United States Department of the Interior

BUREAU OF RECLAMATION
Central Valley Operations Office
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

IN REPLY
REFER TO:

JAN 27 2015

RECEIVED

JAN 27 2015

Nat'l Marine Fisheries Svs.
Sacramento, CA

CVO-100
ENV-7.00

Ms. Maria Rea
Assistant Regional Administrator
California Central Valley Area Office
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814

Subject: Interim Contingency Plan for February and March Pursuant to Reasonable and Prudent Alternative (RPA) Action I.2.3.C of the 2009 Coordinated Long-term Operation of the Central Valley Project (CVP) and State Water Project (SWP) Biological Opinion (2009 BiOp)

Dear Ms. Rea:

The Bureau of Reclamation (Reclamation) and the Department of Water Resources (DWR) have prepared the enclosed Temporary Urgency Change (TUC) Petition which will serve as the drought contingency plan for the months of February and March 2015. The TUC Petition is consistent with the drought exception procedures outlined in NOAA's National Marine Fisheries Service's (NMFS) 2009 BiOp RPA Action I.2.3.C. Reclamation is seeking concurrence from NMFS that the drought response actions proposed by Reclamation and DWR for February and March are within the limits of the Incidental Take Statement (ITS) of the 2009 BiOp. Additionally, because actions in the TUC Petition are in compliance with the drought exception procedures described in the 2009 BiOp, these actions do not jeopardize the continued existence of the listed species or adversely modify or destroy designated critical habitats addressed in the 2009 BiOp.

As you are aware, California is facing unprecedented critically dry conditions in the current water year, following three previous dry years. As a result of this continued aridity, the CVP and the SWP reservoir levels were significantly below average in October at the beginning of water year (WY) 2015. The State's December 30, 2014, snow survey found a Sierra Nevada snowpack that is less than half of normal in terms of the amount and water content for this time of year. Furthermore, although November and December 2014 storms brought much needed precipitation, after three dry years the State's overall water storage levels remain far below average. Adequate storage is needed throughout the year and especially in dry times of the year in order for the CVP and SWP to supply human needs, continue repelling saltwater in the Delta, and provide for cold water needs of Chinook salmon, steelhead, and green sturgeon.

In response to this water shortage crisis, Reclamation and DWR submitted a TUC Petition Regarding Delta Water Quality on January 23, 2015, requesting that the State Water Resources Control Board (State Board) temporarily modify requirements of Water Rights Decision 1641 (D-1641) for 180 days, with specific requests for February and March to enable changes in operations that will provide minimum human health and safety supplies and conserve water for later protections of instream uses and water quality. As the season develops and conditions become clearer, Reclamation and DWR will revisit operational strategies with the federal and state resource agencies.

As described in the enclosed TUC Petition, Reclamation and DWR specifically request modification of the D-1641 Delta outflow requirements, Export Limits, Delta Cross Channel (DCC) gate operations, and Vernalis flow requirements. The changes would provide that the February and March outflow requirements would be modified to require the Net Delta Outflow Index (NDOI) be no less than 4,000 cubic feet per second (cfs) on a monthly average. Combined exports would be limited to a health and safety level (i.e., 1,500 cfs) if the DCC gates are open or if outflow is between 4,000 cfs and 5,500 cfs. An intermediate combined export level of 3,500 cfs would apply if outflow is greater than 5,500 cfs but less than 7,100 cfs, and if the DCC gates are closed. In addition, the Vernalis flow objective would be reduced to 500 cfs on a monthly average. These changes would reduce reservoir releases from those otherwise required to meet D-1641 in February and March to conserve storage for later fishery protection, minimum health and safety needs, and if necessary, salinity control. The request also includes modifying February and March DCC gate operations to allow for opening of the gates as water quality and fishery conditions warrant and as restricted to specific monitoring of fish.

The enclosed Project Description for February - March 2015 Drought Response Actions (Project Description) provides additional details regarding the specific request for February and March 2015. The Project Description also includes: (1) a description of a framework for future requests for Old and Middle River flow management flexibility. If conditions warrant, these requests will be developed and analyzed as soon as the forecasts indicate that such flexibility may be utilized; and (2) identification of potential operations that may be implemented in 2015 and beyond to address the ongoing drought conditions or to help recover from the conditions created from the previous three years of drought, in the event the hydrology becomes wetter.

Reclamation and DWR reviewed the effects of the specific request for February and March 2015 on listed species, and the resultant Biological Review is enclosed. Based on the Biological Review, we believe that the effects of the actions requested for February and March on listed salmonids, green sturgeon and their designated critical habitats will not result in violation of the incidental take limit in the 2009 BiOp, nor will it jeopardize the continued existence of those species or destroy or adversely modify their designated critical habitats.

Similarly to 2014, Reclamation and DWR will continue close coordination on current and projected operations on a weekly basis through the Real-Time Drought Operations Management Team (RTDOT) and other on-going meetings (Smelt Working Group, Delta Operations for Salmonids and Sturgeon, Delta Conditions Team, Water Operations Management Team, etc.).

The RTDOT was formed in 2014 and includes designated representatives from Reclamation, DWR, the State Board, Department of Fish and Wildlife (DFW), NMFS, and the U.S. Fish and Wildlife Service (USFWS). The RTDOT has proven effective as a forum to discuss potential changes to SWP and CVP operations to meet health and safety requirements and to reasonably protect all beneficial uses of water. The team will continue to meet at least weekly to ensure effective coordination among the pertinent agencies. This team will help guide development of a CVP/SWP operational strategy and corresponding contingency plans to address operations from April through November as conditions continue to evolve. The results of these efforts will inform both future determinations associated with the 2009 BiOp and the 2008 USFWS Coordinated Long-term Operation of the CVP and SWP Biological Opinion, and additional TUC Petitions to the State Board, if necessary. Additionally, Delta Smelt and salmonid monitoring, as described in the *CVP and SWP Drought Contingency Plan, October 15, 2014 - January 15, 2015,* submitted to the SWRCB on October 15, 2014, will continue as needed to inform operational decisions.

RPA Action I.2.3.C is triggered based on a February forecast showing that end of September Shasta storage will be less than 1.9 million acre feet (MAF). While Reclamation has not yet completed the February forecast, the January 90 percent exceedance hydrology forecast, as provided in the *CVP and SWP Drought Contingency Plan, January 15, 2015-September 30, 2015*, shows Reclamation to be unable to meet 1.9 MAF at the end of September. Given that there has been a severe lack of precipitation in January, we expect the February forecast to show reduced storage levels from the January forecast. Therefore, Reclamation and DWR are submitting this contingency plan for February and March. Reclamation and DWR are committed to updating this contingency plan by March 1, 2015, as required by RPA Action I.2.3.C. Also, RPA Action I.2.3.C requires a relaxation of the Wilkins Sough navigation criteria. Reclamation will target a navigation control point at Wilkins Slough not to exceed 4,000 cubic feet per second during February and March. Additionally, Reclamation hydrologic forecasts show that Keswick releases will not be above 3,250 cfs, consistent with RPA I.2.3.B. Reclamation will coordinate changes to Wilkins Slough and Keswick release requirements with NMFS.

Reclamation and DWR request that NMFS consider the enclosed TUC Petition as the interim contingency plan for February and March, and includes proposed changes to the Project Description for the 2009 BiOp and change to RPA Action IV.1.2. The changes are intended to preserve cold-water pool for later in the year and consistent with the drought contingency exceptions contemplated in the 2009 BiOp (RPA Action I.2.3.C). RPA Action IV.1.2 requires the DCC gates to be closed from February 1 through May 20 to protect winter-run, spring-run, and fall-run Chinook salmon, steelhead and green sturgeon from entrainment into the interior Delta. These actions combined help to preserve Shasta storage for later in the year consistent with the drought exception procedure in RPA Action I.2.3.C.

The enclosed Biological Review supports Reclamation and DWR's conclusion that the effects associated with changes identified in the TUC Petition are within what was analyzed in the 2009 BiOp. Any incidental take resulting from these changes are within the existing incidental take limits in the 2009 BiOp. Because these actions are contemplated within the drought exception

procedures described in the 2009 BiOp, they do not jeopardize species or adversely modify or destroy designated critical habitat addressed in the 2009 BiOp. Reclamation seeks NMFS' concurrence in this determination.

We look forward to working with you and your staff as we navigate through what appears to be another extremely challenging water year and appreciate your willingness to work with us on this time sensitive matter.

Sincerely,

Paul Fujitani

for Ron Milligan
Operations Manager

Enclosures - 3

cc: Mr. Tom Howard
Executive Director
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

Mr. Chuck Bonham
Director
California Department of Fish and Wildlife
1416 Ninth Street
Sacramento, CA 95814

Mr. Mark Cowin
Director
California Department of Water Resources
1416 Ninth Street
Sacramento, CA 95814

Mr. Michael A. Chotkowski
Field Supervisor, Bay Delta Fish and Wildlife Office
U.S. Fish and Wildlife Service
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814

cc: See -next page

cc: Continued from previous page

Mr. Dean Messer
Chief, Environmental Services
California Department of Water Resources
P.O. Box 94836
West Sacramento, CA 94236-0001

Mr. John Leahigh
Operations Control Office
California Department of Water Resources
3310 El Camino Avenue, Suite 300
Sacramento, CA 95821

Mr. Ren Lohoefener
Regional Director
Pacific Southwest Region
U. S. Fish and Wildlife Service
2800 Cottage Way
Sacramento, CA 95825

Mr. David Murillo
Regional Director
Mid-Pacific Region
Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825
(w/encl to each)

BUREAU OF RECLAMATION
2800 Cottage Way, E-1604
Sacramento, California 95825

DEPARTMENT OF WATER RESOURCES
1416 Ninth Street, Room 1115-1
Sacramento, California 95814

Mr. Thomas Howard
Executive Director
State Water Resources Control Board
1001 I Street
Sacramento. California 95814

Subject: Temporary Urgency Change Petition

Dear Mr. Howard:

The Department of Water Resources (DWR) and U.S Bureau of Reclamation (Reclamation) are submitting this Temporary Urgency Change Petition (TUCP) to request certain changes to the terms of the water rights permits for operation of the State Water Project and Central Valley Project from what is currently provided in Water Rights Decision 1641 (D-1641) for the next 180 days. This petition sets forth specific requests for the months of February and March and an anticipated future request for the remainder of the 2015 water year based on current forecasts, hydrology, and the lessons learned from 2014 drought operations.

The proposed changes described in the enclosed TUCP, if approved, would modify D-1641 requirements for February and March 2015. The specific request seeks 1) a change in minimum monthly average Net Delta Outflow Index to 4,000 cubic feet per second (cfs), 2) a change in San Joaquin River at Airport Way Bridge, Vernalis river flow minimum monthly average of 500 cfs, 3) modifying the closure requirement of the Delta Cross Channel gates to address Delta water quality concerns, and 4) an outflow related combined export rate that reflects an appropriate balance between competing beneficial needs. These changes would allow management of reservoir releases on a pattern that conserves upstream storage for fish and wildlife protection and Delta salinity control while providing critical water supply needs.

Reclamation and DWR are currently preparing a Biological Review of these proposed changes for Endangered Species Act (ESA) consultation purposes with the National Marine Fisheries Service and U.S. Fish and Wildlife Service. When the ESA consultations are completed and determinations are made, DWR will seek a Consistency Determination from the California Department of Fish and Wildlife. The final consultation information will be submitted to the State Water Resource Control Board once it is completed.

