantifiable benefits may be determined in the future.

Activities

Under the 2013 Bay-Delta Restoration Program: Agricultural Water Conservation and Efficiency Grants, Reclamation continues to offer grants to support projects within the San Joaquin Valley. Reclamation selected two grant recipients in 2013. Projects awarded include:

- Central California Irrigation District was awarded $300,000 for the Amaral System Spill Elimination Project. This project will convert 0.8 miles of open channel to pipeline and construct an intermediate reservoir on the Amaral system. The new pipeline will operate as a closed, on demand system and will eliminate operational spills. In addition, the new reservoir will capture tail water generated by upslope irrigators, eliminating drain water discharges to the SJR. The project is expected to conserve 487 acre-feet of water annually.

- Firebaugh Canal Water District was awarded $114,000 for the Check 2 Modernization Project. This project will replace a wooden check structure with a modern reinforced concrete structure. The new structure will include fabricated control gates with motorized operators. The operators will be integrated into the FCWD's Supervisory Control and Data Acquisitions (SCADA) system, allowing for remote monitoring and operation. This modernization project will improve operational efficiency and delivery flexibility on the entire 1st Lift Canal service area. The project will help the district better manage 10,000 AF of water annually.

Through the 2013 WaterSMART Water and Energy Efficiency Program, Reclamation awarded five projects within the San Joaquin basin:

- $1,332,506 to Henry Miller Reclamation District #2131 for making improvements to its Island Canal system, including constructing new automatic flow control structures, two automatic spillways, a new regulating reservoir, and a flow and water quality monitoring station. The project is intended to reduce operational spills and to make more precise deliveries. The project is expected to result in water savings of 4,150 AF annually, which will allow the District to reduce diversions from the Delta-Mendota Canal.
- $1,500,000 to the Patterson Irrigation District in the San Joaquin Valley to install three new pump stations and approximately 3.7 miles of new pipeline so that water from the District's drains can be recovered and pumped back into the delivery system for use, reducing the need for water from other sources. The project is expected to result in 5,000 AF of water savings annually, which will allow the District to market that amount through existing and new water transfer agreements.
- Recla $300,000 to the Tranquillity Irrigation District to connect two separate District distribution systems to increase efficiency. The project includes the construction of a pumping plant equipped with a SCADA system and flow meter and installation of a half-mile pipeline to connect the distribution systems. As a result, the project will reduce seepage, evaporation, and storage losses, expected to result in water savings of 630 AF annually. The District also expects to reduce energy consumption by approximately 216,100 kilowatt-hours each year by reducing pumping requirements.
- $300,000 to the Ivanhoe Irrigation District to automate the 68 Main distribution system by installing a SCADA system and automating five control in-line gate valves. By automating the 68 Main distribution system, the District will improve water delivery efficiencies and reduce groundwater pumping in an area experiencing groundwater overdraft. The project is expected to result in water savings of 413 AF annually.
- $299,608 to the Madera Irrigation District to implement various efficiency improvements throughout its delivery system, including the installation of automated flume gates, a new SCADA system, and flow meters. The project is expected to result in water savings of 2,925 AF annually through reduction of operational spills.

C. Mitigation Actions

Reclamation's Action Plan identifies two mitigation actions to reduce salinity loads: (1) a Real Time Management Program (RTMP) to improve the timing of west-side discharge of saline

drainage to the LSJR so as to occur during times of sufficient river assimilative capacity, and (2) implementation of innovative wetland best management practices (BMP) for salinity. These BMPs could include early drawdown and re-flooding during years of water surplus; delayed wetland drawdown (cannot be practiced on the same land two years in a row without damaging wetland habitat); and recirculation of wetland drainage. Reclamation actively supports the development of RTMP combined with a San Joaquin River Forecast Model (currently the WARMF model) for assimilative capacity.