Sincerely,

Robert R Murillo

David Murillo
Regional Director
Bureau of Reclamation

Date: 1-23-15

for

Mark W. Cowin
Director
Department of Water Resources

Date: 1.23.15

Please indicate County where your project is located here:

various

MAIL FORM AND ATTACHMENTS TO:
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Tel: (916) 341-5300 Fax: (916) 341-5400
http://www.waterboards.ca.gov/waterrights

PETITION FOR CHANGE

Separate petitions are required for each water right. Mark all areas that apply to your proposed change(s). Incomplete forms may not be accepted. Location and area information must be provided on maps in accordance with established requirements. (Cal. Code Regs., tit. 23, § 715 et seq.) Provide attachments if necessary.

☐ **Point of Diversion** Wat. Code, § 1701
☐ **Point of Rediversion** Cal. Code Regs., tit. 23, § 791(e)
☐ **Place of Use** Wat. Code, § 1701
☐ **Purpose of Use** Wat. Code, § 1701

☐ **Distribution of Storage** Cal. Code Regs., tit. 23, § 791(e)
☒ **Temporary Urgency** Wat. Code, § 1435
☐ **Instream Flow Dedication** Wat. Code, § 1707
☐ **Waste Water** Wat. Code, § 1211

☐ **Split** Cal. Code Regs., tit. 23, § 836
☐ **Terms or Conditions** Cal. Code Regs., tit. 23, § 791(e)
☐ **Other**

Application: various Permit: various License: various Statement: various

I (we) hereby petition for change(s) noted above and described as follows:

Point of Diversion or Rediversion – Provide source name and identify points using both Public Land Survey System descriptions to ¼-¼ level and California Coordinate System (NAD 83).

Present: Not requested

Proposed: No change

Place of Use – Identify area using Public Land Survey System descriptions to ¼-¼ level; for irrigation, list number of acres irrigated.

Present: Not requested

Proposed: No change

Purpose of Use

Present: Not requested

Proposed: No change

Split

Provide the names, addresses, and phone numbers for all proposed water right holders.

Not requested

In addition, provide a separate sheet with a table describing how the water right will be split between the water right holders: for each party list amount by direct diversion and/or storage, season of diversion, maximum annual amount, maximum diversion to offstream storage, point(s) of diversion, place(s) of use, and purpose(s) of use. Maps showing the point(s) of diversion and place of use for each party should be provided.

Distribution of Storage

Present: Not requested

Proposed: No change

Temporary Urgency
This temporary urgency change will be effective from February 1, 2015 to July 30, 2015 .

Include an attachment that describes the urgent need that is the basis of the temporary urgency change and whether the change will result in injury to any lawful user of water or have unreasonable effects on fish, wildlife or instream uses.

Instream Flow Dedication – Provide source name and identify points using both Public Land Survey System descriptions to ¼-¼ level and California Coordinate System (NAD 83).

Upstream Location: Not requested

Downstream Location: Not requested

List the quantities dedicated to instream flow in either: ☐ cubic feet per second or ☐ gallons per day:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Will the dedicated flow be diverted for consumptive use at a downstream location? ◯ Yes ◯ No
If yes, provide the source name, location coordinates, and the quantities of flow that will be diverted from the stream.

Waste Water
If applicable, provide the reduction in amount of treated waste water discharged in cubic feet per second.

Will this change involve water provided by a water service contract which prohibits your exclusive right to this treated waste water? ◯ Yes ◉ No

Will any legal user of the treated waste water discharged be affected? ◯ Yes ◯ No

General Information – For all Petitions, provide the following information, if applicable to your proposed change(s).

Will any current Point of Diversion, Point of Storage, or Place of Use be abandoned? ◯ Yes ◉ No

I (we) have access to the proposed point of diversion or control the proposed place of use by virtue of:
☒ ownership ☐ lease ☐ verbal agreement ☐ written agreement

If by lease or agreement, state name and address of person(s) from whom access has been obtained.

Give name and address of any person(s) taking water from the stream between the present point of diversion or rediversion and the proposed point of diversion or rediversion, as well as any other person(s) known to you who may be affected by the proposed change.

This petition odes not involve a change in point of diversion. No person(s) will be injured by the proposed change. See supplement for additional information.

All Right Holders Must Sign This Form: I (we) declare under penalty of perjury that this change does not involve an increase in the amount of the appropriation or the season of diversion, and that the above is true and correct to the best of my (our) knowledge and belief. Dated 1/23/2015 at Sacramento, CA .

Chief, SWP Water Ops
Right Holder or Authorized Agent Signature

Paul Fujitani for Ron Milligan
CVP Operations Manager
Right Holder or Authorized Agent Signature

NOTE: All petitions must be accompanied by:
(1) the form Environmental Information for Petitions, including required attachments, available at: http://www.waterboards.ca.gov/waterrights/publications_forms/forms/docs/pet_info.pdf
(2) Division of Water Rights fee, per the Water Rights Fee Schedule, available at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/fees/
(3) Department of Fish and Wildlife fee of $850 (Pub. Resources Code, § 10005)

State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
Tel: (916) 341-5300 Fax: (916) 341-5400
http://www.waterboards.ca.gov/waterrights

ENVIRONMENTAL INFORMATION FOR PETITIONS

This form is required for all petitions.

Before the State Water Resources Control Board (State Water Board) can approve a petition, the State Water Board must consider the information contained in an environmental document prepared in compliance with the California Environmental Quality Act (CEQA). This form is not a CEQA document. If a CEQA document has not yet been prepared, a determination must be made of who is responsible for its preparation. As the petitioner, you are responsible for all costs associated with the environmental evaluation and preparation of the required CEQA documents. Please answer the following questions to the best of your ability and submit any studies that have been conducted regarding the environmental evaluation of your project. If you need more space to completely answer the questions, please number and attach additional sheets.

DESCRIPTION OF PROPOSED CHANGES OR WORK REMAINING TO BE COMPLETED

For a petition for change, provide a description of the proposed changes to your project including, but not limited to, type of construction activity, structures existing or to be built, area to be graded or excavated, increase in water diversion and use (up to the amount authorized by the permit), changes in land use, and project operational changes, including changes in how the water will be used. For a petition for extension of time, provide a description of what work has been completed and what remains to be done. Include in your description any of the above elements that will occur during the requested extension period.

See Attachment 1

Insert the attachment number here, if applicable: 1

Coordination with Regional Water Quality Control Board

For change petitions only, you must request consultation with the Regional Water Quality Control Board regarding the potential effects of your proposed change on water quality and other instream beneficial uses. (Cal. Code Regs., tit. 23, § 794.) In order to determine the appropriate office for consultation, see: http://www.waterboards.ca.gov/waterboards_map.shtml. Provide the date you submitted your request for consultation here, then provide the following information.

Date of Request: n/a

Will your project, during construction or operation, (1) generate waste or wastewater containing such things as sewage, industrial chemicals, metals, or agricultural chemicals, or (2) cause erosion, turbidity or sedimentation? ○ Yes ◉ No

Will a waste discharge permit be required for the project? ○ Yes ◉ No

If necessary, provide additional information below:

Insert the attachment number here, if applicable:

Local Permits

For temporary transfers only, you must contact the board of supervisors for the county(ies) both for where you currently store or use water and where you propose to transfer the water. (Wat. Code § 1726.) Provide the date you submitted your request for consultation here.

Date of Contact: n/a

For change petitions only, you should contact your local planning or public works department and provide the information below.

Person Contacted: n/a Date of Contact:

Department: Phone Number:

County Zoning Designation:

Are any county permits required for your project? If yes, indicate type below. ○ Yes ○ No

☐ Grading Permit ☐ Use Permit ☐ Watercourse ☐ Obstruction Permit

☐ Change of Zoning ☐ General Plan Change ☐ Other (explain below)

If applicable, have you obtained any of the permits listed above? If yes, provide copies. ○ Yes ○ No

If necessary, provide additional information below:

Insert the attachment number here, if applicable:

Federal and State Permits

Check any additional agencies that may require permits or other approvals for your project:

☐ Regional Water Quality Control Board ☐ Department of Fish and Game

☐ Dept of Water Resources, Division of Safety of Dams ☐ California Coastal Commission

☐ State Reclamation Board ☐ U.S. Army Corps of Engineers ☐ U.S. Forest Service

☐ Bureau of Land Management ☐ Federal Energy Regulatory Commission

☐ Natural Resources Conservation Service

Have you obtained any of the permits listed above? If yes, provide copies. ○ Yes ◉ No

For each agency from which a permit is required, provide the following information:

Agency	Permit Type	Person(s) Contacted	Contact Date	Phone Number
n/a				

If necessary, provide additional information below:

Insert the attachment number here, if applicable: ☐

Construction or Grading Activity

Does the project involve any construction or grading-related activity that has significantly altered or would significantly alter the bed, bank or riparian habitat of any stream or lake? ○ Yes ◉ No

If necessary, provide additional information below:

Insert the attachment number here, if applicable: ☐

Archeology

Has an archeological report been prepared for this project? If yes, provide a copy. ◯ Yes ◉ No

Will another public agency be preparing an archeological report? ◯ Yes ◉ No

Do you know of any archeological or historic sites in the area? If yes, explain below. ◯ Yes ◉ No

If necessary, provide additional information below:

Insert the attachment number here, if applicable: ☐

Photographs

For all petitions other than time extensions, attach complete sets of color photographs, clearly dated and labeled, showing the vegetation that exists at the following three locations:

☐ Along the stream channel immediately downstream from each point of diversion

☐ Along the stream channel immediately upstream from each point of diversion

☐ At the place where water subject to this water right will be used

Maps

For all petitions other than time extensions, attach maps labeled in accordance with the regulations showing all applicable features, both present and proposed, including but not limited to: point of diversion, point of rediversion, distribution of storage reservoirs, point of discharge of treated wastewater, place of use, and location of instream flow dedication reach. (Cal. Code Regs., tit. 23, §§ 715 et seq., 794.)

Pursuant to California Code of Regulations, title 23, section 794, petitions for change submitted without maps may not be accepted.

All Water Right Holders Must Sign This Form:
I (we) hereby certify that the statements I (we) have furnished above and in the attachments are complete to the best of my (our) ability and that the facts, statements, and information presented are true and correct to the best of my (our) knowledge. Dated 1/23/2015 at _____.

Chief, SWP Water Ops
Water Right Holder or Authorized Agent Signature

Paul Fujitani for Ron Milligan
Water Right Holder or Authorized Agent Signature
CVP Operations Manager

NOTE:
- **Petitions for Change may not be accepted unless you include proof that a copy of the petition was served on the Department of Fish and Game. (Cal. Code Regs., tit. 23, § 794.)**
- **Petitions for Temporary Transfer may not be accepted unless you include proof that a copy of the petition was served on the Department of Fish and Game and the board of supervisors for the county(ies) where you currently store or use water and the county(ies) where you propose to transfer the water. (Wat. Code § 1726.)**

SUPPLEMENT TO 2015 TEMPORARY URGENCY CHANGE PETITION TO CERTAIN DWR AND RECLAMATION PERMIT TERMS AS PROVIDED IN D-1641

California Department of Water Resources

Application Numbers 5630, 14443, 14445A, 17512, 17514A, Permits 16478, 16479, 16481, 16482, 16483

U.S. Bureau of Reclamation Permits for the Central Valley Project

Application Numbers: 23, 234, 1465, 5626, 5628, 5638, 9363, 9364, 9366, 9367, 9368, 13370, 13371, 14858A, 14858B, 15374, 15375, 15376, 15764, 16767, 16768, 17374, 17376, 19304, 22316

License Number 1986 and Permit Numbers: 11885, 11886, 12721, 11967, 11887, 12722, 12723, 12725, 12726, 12727, 11315, 11316, 16597, 20245, 11968, 11969, 11970, 12860, 11971, 11972, 11973, 12364, 16600, 15735

I. Requested Change

Due to the exceptionally dry conditions in 2014 and continued dry conditions faced by California in the current water year, the Department of Water Resources (DWR) and the United States Bureau of Reclamation (Reclamation) (collectively Projects) request the State Water Resources Control Board (State Water Board) change the terms of the water rights permits for operation of the Projects from what is currently provided in Water Rights Decision 1641 (D-1641) for the next 180 days This petition sets forth specific requests for the month of February and March 2015, and an anticipated future request for the remainder of the 2015 water year that will be submitted to the State Water Board prior to April 1, 2015, as determined through the existing multi-party coordination process, the Real-Time Drought Operations Management Team (RTDOT).

Reclamation and DWR request modification of D-1641 consistent with the lessons learned throughout 2014, the draft Interagency 2015 Drought Strategy for the Central Valley Project and State Water Project (2015 Drought Strategy), the January 15, 2015 Central Valley Project and State Water Project Drought Contingency Plan (2015 DCP), Governor Brown's January 17, 2014 Emergency Proclamation (January 2014 Proclamation), and the December 22, 2014 Emergency Proclamation (December 2014 Proclamation).

The changes would modify the D-1641 requirements identified in Table 3 for February and March. DWR and Reclamation request a Delta outflow of 4,000 cubic feet per second (cfs), a San Joaquin River at Airport Way Bridge, Vernalis river flow of 500 cfs, modifying the closure requirement of the Delta Cross Channel gates (DCC) to address Delta water quality concerns consistent with fish protections necessary as determined by the RTDOT, and a combined export rate that reflects an appropriate balance between competing beneficial needs in light of the drought. These changes will allow

management of reservoir releases on a pattern that will conserve upstream storage for fish and wildlife protection and Delta salinity control while allowing for critical water supply needs exports.

As set forth in the 2015 DCP, critical operational considerations for these and other changes includes providing essential human health and safety needs to CVP and SWP service areas throughout 2015 and 2016 if drought conditions continue, reducing critical economic losses to agriculture, municipal and industrial uses, maintaining protections for endangered species and other fish and wildlife resources, providing water for state, federal and privately managed wetlands, and maximizing operational flexibility within existing law and regulations. These critical operational considerations are detailed further in the 2015 DCP.

Before Reclamation implements any action that may be approved by the State Water Board, Reclamation will utilize the drought exception procedures described in the 2009 NMFS CVP/SWP Long Term Operation Biological Opinion, as applicable, and complete the regulatory process with the Fish and Wildlife Service related to delta smelt provided for in the 2008 CVP/SWP Long Term Operation Biological Opinion.

1) Modification of February and March Delta Outflow

D-1641 requires a Delta outflow minimum monthly average Net Delta Outflow Index (NDOI) of 7,100 cfs 3-day average and salinity requirements such that outflow may be as high as 29,200 cfs for short periods of time. Reclamation and DWR petition the State Water Board to adopt a Delta outflow standard of a minimum monthly NDOI during the months of February and March to be no less than 4,000 cfs, which is more consistent with the unprecedentedly and persistently dry conditions facing California than the levels currently contained within D-1641 Table 3 and footnotes. Approving this request will avoid the potential “starting gate” requirement as specified in footnote 10 of Table 3, which imposes a substantial water cost to upstream reservoir storage in order to meet 2.64 mmhos/cm for at least one day at Collinsville between February 1 and February 14. This modification is necessary because of the extraordinarily dry conditions of the past several years in combination with the forecasts of limited future precipitation, low reservoir storage, and the competing demands on water supply of fish and wildlife protection, Delta salinity control, and critical water supply needs.

2) Modification of February and March San Joaquin River Flow

D-1641 requires a San Joaquin River at Airport Way Bridge, Vernalis minimum monthly average flows. Reclamation and DWR petition the State Water Board to adopt a San Joaquin River at Airport Way Bridge, Vernalis river flow requirement for February and March of base flow period averages no less than 500 cfs (and consistent with footnote 12) which is more appropriate for the unprecedentedly and persistently dry conditions facing California than the levels currently contained within D-1641 Table 3 and

footnotes. This modification is necessary because of the extraordinarily dry conditions of the past several years in combination with the forecasts of limited future precipitation, extremely low reservoir storage, and the competing demands on water supply of fish and wildlife protection, Delta salinity control, and critical water supply needs.

3) Modification of DCC Gate Operations

D-1641 requires the closure of the DCC gates from February 1 through May 20. Reclamation and DWR petition the State Water Board to modify the DCC operation requirements in D-1641 Table 3 such that the DCC gates may be opened during February and March as necessary to reduce intrusion of high salinity water into the Delta while preserving limited storage in upstream reservoirs and reducing impacts to migrating Chinook salmon. Requirements for closure of the DCC gates from February 15 through May 20 shall be determined through the RTDOT process. The DCC gate triggers matrix (as described in Appendix G of the April 2014 Drought Operations Plan and Operational Forecast) will be used to determine operation of the DCC gates. The triggers outlines in this matrix provide direction and a method that balances water quality and fishery objectives in the Delta. Normally, Delta flows would assist in meeting salinity requirements in the Delta with the DCC gates closed. Under current extremely low flow conditions, particularly on the San Joaquin River, DCC gate operations are a critical tool for protecting against Delta salinity intrusion that threatens water supplies for in-Delta water users and export users alike.

4) Modification of Export Limits

D-1641 limits exports by the Projects up to a combined export rate not to exceed 35% or 45% of Delta inflow, depending upon the Eight River Index. Reclamation and DWR petition the State Water Board to adopt a modified Combined Export Rate reflective of the following.

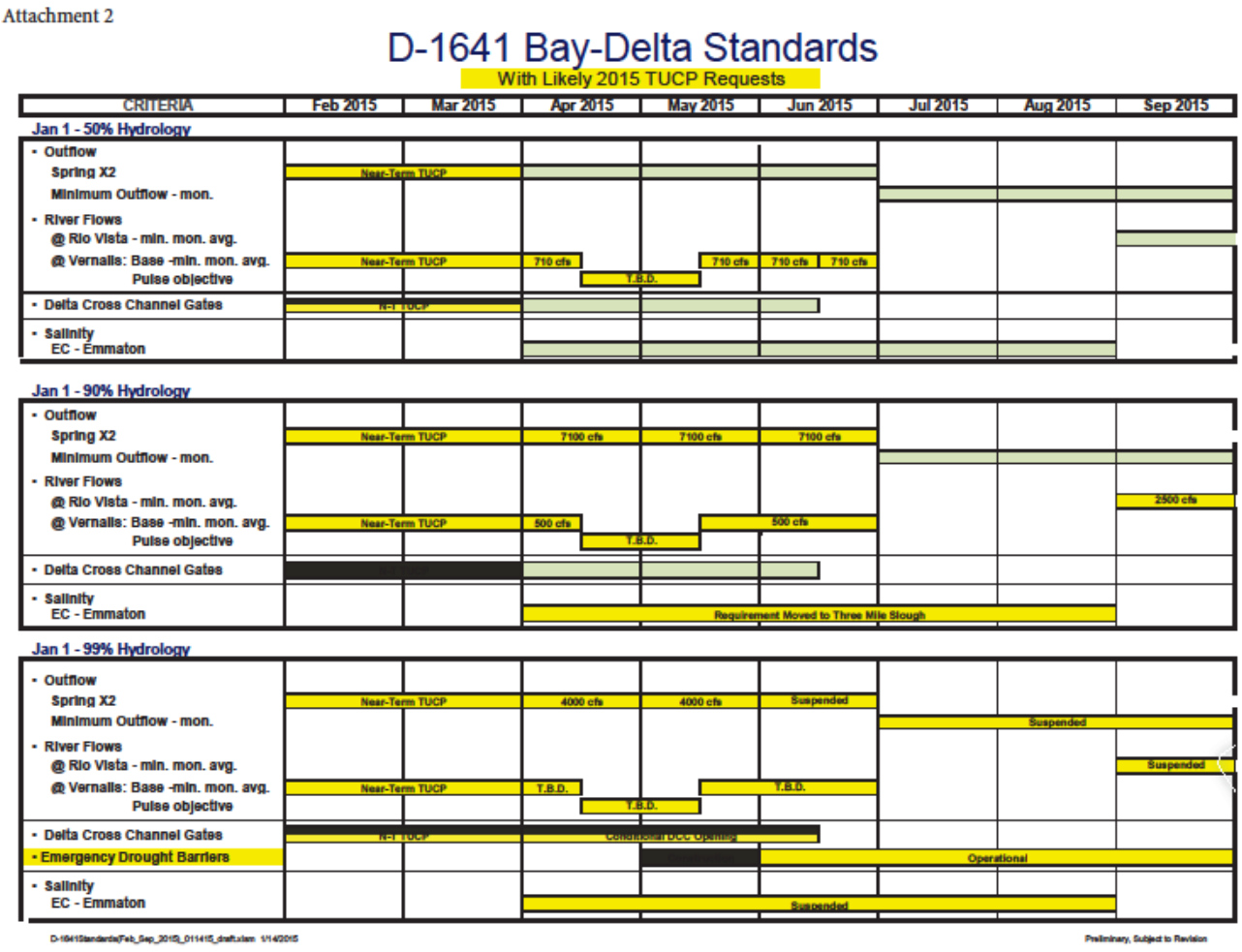
- The maximum Export Limits included in Table 3 of D-1641 be modified as follows: During February and March when footnote 10 of Table 3 of D-1641 is not being met, the combined maximum SWP and CVP export rate for SWP and CVP contractors at the Clifton Court Forebay Intake and C.W. “Bill” Jones Pumping Plant will be no greater than 3,500 cfs on a 3-day running average. During February and March when an NDOI of at least 5,500 cfs is not being met, or the DCC gates are open during a period inconsistent with footnote 23 of Table 3 of D-1641, the combined maximum SWP and CVP export rate will be no greater than 1,500 cfs. When precipitation and runoff events occur that allow the DCC gates to be closed and footnote 10 of Table 3 of D-1641 is being met [3-day average Delta Outflow of 7,100 cfs, or electrical conductivity of 2.64 millimhos per centimeter on a daily or 14-day running average at the confluence of the Sacramento and the San Joaquin rivers (Collinsville station C2) if applicable], but any additional Delta Outflow requirements contained in Table 4 of D-1641 are not being met, then exports of natural and abandoned flows are permitted up to D-1641 Export Limits contained in Table 3 and, in compliance with applicable laws and regulations including federal Endangered Species Act (ESA) and California

ESA (CESA).

5) Anticipated Future Amendment Requests

Reclamation and DWR anticipate requests for amendment to the proposed temporary urgency change prior to April 1, 2015. Any amended request is likely to reflect a subset of the changes presented in the 2015 DCP Attachment 2, reproduced here for reference. The anticipated amendments are not included yet in this petition as the hydrologic conditions or other factors as set forth in the 2015 DCP, which may necessitate the amendments, are not yet know.

Attachment 2



During the continuing drought, operation of the CVP and SWP must provide for, at a minimum, essential human health and safety needs throughout the CVP and SWP service areas, and retain the capability to provide for such minimum needs throughout Water Year (WY) 2015 and WY 2016 if drought conditions continue. For clarity, Reclamation and DWR's consideration of these essential human health and safety

needs includes adequate water supplies and water quality for drinking water, sanitation, and fire suppression, but does not extend to other urban water demands such as outdoor landscape irrigation. While most California communities have adequate reserve supplies, some will require continued delivery of limited amounts of water through the CVP and SWP systems to meet these basic needs. Human health and safety concerns may drive specific consultation requests throughout WY 2015 if not considered in the existing exception procedures of the BiOps.

The description below is included to highlight specific actions and factors that may be considered throughout 2015, and identifies actions that may be included in future consultations, if necessary. This is not intended to be a fully inclusive list, nor does inclusion in the list mean the agencies will go forward with any action. Reclamation and DWR are not proposing these actions at this time, however these actions are considered in looking at the future status of the species in light of the actions proposed in February and March 2015.