1. RTMP – Development of Stakeholder-Driven Program

Brief Description: The RTMP is described in the TMDL as a stakeholder driven effort to use "real-time" water quality and flow monitoring data to support water management operations in order to maximize the use of assimilative capacity in the SJR. The CV Water Board describes this assimilative capacity as up to 85% of the load determined by the Vernalis salinity objective. Reclamation is working with SJR stakeholders and CV-SALTS to support the development of a stakeholder-driven program.

Activities

- Reclamation continues working to initiate stakeholder involvement opportunities in developing a RTMP. The RTMP team is evaluating opportunities for engaging stakeholders through participation in CV-SALTS and the Lower San Joaquin River Committee (LSJR Committee). Reclamation initiated monthly teleconferences with San Joaquin Basin stakeholders to discuss the direction and support for the RTMP. The RTMP Framework and Memorandum of Understanding draft documents were created and distributed for comment by all interested parties. The current targeted milestone for approval of the RTMP is August 2014.
- Reclamation continued working with the RTMP workgroup on the Framework, process and milestones to identify program needs. Reclamation and the workgroup conduct monthly meetings to coordinate their efforts. Participation in these meetings includes representatives from the Westside Coalition, USFWS, California Department of Fish and Wildlife (CDFW), and wetland areas. Together they are identifying the necessary requirements to establish a Water Board-approved RTMP and are reviewing the potential load requirements under the 2008 Salt and Boron TMDL.

2. RTMP – Technical Support

Brief Description: A successful RTMP will require a real-time monitoring network and a model capable of forecasting SJR assimilative capacity. The concept behind the RTMP is to enable the use of available assimilative capacity to export salt loads from the basin. The WARMF-SJR River Forecast model, currently being enhanced to make it more user-friendly, is one component of the RTMP decision support system. Reclamation is committed to participate in the continued development of tools. Reclamation will continue to support the development of the RTMP; some of their activities are described below.

Activities

- The RTMP pilot study includes developing a visualization tool that helps wetland water managers to: characterize salt loading, estimate salt loads leaving their management areas, and compare loads being discharged to Mud and Salt Sloughs and the SJR and target salt loads. Work is underway at Lawrence Berkely National Laboratory (LBNL) to develop a schema for allocating salt loads based on factors such as land area or historic salt loads. Salt loading can either be estimated by the WARMF-SJR model or, where monitoring stations are installed, on historic data. The current tool presents real-time flow, EC and salt load data within water supply conveyances entering the GRCD, conveyances within the GWD and in drainage conveyances leaving the GRCD. The visualization tool obtains the last 31 days of hourly mean data after it has been processed by the WISKI software program. The WISKI software was purchased for Grassland Water District in late 2013 and has been successfully installed on a dedicated server also purchased for the District. GWD personnel are trained on use of the software through instructional videos developed at LBNL and through hands-on training at the District office. Recent feedback from the District suggests enthusiastic adoption of the software – the time savings alone in generating annual reports for Reclamation on the monitoring program will be substantial. Continuing cooperative work with GWD explores using the existing network to calculate flow and salt loading at locations that are optimal for salinity District management decision making.

Figure 3. San Joaquin River at New Jerusalem Drain Monitoring Station

- Several technical meetings were held with the objective of improving the current WARMF-SJR forecast model interface. The improved WARMF-SJR Forecast Model interface will ultimately improve the following:
    - Make it easier to assemble the data sets and model inputs to make forecasts of SJR salt assimilative capacity.
    - Improve model visualization of each forecast to make it easier to interpret model output. The Lagrangian (Gowdy) output facilitates an improved understanding of who contributes what and when along the SJR. Each output is for a single day and these need to be integrated over time to obtain a complete picture of each stakeholder's relative contribution to salt loading. Reclamation's GWD visualization tool which displays Ec and flow data and combines these to estimate salt load is receiving data from GWD's WISKI server (last month the tool was still tied to the LBNL server). This is a significant development and

provides an example to other small water districts of the benefits of real-time monitoring.
- The GOES assignments appear to have been re-assigned. The hiatus in service was too long to prevent this from taking place. Once re-established, work will proceed to restore GOES telemetry and to work with water district managers to encourage active maintenance of the sensors.