Upstream Reservoirs: Upstream reservoirs will be operated through the winter and spring to preserve and build storage. Upstream reservoir storage, while improved from end of September 2014 storage, remains extremely low in the early part of WY 2015. Reclamation and DWR will be trying to develop cold water resources in the winter and spring in those reservoirs where temperature management is needed later in the year. This may include working with the Sacramento River Settlement Contractors to shift early spring demand later into the year to conserve water in Shasta Reservoir, if warranted.

Water Supply: Throughout dry conditions, CVP and SWP systems will be operated to lessen critical economic losses to agricultural, municipal, and industrial uses due to water shortages through project water deliveries and by facilitating voluntary water transfers and exchanges to the extent possible, while balancing the needs of upstream storage, fishery and wildlife resource protection, and operational flexibility. A key to minimizing water supply shortages for economic purposes will be to take advantage of opportunities to export natural or abandoned flow in the winter and spring while maintaining Delta water quality and minimizing adverse effects to listed fish. Release of stored water in summer and fall will be managed to concurrently benefit in-stream temperature objectives, wildlife objectives, meet Sacramento Valley in-basin needs, and preserve carry over storage to meet objectives in WY 2016.

Refuges: One of the requirements of the Central Valley Project Improvement Act (CVPIA) passed by Congress in 1992 included providing water for state, federal and private managed wetlands in order to maintain and improve wetland habitat areas. For south of Delta refuges, water from San Luis Reservoir can be made available to meet

refuge needs when total demand from direct diversions from the Delta are not feasible. The CVPIA and refuge water supply contracts allow for flexibility to transfer water from refuges both within basin as well as north of the Delta to south of the Delta. Water transfers from north of Delta refuges to south of Delta refuges would occur to support priority habitat needs of south of Delta refuges given available capacity to facilitate the transfer. This water would be directly diverted or could be stored in San Luis Reservoir and used when most needed by south of the Delta refuges. Refuge deliveries are included in CVP operational scenarios and forecasts, and calculations regarding anticipated reservoir levels into the late fall and early winter.

D-1641 Related Actions: Reclamation and DWR may seek adjustments under D-1641, including: (1) triggers for modified X2 criteria to balance upstream storage and fish protection, (2) triggers for moving Western Delta Ag compliance point (i.e., Emmaton to Three-Mile Slough), (3) San Joaquin flows at Vernalis, (4) Rio Vista flow requirements, and (5) Net Delta Outflow requirements. Additionally, Reclamation and DWR may exercise the flexibility provided in D-1641 to adjust the E/I ratio's averaging period for sporadic storm events (similar to 2014).

Preferential Pumping: The projects will consider a facility shift in exports in April and May so that minimal pumping will occur at the SWP's Banks Pumping Plant and the majority will occur at the CVP's Jones Pumping Plant. This export shift will increase survival of salmonids through these facilities, since fewer fish will enter the SWP, where loss is higher due to substantial pre-screen mortality associated with Clifton Court Forebay. Combined exports would remain the same. The amount of shifted pumping from Banks to Jones would be made available to the SWP.

Temporary Emergency Drought Barriers: If hydrologic forecasts show there will be insufficient water in upstream reservoirs to repel the saltwater and meet health and safety and other critical needs, then installation of Emergency Drought Barriers will be considered to lessen water quality impacts. Excessive salinity increases in the Delta could render the water undrinkable for 25 million Californians and unusable by farms reliant upon this source. Temporary rock (rip-rap) Emergency Drought Barriers may be installed at up to three locations in the Delta during drought conditions in 2015, or in a subsequent year if necessary, to manage salinity in the Delta when there is not enough water in upstream reservoirs to release to rivers to repel the saltwater. Consultation on installation and operation of the barriers will be conducted on the barriers prior to installation and may require additional adjustments to D-1641.

Hatchery Operations: Livingston Stone National Fish Hatchery (LSNFH) managers will coordinate with Delta Operations for Salmonids and Sturgeon (DOSS) to time the hatchery release of winter-run Chinook salmon to coincide with favorable hydrologic

conditions, and to track their movement down the Sacramento River into and through the Delta utilizing acoustically-tagged winter-run Chinook salmon released at approximately the same time and real-time acoustic receivers deployed in the Sacramento River and Delta at various locations. DOSS will review the real-time acoustic tag data to determine the likely migration timing and distribution of the hatchery winter-run in the Sacramento River and into the Delta, and advise NMFS and Water Operations Management Team (WOMT) of potential risks to hatchery winter-run salmon.

Transfers and Exchanges: Reclamation and DWR will continue to facilitate water transfers and exchanges. If these transfers or exchanges are conveyed through the Delta outside the transfer window described in the 2008 and 2009 BiOps (July-September), Reclamation and DWR will consult with USFWS and NMFS prior to conveyance of the transfer water and DWR will request a consistency determination from CDFW.

Trinity Releases

Spring flows on the Trinity River will be consistent with annual allocations as provided through the Trinity River Main-stem Fishery Restoration Record of Decision. Flows for the remainder of the year will make consistent with SWRCB Order WR 90-5. Consistent with fish health criteria, releases to augment flows in the Lower Klamath River may be considered.

II. Basis to Authorize Modification of Water Rights

The California Water Code, Section 1435, authorizes the State Water Board to grant a temporary change order for any permittee or licensee who has an urgent need to change a permit or license, where the State Water Board finds: 1) the permittee has an urgent need for the proposed change, 2) the proposed change may be made without injury to any other lawful user of water, 3) the proposed change can be made without unreasonably affecting fish, wildlife, or other instream beneficial uses, 4) the proposed change is in the public interest. The law also requires consultation with representatives of the Department of Fish and Wildlife. DWR and Reclamation provide the information in this petition to support the findings necessary under California Water Code section 1435.

1) DWR and Reclamation Have an Urgent Need for the Change

California is entering its fourth consecutive year of below-average rainfall and very low snowpack. 2015 is also the eighth of nine years with below average runoff, which has resulted in chronic and significant shortages to municipal and industrial, agricultural, and refuge supplies and historically low levels of groundwater. As of January, 78% of the state is experiencing an Extreme Drought and 39% is experiencing an Exceptional

Drought, as recorded by the National Drought Mitigation Center, U.S. Drought Monitor. Recent snow survey results indicate a snowpack between 31% and 34% of average, and declining. As a result of this prolonged drought, reservoir levels throughout the state are already significantly below average and alternative local supplies to surface storage for many communities are limited. Total storage in Lake Oroville is roughly 1.4 million acre-feet (MAF)(40% of capacity), and the total combined storage at Shasta and Folsom reservoirs is also very low at about 2.4 MAF (49% of capacity). The low initial storage and historically dry conditions will likely lead to critical water shortages in 2015.

Forecasts for Water Year 2015 indicate it is increasingly likely to again be one of the more severe drought years in California's history. For the purposes of this consultation, Reclamation and DWR are using the 90 percent exceedance forecast for Central Valley hydrology to predict what actions are necessary. At this point in time, the actual January 2015 hydrology is trending significantly drier than the 90 percent forecast.

The continuation of extremely dry conditions in the Bay-Delta watershed poses great challenges to the effective management of water resources, and Reclamation and DWR believe that there is great risk that water supplies will not be adequate to meet both the obligations under D-1641 and temperature requirements on the Sacramento River. As a result, significant risks to health and safety, temperature control, minimum in-stream flow requirements, and an inability to control salinity encroachment in the Sacramento-San Joaquin Delta could result later this season. Under the current circumstances the Projects believe the most prudent course of action is to conserve storage in upstream reservoirs until significant improvement of that storage is realized.

If the requested February and March modifications to D-1641 Table 3 are granted, Reclamation and DWR forecast additional conservation of stored water in upstream reservoirs. Upstream supplies can provide the water necessary to protect fish and wildlife, Delta water quality and exports for critical needs. The 4,000 cfs Delta outflow is the estimated minimum nominal rate assumed to maintain salinity levels above 250 mg/l chloride at all export locations specified under Table 1 of D-1641.

Without a modification of the Delta outflow requirement and Vernalis requirement, Reclamation and DWR could be forced to increase releases from upstream reservoirs in February and March to meet Delta outflow levels up to 7,100 cfs or more, and Vernalis flows of up to 1,140 cfs. The estimated impact to reservoir storage decreases the likelihood that adequate cold-water reserves will be available to meet regulatory requirements protecting salmon and other cold-water fish species in the summer and fall of 2015 and could even result in a "loss of control" over salinity encroachment in the Delta by late spring 2015 and into 2016 in a worst case scenario. "Loss of control" describes a condition in which storages at or near dead pool in the major Project reservoirs will not allow sufficient release capability to control encroachment of ocean

water into the Delta, which will make the Delta water quality incompatible with in-Delta beneficial uses. This condition would persist until Northern California receives rainfall that produces sufficient runoff to flush the Delta of ocean water, which will once again allow for these in-Delta beneficial uses. Failure to sufficiently control Delta salinity will jeopardize the ability to provide for human health and safety for communities both within the Delta and those that rely upon the Delta for water supply.

D-1641 also requires closure of the DCC gates from February 1 through May 20. Through this petition and in furtherance of the January 2014 Proclamation, the Projects are seeking the use of the DCC gates as a means of controlling salinity conditions in the Delta. Natural runoff and the Delta inflow/outflow needed to meet the X2 requirement would normally assist in meeting salinity requirements in the Delta with the DCC gates closed, but under these extremely low flow conditions DCC gate operations may be needed to protect interior Delta salinity conditions.

a. Authorization to Take Extraordinary Measures

As a result of the extraordinary conditions experienced throughout 2014 and into 2015, the Governor signed the January 2014 Proclamation and December 2014 Proclamation. These proclamations include or renew the following two directives:

> Directive 8 - "The Water Board to consider modifying requirements for reservoir releases or diversion limitations, where existing requirements were established to implement a water quality control plan. These changes would enable water to be conserved upstream later in the year to protect cold water pools for salmon and steelhead, maintain water supply, and improve water quality."
>
> Directive 9 - "The Department of Water Resources and the Water Board will take actions necessary to make water immediately available, and, for the purposes of carrying out directives 5 and 8, Water Code section 13247 and Division 13 (commencing with section 21000) of the Public Resources Code and regulations adopted pursuant to that Division are suspended on the basis that strict compliance with them will prevent, hinder, or delay the mitigation of the effects of the emergency."

DWR has initiated a number of actions to minimize drought impacts and meet minimum health and safety needs including aggressive conservation efforts and taking a lead role in the Governor's Interagency Drought Task Force. Under the January 2014 Proclamation, the State Water Board is authorized to modify D-1641.

b. Real-Time Drought Operations Management Team

DWR and Reclamation propose the continuance of the RTDOT. The RTDOT consists of a team of managers from DWR, Reclamation, State Water Board, California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS)

and the Fish and Wildlife Service (USFWS) authorized to evaluate the physical and biological data on an ongoing basis to ensure efficient water operations management through potentially dynamic weather and flow events during the course of the declared drought emergency. The RTDOT provides state and federal water operators, fish agencies, and the State Water Board with a reliable communication schedule and established points of contact to timely respond to emergency issues.

DWR and Reclamation expect to work with DFW, NMFS, and USFWS to ensure that decisions made by this group or proposals submitted to the State Water Board follow the principles set forth in the 2015 Drought Strategy and meet the requirements of CESA and ESA, including complying with the drought contingency provision (RPA Action I.2.3.c.) in the 2009 NMFS Biological Opinion. This process allows the regulatory agencies to provide feedback and concur on potential project operations and related effects on an ongoing basis as the drought emergency is addressed. As a result of this coordination, DWR and Reclamation may submit to the State Water Board additional information on developing standards appropriate for operation of the Projects during the drought.

2) There Will be no Impact to Other Legal Users of Water

The Projects anticipate these changes will not change the natural and abandoned flows. The requested changes to D-1641 will reduce the Projects anticipated releases of stored water to augment natural and abandoned flow to satisfy Project regulatory requirements. These Project releases would not be flows available for downstream diverters without a contract with the Projects because those diverters have no right to Project stored water. If the State Water Board approves the requested changes that result in a reduction in stored water releases, such a reduction could not result in an injury to other legal users of water.

3) The Change Will Not Result in Unreasonable Impacts to Fish and Wildlife or Other Instream Uses

Extreme drought conditions are well known to stress the aquatic resources of the San Francisco estuary and its watershed. Dry conditions during winter are expected to adversely affect spawning and rearing conditions for Longfin Smelt and Delta Smelt, and migration conditions for winter-run Chinook salmon, spring-run Chinook salmon, steelhead trout, and southern distinct population segment of North American green sturgeon. While maintaining flows consistent with unmodified D-1641 outflow requirements would provide some short-term support for these species, the reduced storage concomitant with these outflows would lead to substantially worse impacts later in the year. Conversely, while a modified D-1641 which reduces outflows may decrease Delta survival of the salmonids during winter, it will conserve reservoir storage which will lead to increased cold water pool available later in the year to provide upstream fishery benefits. The proposed export limits are intended to provide additional water deliveries

while not exceeding proportional regulatory standards regarding exports (e.g. E/I). The proposed DCC gate operations balance risks to both water quality and outmigrating anadromous fish during February and March, in the event of the extreme low Delta inflows. Hence, this proposal seeks to balance the short-term and long-term habitat needs of some of the covered anadromous and pelagic species during the entirety of WY2015.

Unlike WY2014, winter-run Chinook salmon and Delta Smelt are currently at an elevated risk of entrainment impacts, due to their spatial distribution, abundance, and productivity. Spring-run Chinook and steelhead are predicted to have an increased risk of entrainment in the South Delta as their migration increases through February and March. Green sturgeon are typically exposed to a broad spectrum of flows and exports over the course of the year, and thus not likely to have increased risk of entrainment due to changes in flows. Increased monitoring and coordination, extending from the interagency drought response efforts in WY2014, is intended to support management of key entrainment risk indicators in the Interior and South Delta as part of the proposed operations. The evidence for the risk of entrainment for each species of concern will be considered as part of the biological review being conducted to support the Endangered Species Act consultation process.

Consultation with California Department of Fish and Wildlife

DWR and Reclamation have met numerous times during the past few months with representatives of the CDFW, as well as with NMFS and USFWS, to discuss the hydrologic situation and potential measures to address it. On December 18, 2013, this group met to discuss water system operations, including additional openings of Delta Cross Channel gates during the winter and spring of 2014. On January 15, 2014, DWR and Reclamation presented the water system operations proposal and the requested Delta outflow Delta Cross Channel gate operations modifications contained in this petition to CDFW, NMFS and USFWS (as well as to representatives of the State Water Boards), and discussed it with this group again on January 24, 2014. During each of these meetings, DWR and Reclamation provided answers to questions posed by CDFW. Furthermore, consultation between DWR, Reclamation, and CDFW has occurred by virtue of the Governor's creation of a Drought Task Force. Both direct talks concerning this petition and discussions on the drought more generally have presented opportunities to consult as required under the State Water Code.

4) The Change is in the Public Interest

The public interest is best served by maintaining sustainable minimum exports and water quality necessary for the protection of critical water supplies. The requested changes are in the public interest by preserving water supplies to meet critical water supply needs, by increasing the duration and likelihood of maintaining minimal salinity control, and by

increasing the duration and likelihood of success of maintaining a cold water pool sufficient for sensitive aquatic species through the remainder of the year.

In addition, by modifying the Delta outflow as proposed in this petition the probability that the Projects will be able to prevent the “loss of control” over Delta salinity this summer will increase. If meeting unmodified D-1641 outflow objectives early in the year results in insufficient storage to control seawater intrusion, a loss of control would persist until the Northern California receives a rainy season with sufficient runoff to flush the Delta of ocean water to once again allow for in-delta beneficial uses. In this event, the enormous amount of water necessary to flush the Delta would be an inefficient use of water.

III. Due Diligence has been Exercised

DWR and Reclamation have exercised due diligence to avoid the circumstances necessitating this request by reducing allocations to its water supply contractors in 2013, when the current severe dry pattern began to emerge. Again in 2014, the Projects allocated a historic low for water deliveries to water supply contractors. Current conditions indicate that 2015 will be another extremely low allocation year for water supply contractors. In addition, prior to this petition DWR and Reclamation have reduced exports and maintained the minimum outflow necessary for salinity control. All avenues to conserve water in upstream storage were exercised while continuing to meet regulatory requirements.

Reclamation and DWR have contracts with senior water right holders to supply specific amounts of water (Exchange and Settlement contracts). The Projects will continue to exercise the discretion allowed in their contracts in order to minimize demands on upstream storage. In 2014, engaging these contractors also resulted in voluntary water conservation or demand shifting by changing the timing of deliveries. In 2015, if drought conditions persist, the Projects will again engage these contractors.

The drafting of this petition began upon the completion of the January 2015 forecast, which, along with the dry January hydrology, demonstrated the urgent need to seek the modifications proposed in this petition, and information supportive of this petition was developed through the marshalling of staff resources to examine and determine narrow and focused changes to address the immediate problem and a matrix of potential future requests that are dependent upon the evolving hydrology. As noted above, DWR and Reclamation have met with State Water Board staff and with representatives of CDFW, NMFS and USFWS, to discuss the elements of this petition, and to seek their input on how best to manage multiple needs for water supply.

Project Description for February – March 2015 Drought Response Actions
To Support Endangered Species Act Consultations

In order to cope with a possible fourth consecutive year of drought, the Bureau of Reclamation (Reclamation) and the project applicant, the California Department of Water Resources (DWR), are considering temporary modifications to operation of the Central Valley Project (CVP) and State Water Project (SWP). Coordinated long-term operation of the CVP and SWP previously underwent Endangered Species Act (ESA) consultation that resulted in biological opinions (BiOps) from the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) in 2008 and 2009, respectively. The first part of this project description describes the specific actions that Reclamation and DWR propose to implement in February and March of 2015 related to changes in D-1641 standards in the Project Description of the 2008 and 2009 BiOps. The second part of this project description is a proposed framework for future requests for OMR flexibility. The third part of this project description (Programmatic Considerations) describes potential operations that may be implemented in 2015 and beyond to address the ongoing drought conditions or to help recover from the conditions created from the previous three years of drought, in the event the hydrology becomes wetter.

Proposed February-March 2015 Actions

Reclamation and DWR are using the 90 percent exceedance forecast for Central Valley hydrology for the purpose of ESA consultation to predict the actions that are necessary to modify the Project Description and Reasonable and Prudent Alternatives (RPAs) described in the 2008 and 2009 BiOps. At this time the actual January 2015 hydrology is trending drier than the 90 percent exceedance forecast. However, Reclamation and DWR consider the 90 percent exceedance a conservative hydrologic estimate on which to base the ESA consultation. The following near-term actions in February and March 2015 are proposed under a dry hydrologic forecast, and may or may not be implemented depending on observed conditions and ability of the applicant to obtain modifications to water rights permits.

- Delta Outflow
    - The minimum monthly Net Delta Outflow Index (NDOI) described in Figure 3 of D-1641 (see Attachment 1) during the months of February and March to be no less than 4,000 cfs.
- Export Limits
    - The maximum Export Limits included in Table 3 of D-1641 (see Attachment 2) be modified as follows: During February and March when footnote 10 of Table 3 of D-1641 is not being met, the combined maximum SWP and CVP export rate for SWP and CVP contractors at the Clifton Court Forebay Intake and C.W. "Bill" Jones pumping plants will be no greater than 3,500 cfs on a 3-day running average. During February and March when an NDOI of at least 5,500 cfs is not being met, or the Delta Cross Channel (DCC) gates are open during a period inconsistent with footnote 23 of Table 3 of D-1641, the combined maximum SWP and CVP export rate will be no greater than 1,500 cfs. When precipitation and runoff events occur that allow the DCC gates to be closed and footnote 10 of Table 3 of D-1641 is being met [3-day average Delta Outflow of 7,100 cfs,

or electrical conductivity of 2.64 millimhos per centimeter on a daily or 14-day running average at the confluence of the Sacramento and the San Joaquin rivers (Collinsville station C2) if applicable], but any additional Delta Outflow requirements contained in Table 4 of D-1641 (see Attachment 3) are not being met, then exports of natural and abandoned flows are permitted up to D-1641 Export Limits contained in Table 3 and, in compliance with applicable laws and regulations including ESA and CESA.

- Delta Cross Channel Gate Operations
    - The DCC Gate Closure requirements included in Table 3 be modified as follows: The DCC gates may be opened during February and March as necessary to preserve limited storage in upstream reservoirs and reduce intrusion of high salinity water into the Delta while reducing impacts on migrating Chinook salmon. Requirements for closure of the DCC gates from February 1 through March 31 shall be determined through the Real-Time Drought Operations Management (RTDOMT) process. The DCC gate triggers matrix (as described in Appendix G of the April 2014 Drought Operations Plan and Operational Forecast) will be used to determine operation of the DCC gates. The triggers outlined in this matrix provide direction and a method that balances water quality and fishery objectives in the Delta.
- Vernalis Flows
    - Table 3 San Joaquin River flow requirements at Airport Way Bridge, Vernalis, for February and March be modified as follows: Base flow period averages (consistent with D1641, Table 3, Footnote 12) shall be no less than 500 cfs.

Old and Middle River (OMR) Flow Management Consultation Framework

If conditions warrant, Reclamation and DWR plan to propose short-term flexibilities consistent with the Interagency 2015 Drought Strategy for the CVP and SWP (2015 Drought Strategy) to allow OMR exceedances of the 14-day running average, measured using the OMR Index, during sporadic storm events under continued drought conditions. Limited exceedances of the –5,000 cfs OMR flow limit to –6,000 cfs, to be implemented only on the ascending limb of the hydrograph, will be requested to capture natural or abandoned flow in the Delta from sporadic storms (increase exports) under drought conditions. Any short-term flexibility in OMR would off-ramp should NMFS or USFWS determine that less negative OMR is required to protect listed fish species under the RPAs set forth in their respective BiOps, should conditions different from those that were expected during the period of operational flexibility occur. To implement this OMR flexibility, an objective of at least 7,100 cfs NDOI or 2.64 EC at Collinsville, or the objective of 4,000 cfs NDOI in May and June, whichever is applicable[1], must be achieved. Additionally, operations will be consistent with the Export Limits described in Table 3 of D-1641. If warranted by continued drought conditions, Reclamation and DWR may seek additional OMR

[1] The 7,100 cfs NDOI or 2.64 EC at Collinsville objective does not apply in May and June if the best available estimate of the Sacramento River Index for the water year is less than 8.1 MAF at the 90% exceedance level. Under this circumstance, a minimum 14-day running average NDOI of 4,000 cfs is required in May and June.

flexibility beyond what is described herein. Implementing these limited exceedances will be evaluated at that time.