- A report was released online :
https://www.researchgate.net/profile/Nigel_Quinn/publications/
This publication describes research, testing and development work related to the WARMF-SJR model and the procedures involved in incorporated point source data into the model. The report also exposes limitations in model reliability and the simulation of wetland hydrology. These are longer-term development issues that will be addressed by Reclamation and the user community over time.

- LBNL and Reclamation continue to work closely with Systech Water Resources, Inc. and the US Geological Survey to improve the resolution of the current surface and groundwater simulation models by redefining watersheds to match water districts on the west-side of the San Joaquin Basin and improving automation of data assimilation for real-time forecasting. A new version of WARMF-SJR was developed that recognizes the west-side tributary discharges to the SJR. In the WARMF-SJR model the model linkage between watershed and river is severed and the flows and salt loads that were simulated by the model replaced by observed flow and salt load data from monitoring station continuous monitoring data from 2005 to 2012. Data was entered into the WISKI database and added to the model input files to allow the model to be run with these inputs. For 2013 to present, simulated data was generated based on like-year input. The substitution of actual data for model simulated data will allow stakeholders to develop a better understanding of the relationship between their land use practices, drainage, flow and salt loads.

3. Wetland Best Management Practices Plan

The CDFW and the GRCD operate under BMPs to reduce the impact of discharges from managed wetlands into the SJR. Reclamation also provides resources to support the development of a real-time monitoring network and other potential BMP analysis tools within Federal, State, and private managed wetlands.

Activities

- Reclamation continues support of the network of real-time flow and water quality monitoring stations at some wetland pond sites and in all major inflow and outflow conveyances within the GWD.
- Reclamation provided ArcGIS software to the GWD to allow the Water Master in the GWD to use the visualization tool. The tool requires the MapObjects toolbox to render color ramping on each monitored conveyance canal on the GIS map.

- Reclamation acquired the hydrologic data management system WISKI and is setting the system up on the GWD server. Installation is scheduled for November 21, 2013. Once installed, the existing WISKI database will be migrated from LBNL to the GWD and training provided to GWD personnel on its use. This software will provide GWD the capability of doing real-time data quality assurance – an essential part of real-time water quality management that has been technically challenging in the past owing to a lack of a suitable software tool.
- Reclamation met twice and participated in several conference calls with the U.S. Fish and Wildlife Service, California Department of Fish Wildlife, and local wetland managers to encourage participation in the RTMP.

4. Participation in CV-SALTS Program

Brief Description: The CV Water Board and State Water Resources Control Board initiated a comprehensive effort to address salinity problems in California's Central Valley and adopt long-term solutions that will lead to enhanced water quality and economic sustainability. The CV-SALTS stakeholder group is a collaborative basin planning effort aimed at developing and implementing a comprehensive salinity management program. The goal of CV-SALTS is to maintain a healthy environment and a good quality of life for all Californians by protecting the state's most essential and vulnerable resource - water.

Activities

Reclamation continues to participate in the following sub-committees of the program: Executive, Technical Advisory, and LSJR. In addition:

- Reclamation continues to provide funding for the chair of the Technical Subcommittee and attends the Executive Committee Policy meetings.
- Reclamation participates in CV-SALTS and the Lower San Joaquin River Committee as they evaluate beneficial use designations and a potential amendment of the Basin Plan.