Additional details regarding potential OMR flexibilities are provided in the 2015 Drought Strategy. The 2015 Drought Strategy articulates the following for winter OMR flexibility under the 2009 NMFS BiOp:

- *Upon the onset of RPA Action IV.2.3 for OMR flow management, OMR shall be no more negative than -5,000 cfs as a 14-day running average, and no more negative than -6,250 cfs as a 5-day running average, except as needed to capture sporadic storms (increase exports). This exception would be evaluated based on listed species distribution and risk in the South and Central Delta, and if conditions remain very dry (according to subsections below).*
    1. *While Action IV.2.3 is in effect, and drought conditions remain, the Projects may request an adjustment to its implementation by requesting that the use of the OMR Index criteria (as approved by USFWS, NMFS, and CDFW) to be no more negative than -6,000 cfs for limited periods in order to capture additional natural or abandoned flow in the Delta because of infrequent storm events. Through this operational flexibility, the Projects are expected to be able to increase exports over what they would otherwise be able to do, while providing protections for the listed species. During any potential adjustment to Action IV.2.3, the action triggers provided in RPA Action IV.2.3 (e.g., combined older juvenile Chinook salmon loss density) will continue to be in effect. Additional flexibility, use of the OMR Index to be no more negative than -6,500 cfs for short periods, may be requested by the Projects to capture the peak of storm events. Once the operational flexibility has been exercised, operations will conform OMR flows consistent with RPA Action IV.2.3.*

    2. *On occasion, there may be multiple rainfall events that occur one right after the other that make implementation of subsection 3, below, difficult, especially in consideration of the Projects exporting as much natural and abandoned flow as possible. In these situations, Reclamation and DWR may request additional flexibility in OMR flow management through the RTDOMT. In considering the request, the RTDOMT will convene and evaluate real-time and forecasted hydrology, data from various monitoring locations (e.g., Knights Landing RSTs, Sacramento trawl and beach seines, Jersey Point and Prisoners Point trawls, and the Federal and state fish facilities), and any advice from the DOSS, in making a decision whether to grant the additional flexibility, and for what duration.*

    3. *A similar flexibility was granted and implemented during a few storms in water year 2014. However, increases in combined exports lagged behind (a couple-day lag time) the peak of the increased natural flow in the Delta. If flexibility is requested and subsequently granted, increased exports during sporadic storm events in water year 2015 will be implemented during the ascending limb of the hydrograph, followed by a subsequent reduction in exports during the descending limb of the storm events. The key to this operation is to capture the spike in water availability prior to a coincident spike in listed fish presence in the central and*

south Delta. This request will be accompanied by augmented real-time monitoring at Prisoners Point and Jersey Point in order to evaluate the timing, location and magnitude of listed anadromous salmonid species in the Delta.

Additionally, the 2015 Drought Strategy articulates the following regarding OMR flexibility under 2008 USFWS BiOp from January 15 through March:

- *In the event storms are infrequent, the RTDOMT expects to implement short-term flexibilities when they occur to allow OMR exceedances in situations where such exceedances may allow for increased water exports while avoiding excessive take of Delta Smelt. Any such request will be accompanied by augmented real-time monitoring at Prisoners Point and Jersey Point in order to evaluate in real-time any changes in the distribution or density of Delta Smelt in the Central Delta. In accordance with the approach employed in last year's drought operations, such a request will also be accompanied by an analysis of effects of the proposed operations on Delta Smelt distribution and entrainment risk. The analyses will address monthly and real-time Delta Smelt distributional information and trends, physical environmental conditions, and, if appropriate, hydrodynamic model output.*

  Management decision-making during both period (1)[December 1-January 15] *and period (2)*[January 15-March] *of the winter will be aided by review of information obtained through "early warning" trawl sampling for Delta smelt that began on December 1. Early-warning drought monitoring will include a survey of the Spring Kodiak Trawl program in December, where the program formerly began in January, and a "real-time" component that samples as frequently as on alternate days in the Central Delta. The "real-time" component has a high potential to quickly answer whether Delta smelt are in danger of moving so far into the Central and South Delta that strong entrainment concerns will eventuate. The information from the "early warning" sampling will be very carefully evaluated along with other sources of information bearing on operations management.*

  The combination of turbidity modeling and augmented biological monitoring is expected to allow more focused management of OMR flow. Where in the past agencies were forced to rely on a combination of monthly biological monitoring and real-time turbidity and flow monitoring, it may now be possible to incorporate real-time monitoring in all three of these areas into management decision-making. As such, FWS expects to be able to more narrowly focus reductions in exports during early storm events than would have been possible in the past, while still maintaining adequate entrainment protection for Delta smelt that may be in the lower Sacramento and San Joaquin rivers.

To complete an ESA consultation in a timely manner, and if flexibilities are warranted, the following OMR consultation process has been developed. This process is intended to explore and evaluate risks associated with any proposal and streamline ESA compliance through ongoing coordination between Reclamation, DWR, and the state and federal fish and wildlife agencies. Any OMR proposal will be discussed as part of the RTDOMT process.

Streamlined OMR Consultation Framework:

1. Identify upcoming storm event
2. Evaluate forecasted run-off and anticipated available in-Delta flows
3. Develop and model a specific OMR and outflow proposal, including specific proposed OMR flow and expected duration of action
4. Finalize proposed project description
5. Prepare listed species and critical habitat biological review including:
    - Existing Delta conditions and supporting hydrodynamic modeling
    - Species distribution and risk of entrainment in the South and Central Delta
    - Particle Tracking Model (PTM) results, including enhanced PTM if available for salmonids
    - Discussion of any existing RPA action that may be in place and any associated effects analysis that provides biological support for a deviation from that action

If Reclamation and DWR determine through the described streamlined process that OMR flexibility is warranted, then Reclamation and DWR will describe the requested flexibility in a reinitiation request that provides the information described above. USFWS and NMFS will provide an evaluation of the anticipated effects of the action on listed species and critical habitats. DWR and CDFW will undertake a similar process for CESA.

Programmatic Considerations for Future Drought-Related Actions

During the continuing drought, operation of the CVP and SWP must provide for, at a minimum, essential human health and safety needs throughout the CVP and SWP service areas, and retain the capability to provide for such minimum needs throughout water year (WY) 2015 and WY 2016 if drought conditions continue. For clarity, Reclamation and DWR's consideration of these essential human health and safety needs includes adequate water supplies and water quality for drinking water, sanitation, and fire suppression, but does not extend to other urban water demands such as outdoor landscape irrigation. While most California communities have adequate reserve supplies, some will require continued delivery of limited amounts of water through the CVP and SWP systems to meet these basic needs. Human health and safety concerns may drive specific consultation requests throughout WY 2015 if not considered in the existing exception procedures of the BiOps.

The description below is included to highlight specific actions and factors that may be considered throughout 2015, and identifies actions that may be included in future consultations, if necessary. This is not intended to be a fully inclusive list, nor does inclusion in the list mean the agencies will go forward with any action. Reclamation and DWR are not proposing these actions at this time, however these

actions are considered in looking at the future status of the species in light of the actions proposed in February and March 2015.

Upstream Reservoirs: Upstream reservoirs will be operated through the winter and spring to preserve and build storage. Upstream reservoir storage, while improved from end of September 2014 storage, remains extremely low in the early part of WY 2015. Reclamation and DWR will be trying to develop cold water resources in the winter and spring in those reservoirs where temperature management is needed later in the year. This may include working with the Sacramento River Settlement Contractors to shift early spring demand later into the year to conserve water in Shasta Reservoir, if warranted.

Water Supply: Throughout dry conditions, CVP and SWP systems will be operated to lessen critical economic losses to agricultural, municipal, and industrial uses due to water shortages through project water deliveries and by facilitating voluntary water transfers and exchanges to the extent possible, while balancing the needs of upstream storage, fishery and wildlife resource protection, and operational flexibility. A key to minimizing water supply shortages for economic purposes will be to take advantage of opportunities to export natural or abandoned flow in the winter and spring while maintaining Delta water quality and minimizing adverse effects to listed fish. Release of stored water in summer and fall will be managed to concurrently benefit in-stream temperature objectives, wildlife objectives, meet Sacramento Valley in-basin needs, and preserve carry over storage to meet objectives in WY 2016.

Refuges: One of the requirements of the Central Valley Project Improvement Act (CVPIA) passed by Congress in 1992 included providing water for state, federal and private managed wetlands in order to maintain and improve wetland habitat areas. For south of Delta refuges, water from San Luis Reservoir can be made available to meet refuge needs when total demand from direct diversions from the Delta are not feasible. The CVPIA and refuge water supply contracts allow for flexibility to transfer water from refuges both within basin as well as north of the Delta to south of the Delta. Water transfers from north of Delta refuges to south of Delta refuges would occur to support priority habitat needs of south of Delta refuges given available capacity to facilitate the transfer. This water would be directly diverted or could be stored in San Luis Reservoir and used when most needed by south of the Delta refuges. Refuge deliveries are included in CVP operational scenarios and forecasts, and calculations regarding anticipated reservoir levels into the late fall and early winter.

Biological Opinion Flexibilities: The specific flexibilities being sought in this consultation for February and March and OMR Flow Management Consultation Framework are described above. The items included below are potential flexibilities that may be sought through future consultations. Many of these items are further described in the Interagency 2015 Drought Strategy Working Draft dated December 11, 2014.

- NMFS BiOp Provisions
    - Flexibility with San Joaquin I:E ratio: Currently, the agencies are discussing several concepts for providing additional flexibility in the April-May period, if conditions remain very dry. These operations will be discussed further and evaluated as part of the phased

operations plan as hydrology is updated. The agencies will declare the San Joaquin I:E ratio as early as possible prior to the April/May implementation.

- Head of Old River Barrier (HORB):
  - The spring HORB, as described in the 2008 Biological Assessment Project Description, will be installed and operational by April 1, 2015, if hydrological conditions are compatible. The HORB is installed in the spring and is intended to prevent downstream-migrating salmonids in the San Joaquin River from entering Old River. Flow conditions will be assessed to determine actual date of installation.
  - Although not described in the NMFS RPA, the fall HORB barrier is typically installed upon request of CDFW and is similar in design to the spring barrier, but smaller in size. The fall barrier is intended to benefit migrating adult salmon in the San Joaquin River by improving flow and dissolved oxygen conditions in the river downstream of the barrier.

- USFWS BiOp Provisions
  - Fall X2 Action (if Sacramento Valley classification is above normal or wet): This RPA component is not expected to be triggered in WY 2015, however, Reclamation will work with DWR, NMFS, USFWS, CDFW, and others to refine the Fall Outflow Adaptive Management Plan (AMP) based on findings to date, including, if appropriate, proposing new experimental management strategies based on those findings.

D-1641 Related Actions: Reclamation and DWR may seek adjustments under D-1641, including: (1) triggers for modified X2 criteria to balance upstream storage and fish protection, (2) triggers for moving Western Delta Ag compliance point (i.e., Emmaton to Three-Mile Slough), (3) San Joaquin flows at Vernalis, (4) Rio Vista flow requirements, and (5) Net Delta Outflow requirements. Additionally, Reclamation and DWR may exercise the flexibility provided in D-1641 to adjust the E/I ratio's averaging period for sporadic storm events (similar to 2014).

Preferential Pumping: The projects will consider a facility shift in exports in April and May so that minimal pumping will occur at the SWP's Banks Pumping Plant and the majority will occur at the CVP's Jones Pumping Plant. This export shift will increase survival of salmonids through these facilities, since fewer fish will enter the SWP, where loss is higher due to substantial pre-screen mortality associated with Clifton Court Forebay. Combined exports would remain the same. The amount of shifted pumping from Banks to Jones would be made available to the SWP.

Temporary Emergency Drought Barriers: If hydrologic forecasts show there will be insufficient water in upstream reservoirs to repel the saltwater and meet health and safety and other critical needs, then installation of Emergency Drought Barriers will be considered to lessen water quality impacts. Excessive salinity increases in the Delta could render the water undrinkable for 25 million Californians and unusable by farms reliant upon this source. Temporary rock (rip-rap) Emergency Drought Barriers may be installed at up to three locations in the Delta during drought conditions in 2015, or in a subsequent year if necessary, to manage salinity in the Delta when there is not enough water in upstream reservoirs

to release to rivers to repel the saltwater. Consultation on installation and operation of the barriers will be conducted on the barriers prior to installation and may require additional adjustments to D-1641.