D. Central Valley Project Deliveries Load Calculation

Brief Description: The CVP delivers water to both the Grassland and Northwest subareas (as described in the Basin Plan) through the DMC, the San Luis Canal, and the San Joaquin River/Mendota Pool. Most CVP water is pumped from the Delta into the DMC through the C.W. "Bill" Jones Pumping Plant located near Tracy, California. CVP water is conveyed south to DMC Check 13 near Santa Nella, California, where water is either mixed with the State Water Project in O'Neill Forebay and then either pumped into San Luis Reservoir for later delivery through the DMC or San Luis Canal, or conveyed further south to the DMC terminus at the Mendota Pool. During periods of drought, groundwater and river water are pumped into the DMC at several locations. The calculation methods used in this report are provisional and some elements in this report do not include estimations of benefits at this time. Reclamation submitted the *Compliance Monitoring and Evaluation Plan* to the CV Water Board (Reclamation 2010) which outlines the criteria and methodology for determining DMC loads and credits.

Quantification Methodology: The monthly amount of CVP water supply delivered to each district is pro-rated according to the area of each district within either the Grassland subarea, Northwest subarea, or outside of these subareas. The monthly mean salinity of CVP water is

calculated from average daily measurements taken at three locations along the DMC. The salinity of CVP water delivered to each district is associated with the salinity monitoring site closest to the District's turnout along the DMC.

The Basin Plan allocates a salt load to Reclamation for water delivered to the Grassland and Northwest Subareas. This background load allocation is calculated according to Table IV-8 Summary of Allocations and Credits (CV Water Board 2004c):

$$LA_{DMC} = Q_{DMC} * 52 \text{ mg/L} * 0.00136$$

Where:

LA_{DMC}	= Load Allocation of salts, in tons
Q_{DMC}	= monthly amount of CVP water delivered to Grassland and Northwest Subareas, in acre - feet
52 mg/L	= "background" salinity of water in the SJR released at Friant Dam (per the Basin Plan) measured as total dissolved solids (TDS)
0.00136	= factor for converting units into tons

Actual DMC salt loads are calculated by the following equation:

$$L_{DMC} = Q_{DMC} * C_{DMC} * 0.00136$$

Where:

L_{DMC}	= Actual DMC Load, in tons
Q_{DMC}	= monthly amount of water delivered to Grassland and Northwest Subareas, in acre - feet
C_{DMC}	= monthly average of salinity of the water delivered to Grassland and Northwest Subareas, in mg/L TDS
0.00136	= factor for converting units into tons

Each Subarea's Q_{DMC} is calculated and then paired with the associated monthly average TDS for that reach, so the equation becomes:

$$L_{DMC} = 0.00136 * \Sigma(Q_{DMC} * C_{DMC})_{\text{Subareas}}$$

This equation is then broken into calculations for each subarea based on the source of CVP water. Table 2 lists the monthly volumes of CVP water and salts delivered to the Grassland and Northwest subareas and an estimate of the salts delivered in excess of the Monthly Load Allocation.

Table 2. Calculation of DMC Allocations and Loads

	Grassland Subarea	Northwest Subarea	Total

	San Joaquin River and Mendota Pool Deliveries from CVP, load in thousand tons	Delta- Mendota Canal Deliveries from CVP, load in thousand tons	San Luis and Cross Valley Canal Deliveries from CVP, load in thousand tons	Total Flow, thousand acre-feet	Load Allocation, thousand tons	Actual Load - Load Allocation, thousand tons	San Joaquin River and Mendota Pool Deliveries from CVP, load in thousand tons	Delta- Mendota Canal Deliveries from CVP, load in thousand tons	Total Flow, thousand acre-feet	Load Allocation, thousand tons	Actual Load - Load Allocation, thousand tons	Total Excess Load from CVP Deliveries, thousand tons
Jan 13	6.0	0.9	1.3	13.9	1.0	7.2	0.1	0.08	0.3	0.02	0.2	7.4
Feb 13	35.9	7.1	3.5	81.5	5.8	40.7	3.3	1.6	9.0	0.6	4.3	45.0
Mar 13	29.8	8.3	4.8	78.8	5.6	37.2	2.8	2.3	10.0	0.7	4.4	41.6
Apr 13	32.8	5.8	6.1	76.3	5.4	39.3	3.1	2.7	10.7	0.8	5.0	44.3
May 13	45.2	11.2	7.4	147.8	10.5	53.4	4.4	2.5	17.7	1.2	5.6	59.0
Jun 13	43.7	11.9	8.8	141.7	10.0	54.3	4.2	4.8	21.1	1.5	7.5	61.8
Jul 13	40.6	11.3	6.2	164.9	11.7	46.5	3.7	5.2	27.1	1.9	7.0	53.5
Aug 13	39.9	12.4	4.1	122.2	8.6	47.8	3.8	3.1	15.3	1.1	5.8	53.6
Sep 13	32.4	16.2	3.4	98.6	7.0	45.0	0.9	1.8	5.2	0.4	2.3	47.3
Oct 13	28.1	10.7	3.4	84.9	6.0	36.2	0.4	1.6	4.2	0.3	1.7	37.9
Nov 13	14.3	2.4	2.3	33.2	2.3	16.6	0.2	0.8	1.8	0.1	0.8	17.4
Dec 13	7.1	0.6	0.5	12.3	0.9	7.3	0.2	0.3	0.7	0.05	0.4	7.7

Source: Reclamation 2013b

E. Reporting Requirements

In the MAA, Reclamation agreed to provide quarterly reports to the CV Water Board. Reclamation will consult with the CV Water Board before proposing any changes to the sample report format. Quarterly reports are due 45 days after the end of the calendar quarter:

Table 3. Quarterly Report Submission Schedule

End of Calendar Quarter	Due Date of Quarterly Report
March 31, 2014	May 15, 2014
June 30, 2014	August 14, 2014

F. Funding Reporting

Reclamation agreed in the MAA to seek additional funding, including grant funding, to support salinity control efforts. Table 4 summarizes Reclamation's funding initiatives.

Activities

Table 4. Program Funding Initiatives

Program	Description	Status	Period of Performance
Program to Meet Standards	Technical Support to Meet Salinity Objectives for Vernalis	Execution 2013 Modification	FY2012 - FY2014
Salt and Boron TMDL	Coordinator/Facilitator Technical Support for RTMP	Closed	FY2009 - FY2012

Program	Description	Status	Period of Performance
Salt and Boron TMDL	Continued Technical Support for SJR RTMP	Closed	FY2009 - FY2012
Program to Meet Standards	Technical Support for LSJR Meeting Water Quality Objectives: 001 fund tasks management module modification 002 fund WARMF online	Awarded 2013 Contract modification	FY2013 – FY2016
Program to Meet Standards	Westside Salt Assessment Fate and Transport Study	Closed	FY2012 - FY2013
Salinity Control	Westside Regional Drainage Plan	Negotiate 2014 Grant Funding ($3.8M)	FY2014 – FY2018
Salinity Control	Grassland Bypass Project	Obligate 2014 Funding ($880k)	FY2014
Program to Meet Standards	Cooperative Agreement with Grassland Water District Real Time Management Program Pilot Study	Awarded financial assistance Cooperative Agreements to incrementally fund Pilot study	September 1, 2012 - September 30, 2017

G. References

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 2004b — 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 Final Draft Staff Report. Appendix D: Background Salt and Boron Loading, Appendix E: Alternate Methods For Calculating Salt Loading from the Northwest Side of the Lower San Joaquin River. Regional Water Quality Control Board Central Valley Region, July 4, 2004.

CV Water Board 2004c — 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 Final Staff Report. Table IV-8 Summary of Allocations and Credits, Dilution Flow Allocations, Regional Water Quality Control Board Central Valley Region, September 10, 2004

Reclamation 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. US Bureau of Reclamation, November 2010.

Reclamation 2013a — Calculations for Quarterly Report, Q4-2013, Table 1: Goodwin Dam Monthly Dilution Flow Allocations, US Bureau of Reclamation, Draft, February 13, 2014

Reclamation 2013b — Delta-Mendota Canal Water Quality Monitoring Program Report for October – December 2013. US Bureau of Reclamation, Draft, February 20, 2014.