Hatchery Operations: Livingston Stone National Fish Hatchery (LSNFH) managers will coordinate with Delta Operations for Salmonids and Sturgeon (DOSS) to time the hatchery release of winter-run Chinook salmon to coincide with favorable hydrologic conditions, and to track their movement down the Sacramento River into and through the Delta utilizing acoustically-tagged winter-run Chinook salmon released at approximately the same time and real-time acoustic receivers deployed in the Sacramento River and Delta at various locations. DOSS will review the real-time acoustic tag data to determine the likely migration timing and distribution of the hatchery winter-run in the Sacramento River and into the Delta, and advise NMFS and Water Operations Management Team (WOMT) of potential risks to hatchery winter-run salmon.

Transfers and Exchanges: Reclamation and DWR will continue to facilitate water transfers and exchanges. If these transfers or exchanges are conveyed through the Delta outside the transfer window described in the 2008 and 2009 BiOps (July-September), Reclamation and DWR will consult with USFWS and NMFS prior to conveyance of the transfer water and DWR will request a consistency determination from CDFW.

Trinity Releases: Spring flows on the Trinity River will be consistent with annual allocations as provided through the Trinity River Main-stem Fishery Restoration Record of Decision. Flows for the remainder of the year will make consistent with SWRCB order WR 90-5. Consistent with fish health criteria, releases to augment flows in the Lower Klamath River may be considered.

Attachment 1

D-1641 Table 3 – Water Quality Objectives for Fish and Wildlife Beneficial Uses

TABLE 3
WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENEFICIAL USES

COMPLIANCE LOCATION	INTERAGENCY STATION NUMBER (RKI [1])	PARAMETER	DESCRIPTION (UNIT) [2]	WATER YEAR TYPE [3]	TIME PERIOD	VALUE
SAN JOAQUIN RIVER SALINITY						
San Joaquin River at and between Jersey Point and Prisoners Point [4]	*D-15 (RSAN018) -and- D-29 (RSAN038)*	*Electrical Conductivity (EC)*	*Maximum 14-day running average of mean daily EC(mmhos/cm)*	*W,AN,BN,D*	*Apr-May*	*0.44 [5]*
EASTERN SUISUN MARSH SALINITY						
Sacramento River at Collinsville -and- Montezuma Slought at National Steel -and- Montezuma Slough near Beldon Landing	*C-2 (RSAC081)* *S-64 (SLMZU25)* *S-49 (SLMZU11)*	*Electrical Conductivity (EC)*	*Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location*	*All*	*Oct* *Nov-Dec* *Jan* *Feb-Mar* *Apr-May*	*19.0* *15.5* *12.5* *8.0* *11.0*
WESTERN SUISUN MARSH SALINITY						
Chadbourne Slough at Sunrise Duck Club -and- Suisun Slough, 300 feet south of Volanti Slough	*S-21 (SLCBN1)* *S-42 (SLSUS12)*	*Electrical Conductivity (EC)*	*Maximum monthly average of both daily high tide EC values (mmhos/cm), or demonstrate that equivalent or better protection will be provided at the location*	*All but deficiency period [6]*	*Oct* *Nov* *Dec* *Jan* *Feb-Mar* *Apr-May*	*19.0* *16.5* *15.5* *12.5* *8.0* *11.0*
				Deficiency Period [6]	*Oct* *Nov* *Dec-Mar* *Apr* *May*	*19.0* *16.5* *15.6* *14.0* *12.5*

TABLE 3 (continued)
WATER QUALITY OBJECTIVES FOR FISH AND WILDLIFE BENEFICIAL USES

COMPLIANCE LOCATION	INTERAGENCY STATION NUMBER(RKI1[])	PARAMETER	DESCRIPTION (UNIT) [2]	WATER YEAR TYPE [3]	TIME PERIOD	VALUE
DELTA OUTFLOW						
		Net Delta Outflow Index (NDOI) [7]	*Minimum monthly average [8] NDOI (cfs)*	*All*	*Jan*	*4,500 [9]*
				All	*Feb-Jun*	*[10]*
				W,AN	*Jul*	*8,000*
				BN		*6,500*
				D		*5,000*
				C		*4,000*
				W,AN,BN	*Aug*	*4,000*
				D		*3,500*
				C		*3,000*
				All	*Sep*	*3,000*
				W,AN,BN,D	*Oct*	*4,000*
				C		*3,000*
				W,AN,BN,D	*Nov-Dec*	*4,500*
				C		*3,500*
RIVER FLOWS						
Sacramento River at Rio Vista	*D-24 (RSAC101)*	*Flow rate*	*Minimum monthly average [11] flow rate (cfs)*	*All*	*Sep*	*3,000*
				W,AN,BN,D	*Oct*	*4,000*
				C		*3,000*
				W,AN,BN,D	*Nove-Dec*	*4,500*
				C		*3,500*
San Joaquin River at Airport Way Bridge, Vernalis	*C-10 (RSAN112)*	*Flow rate*	*Minimum monthly average [12] flow rate (cfs) [13]*	*W,AN*	*Feb-Apr 14*	*2,130 or 3,420*
				BN,D	*and*	*1,420 or 2,280*
				C	*May 16-Jun*	*710 or 1,140*
				W	*Apr 15-*	*7,330 or 8,620*
				AN	*May 15 [14]*	*5,730 or 7,020*
				BN		*4,620 or 5,480*
				D		*4,020 or 4,880*
				C		*3,110 or 3,540*
				All	*Oct*	*1,000 [15]*
EXPORT LIMITS						
		Combined export rate [16]	*Maximum 3-day running average (cfs)*	*All*	*Apr 15- May 15 [17]*	*[18]*
				All	*Feb-Jun*	*35% Delta inflow [21]*
			Maximum percent of Delta inflow diverted [19] [20]	*All*	*Jul-Jan*	*65% Delta inflow*
DELTA CROSS CHANNEL GATES CLOSURE						
Delta Cross Channel at Walnut Grove	—	*Closure of gates*	*Closed gates*	*All*	*Nov-Jan*	*[22]*
					Feb-May 20	—
					May 21- Jun 15	*[23]*

Table 3 Footnotes

[1] River Kilometer Index station number.

[2] Determination of compliance with an objective expressed as a running average begins on the last day of the averaging period. The averaging period commences with the first day of the time period of the applicable objective. If the objective is not met on the last day of the averaging period, all days in the averaging period are considered out of compliance.

[3] The Sacramento Valley 40-30-30 Water Year Hydrologic Classification Index (see Figure 1) applies unless otherwise specified.

[4] Compliance will be determined at Jersey Point (station D15) and Prisoners Point (station D29).

[5] This standard does not apply in May when the best available May estimate of the Sacramento River Index for the water year is less than 8.1 MAF at the 90% exceedence level. [Note: The Sacramento River Index refers to the sum of the unimpaired runoff in the water year as published in the DWR Bulletin 120 for the following locations: Sacramento River above Bend Bridge, near Red Bluff; Feather River, total unimpaired inflow to Oroville Reservoir; Yuba River at Smartville; and American River, total unimpaired inflow to Folsom Reservoir.]

[6] A deficiency period is: (1) the second consecutive dry water year following a critical year; (2) a dry water year following a year in which the Sacramento River Index (described in footnote 5) was less than 11.35 MAF; or (3) a critical water year following a dry or critical water year. The determination of a deficiency period is made using the prior year's final Water Year Type determination and a forecast of the current year's Water Year Type; and remains in effect until a subsequent water year is other than a Dry or Critical water year as announced on May 31 by DWR and USBR as the final water year determination.

[7] Net Delta Outflow Index (NDOI) is defined in Figure 3.

[8] For the May-January objectives, if the value is less than or equal to 5,000 cfs, the 7-day running average shall not be less than 1,000 cfs below the value; if the value is greater than 5,000 cfs, the 7-day running average shall not be less than 80% of the value.

[9] The objective is increased to 6,000 cfs if the best available estimate of the Eight River Index for December is greater than 800 TAF. [Note: The Eight River Index refers to the sum of the unimpaired runoff as published in the DWR Bulletin 120 for the following locations: Sacramento River flow at Bend Bridge, near Red Bluff; Feather River, total inflow to Oroville Reservoir; Yuba River flow at Smartville; American River, total inflow to Folsom Reservoir; Stanislaus River, total inflow to New Melones Reservoir; Tuolumne River, total inflow to Don Pedro Reservoir; Merced River, total inflow to Exchequer Reservoir; and San Joaquin River, total inflow to Millerton Lake.]

[10] The minimum daily net Delta outflow shall be 7,100 cfs for this period, calculated as a 3-day running average. This requirement is also met if either the daily average or 14-day running average EC at the confluence of the Sacramento and the San Joaquin rivers is less than or equal to 2.64 mmhos/cm (Collinsville station C2). If the best available estimate of the Eight River Index (described in footnote 9) for January is more than 900 TAF, the daily average or 14-day running average EC at station C2 shall be less than or equal to 2.64 mmhos/cm for at least one day between February 1 and February 14; however, if the best available estimate of the Eight River Index for January is between 650 TAF and 900 TAF, the Executive Director of the SWRCB is delegated authority to decide whether this requirement applies. If the best available estimate of the Eight River Index for February is less than 500 TAF, the standard may be further relaxed in March upon the request of the DWR and the USBR, subject to the approval of the Executive Director of the SWRCB. The standard does not apply in May and June if the best available May estimate of the Sacramento River Index (described in footnote 5) for the water year is less than 8.1 MAF at the 90% exceedence level.

Under this circumstance, a minimum 14-day running average flow of 4,000 cfs is required in May and June. Additional Delta outflow objectives are contained in Table 4.

[11] The 7-day running average shall not be less than 1,000 cfs below the monthly objective.

[12] Partial months are averaged for that period. For example, the flow rate for April 1-14 would be averaged over 14 days. The 7-day running average shall not be less than 20% below the flow rate objective, with the exception of the April 15-May 15 pulse flow period when this restriction does not apply.

[13] The water year classification for the San Joaquin River flow objectives will be established using the best available estimate of the 60-20-20 San Joaquin Valley Water Year Hydrologic Classification (see Figure 2) at the 75% exceedence level. The higher flow objective applies when the 2-ppt isohaline (measured as 2.64 mmhos/cm surface salinity) is required to be at or west of Chipps Island.

[14] This time period may be varied based on real-time monitoring. One pulse, or two separate pulses of combined duration equal to the single pulse, should be scheduled to coincide with fish migration in San Joaquin River tributaries and the Delta. The USBR will schedule the time period of the pulse or pulses in consultation with the USFWS, the NMFS, and the DFG. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement. The schedule is subject to the approval of the Executive Director of the SWRCB.

[15] Plus up to an additional 28 TAF pulse/attraction flow during all water year types. The amount of additional water will be limited to that amount necessary to provide a monthly average flow of 2,000 cfs. The additional 28 TAF is not required in a critical year following a critical year. The pulse flow will be scheduled by the DWR and the USBR in consultation with the USFWS, the NMFS and the DFG. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement.

[16] Combined export rate for this objective is defined as the Clifton Court Forebay inflow rate (minus actual Byron-Bethany Irrigation District diversions from Clifton Court Forebay) and the export rate of the Tracy pumping plant.

[17] This time period may be varied based on real-time monitoring and will coincide with the San Joaquin River pulse flow described in footnote 18. The DWR and the USBR, in consultation with the USFWS, the NMFS and the DFG, will determine the time period for this 31-day export limit. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement.

[18] Maximum export rate is 1,500 cfs or 100% of 3-day running average of San Joaquin River flow at Vernalis, whichever is greater. Variations to this maximum export rate may be authorized if agreed to by the USFWS, the NMFS and the DFG. This flexibility is intended to result in no net water supply cost annually within the limits of the water quality and operational requirements of this plan. Variations may result from recommendations of agencies for protection of fish resources, including actions taken pursuant to the State and federal Endangered Species Act. Any variations will be effective immediately upon notice to the Executive Director of the SWRCB. If the Executive Director of the SWRCB does not object to the variations within 10 days, the variations will remain in effect. The Executive Director of the SWRCB is also authorized to grant short-term exemptions to export limits for the purpose of facilitating a study of the feasibility of recirculating export water into the San Joaquin River to meet flow objectives.

[19] Percent of Delta inflow diverted is defined in Figure 3. For the calculation of maximum percent Delta inflow diverted, the export rate is a 3-day running average and the Delta inflow is a 14-day running average, except when the CVP or the SWP is making storage withdrawals for export, in which case both the export rate and the Delta inflow are 3-day running averages.

[20] The percent Delta inflow diverted values can be varied either up or down. Variations are authorized subject to the process described in footnote 18.

[21] If the best available estimate of the Eight River Index (described in footnote 9) for January is less than or equal to 1.0 MAF, the export limit for February is 45% of Delta inflow. If the best available estimate of the Eight River Index for January is greater than 1.5 MAF, the February export limit is 35% of Delta inflow. If the best available estimate of the Eight River Index for January is between 1.0 MAF and 1.5 MAF, the DWR and the USBR will set the export limit for February within the range of 35% to 45%, after consultation with the USFWS, the NMFS and the DFG. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement.

[22] For the November-January period, close Delta Cross Channel gates for a total of up to 45 days. The USBR will determine the timing and duration of the gate closure after consultation with the USFWS, the NMFS and the DFG. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement.

[23] For the May 21-June 15 period, close Delta Cross Channel gates for a total of 14 days. The USBR will determine the timing and duration of the gate closure after consultation with the USFWS, the NMFS and the DFG. Consultation with the CALFED Operations Group established under the Framework Agreement will satisfy the consultation requirement.

Attachment 2

D-1641 Figure 3 - NDOI and Percent Inflow Diverted

Figure 3
NDOI and PERCENT INFLOW DIVERTED [1]

The NDOI and the percent inflow diverted, as described in this footnote, shall be computed daily by the DWR and the USBR using the following formulas (all flows are in cfs):

NDOI = DELTA INFLOW - NET DELTA CONSUMPTIVE USE - DELTA EXPORTS

PERCENT INFLOW DIVERTED = (CCF + TPP) ÷ DELTA INFLOW

where *DELTA INFLOW = SAC + SRTP + YOLO + EAST + MISC + SJR*

SAC	=	Sacramento River at Freeport mean daily flow for the previous day; the 25-hour tidal cycle measurements from 12:00 midnight to 1:00 a.m. may be used instead.
SRTP	=	Sacramento Regional Treatment Plant average daily discharge for the previous week.
YOLO	=	Yolo Bypass mean daily flow for the previous day, which is equal to the flows from the Sacramento Weir, Fremont Weir, Cache Creek at Rumsey, and the South Fork of Putah Creek.
EAST	=	Eastside Streams mean daily flow for the previous day from the Mokelumne River at Woodbridge, Cosumnes River at Michigan Bar, and Calaveras River at Bellota.
MISC	=	Combined mean daily flow for the previous day of Bear Creek, Dry Creek, Stockton Diverting Canal, French Camp Slough, Marsh Creek, and Morrison Creek.
SJR	=	San Joaquin River flow at Vernalis, mean daily flow for the previous day.

where *NET DELTA CONSUMPTIVE USE = GDEPL - PREC*

GDEPL	=	Delta gross channel depletion for the previous day based on water year type using the DWR's latest Delta land use study.[2]
PREC	=	Real-time Delta precipitation runoff for the previous day estimated from stations within the Delta.

and where *DELTA EXPORTS*[3] *= CCF + TPP + CCC + NBA*

CCF	=	Clifton Court Forebay inflow for the current day.[4]
TPP	=	Tracy Pumping Plant pumping for the current day.
CCC	=	Contra Costa Canal pumping for the current day.
NBA	=	North Bay Aqueduct pumping for the current day.

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1 Not all of the Delta tributary streams are gaged and telemetered. When appropriate, other methods of estimating stream flows, such as correlations with precipitation or runoff from nearby streams, may be used instead.

2 The DWR is currently developing new channel depletion estimates. If these new estimates are not available, DAYFLOW channel depletion estimates shall be used.

3 The term "Delta Exports" is used only to calculate the NDOI. It is not intended to distinguish among the listed diversions with respect to eligibility for protection under the area of origin provisions of the California Water Code.

4 Actual Byron-Bethany Irrigation District withdrawals from Clifton Court Forebay shall be subtracted from Clifton Court Forebay inflow. (Byron-Bethany Irrigation District water use is incorporated into the GDEPL term.

Attachment 3

D-1641 Table 4 - Number of Days When Maximum Daily Average Electrical Conductivity of 2.64 mmhos/com Must Be Maintained at Specified Location

Table 4. Number of Days When Maximum Daily Average Electrical Conductivity of 2.64 mmhos/cm Must Be Maintained at Specified Location

Number of Days When Maximum Daily Average Electrical Conductivity of 2.64 mmhos/cm Must Be Maintained at Specified Location [a]																	
PMI[b] (TAF)	Chipps Island (Chipps Island Station D10)					PMI[b] (TAF)	Port Chicago (Port Chicago Station C14) [d]					PMI[b] (TAF)	Port Chicago (Port Chicago Station C14)[d]				
	FEB	MAR	APR	MAY	JUN		FEB	MAR	APR	MAY	JUN		FEB	MAR	APR	MAY	JUN
≤ 500	0	0	0	0	0	0	0	0	0	0	0	5250	27	29	25	26	6
750	0	0	0	0	0	250	1	0	0	0	0	5500	27	29	26	28	9
1000	28[c]	12	2	0	0	500	4	1	0	0	0	5750	27	29	27	28	13
1250	28	31	6	0	0	750	8	2	0	0	0	6000	27	29	27	29	16
1500	28	31	13	0	0	1000	12	4	0	0	0	6250	27	30	27	29	19
1750	28	31	20	0	0	1250	15	6	1	0	0	6500	27	30	28	30	22
2000	28	31	25	1	0	1500	18	9	1	0	0	6750	27	30	28	30	24
2250	28	31	27	3	0	1750	20	12	2	0	0	7000	27	30	28	30	26
2500	28	31	29	11	1	2000	21	15	4	0	0	7250	27	30	28	30	27
2750	28	31	29	20	2	2250	22	17	5	1	0	7500	27	30	29	30	28
3000	28	31	30	27	4	2500	23	19	8	1	0	7750	27	30	29	31	28
3250	28	31	30	29	8	2750	24	21	10	2	0	8000	27	30	29	31	29
3500	28	31	30	30	13	3000	25	23	12	4	0	8250	28	30	29	31	29
3750	28	31	30	31	18	3250	25	24	14	6	0	8500	28	30	29	31	29
4000	28	31	30	31	23	3500	25	25	16	9	0	8750	28	30	29	31	30
4250	28	31	30	31	25	3750	26	26	18	12	0	9000	28	30	29	31	30
4500	28	31	30	31	27	4000	26	27	20	15	0	9250	28	30	29	31	30
4750	28	31	30	31	28	4250	26	27	21	18	1	9500	28	31	29	31	30
5000	28	31	30	31	29	4500	26	28	23	21	2	9750	28	31	29	31	30
5250	28	31	30	31	29	4750	27	28	24	23	3	10000	28	31	30	31	30
≤ 5500	28	31	30	31	30	5000	27	28	25	25	4	>10000	28	31	30	31	30

[a] The requirement for number of days the maximum daily average EC (EC) of 2.64 mmhos per centimeter (mmhos/cm) must be maintained at Chipps Island and Port Chicago can also be met with maximum 14-day running average EC of 2.64 mmhos/cm, or 3-day running average NDOIs of 11,400 cfs and 29,200 cfs, respectively. If salinity/flow objectives are met for a greater number of days than the requirements for any month, the excess days shall be applied to meeting the requirements for the following month. The number of days for values of the PMI between those specified in this table shall be determined by linear interpolation.

[b] PMI is the best available estimate of the previous month's Eight River Index. (Refer to Footnote 10 for Table 3 for a description of the Eight River Index.)

[c] When the PMI is between 800 TAF and 1000 TAF, the number of days the maximum daily average EC of 2.64 mmhos/cm (or maximum 14-day running average EC of 2.64 mmhos/cm, or 3-day running average NDOI of 11,400 cfs) must be maintained at Chipps Island in February is determined by linear interpolation between 0 and 28 days.

[d] This standard applies only in months when the average EC at Port Chicago during the 14 days immediately prior to the first day of the month is less than or equal to 2.64 mmhos/cm.

Status of Species

Winter-run Chinook salmon

A small number of winter-run Chinook salmon (*Oncorhynchus tshawytscha*) (n=3,015; 90% CI= 2,741-3,290) returned to spawn in the upper Sacramento River in 2014. Of these 3,105 winter-run Chinook, 388 were collected for broodstock at the Keswick trap. Assuming that 3-year old fish make up the majority of each spawning cohort, returning adults in 2014 were produced by a much smaller spawning escapement in 2011 (i.e., 827 adult spawners). The effects of limited cold water storage and loss of temperature control out of Keswick Dam from early September through the fall of 2014 led to substantial egg and fry mortality (Figure 1). Typically, the peak of fry outmigration from the upper Sacramento River has occurred in early-to-mid October, with fish rearing in the middle reaches of the Sacramento River downstream of Red Bluff Diversion Dam (RBDD). However, in 2014, the winter-run Chinook salmon fry population appeared to start moving downstream past RBDD in September and no noticeable peaks in passage have been observed through the current period (Figures 2 and 3). A one-day emigration pulse event occurred in late October, which was associated with a spike in turbidity; but observation of migrating fry passed RBDD have so far remained extremely low even with large precipitation events in early and mid-December and their associated increases in turbidity and river flows.

Because of staffing issues and concerns about debris during the high flows in December, the rotary screw traps at RBDD were operated for just 8 of 31 days during December 2014[1]. While this adds some uncertainty to the 2014 brood year passage estimates, historical patterns suggest that most winter-run Chinook salmon juveniles would have passed RBDD before December. Also, the seasonal passage estimates RBDD do include estimates of passage on non-sampled days based on interpolation. So, while it is possible that some of the higher passage days might not have been sampled and the estimated seasonal passage may be somewhat underestimating actual passage, the current RBDD passage estimate is less than half of the estimated passage for brood year 2011 juveniles, despite an adult escapement nearly four times the escapement observed in 2011.

Few winter-run Chinook salmon juveniles are currently being observed in the upper Sacramento River and the annual population estimates remain lower than expected. As of January 14, 2015, an estimated 402,000 winter-run Chinook salmon juveniles have migrated past RBDD (Gruber 2015). Flows from Keswick Dam were reduced during November for cold water pool conservation (Figure 4), and of 89 potential stranding sites along the Sacramento River from Tehama (Los Molinos) to Keswick Dam (about 70 river miles), only nine completely isolated sites were identified to have winter-run salmon trapped in them (Doug Killam, California

[1] Biweekly reports from RBDD are available at: http://www.fws.gov/redbluff/RBDD%20JSM%20Biweekly/2014/rbdd_jsmp_2014.html

Department of Fish and Wildlife [CDFW], pers. comm. January 20, 2015). Field biologists attribute the rarity of stranded juveniles in potential stranding locations to rarity of juveniles, not to improved avoidance of stranding relative to previous years.

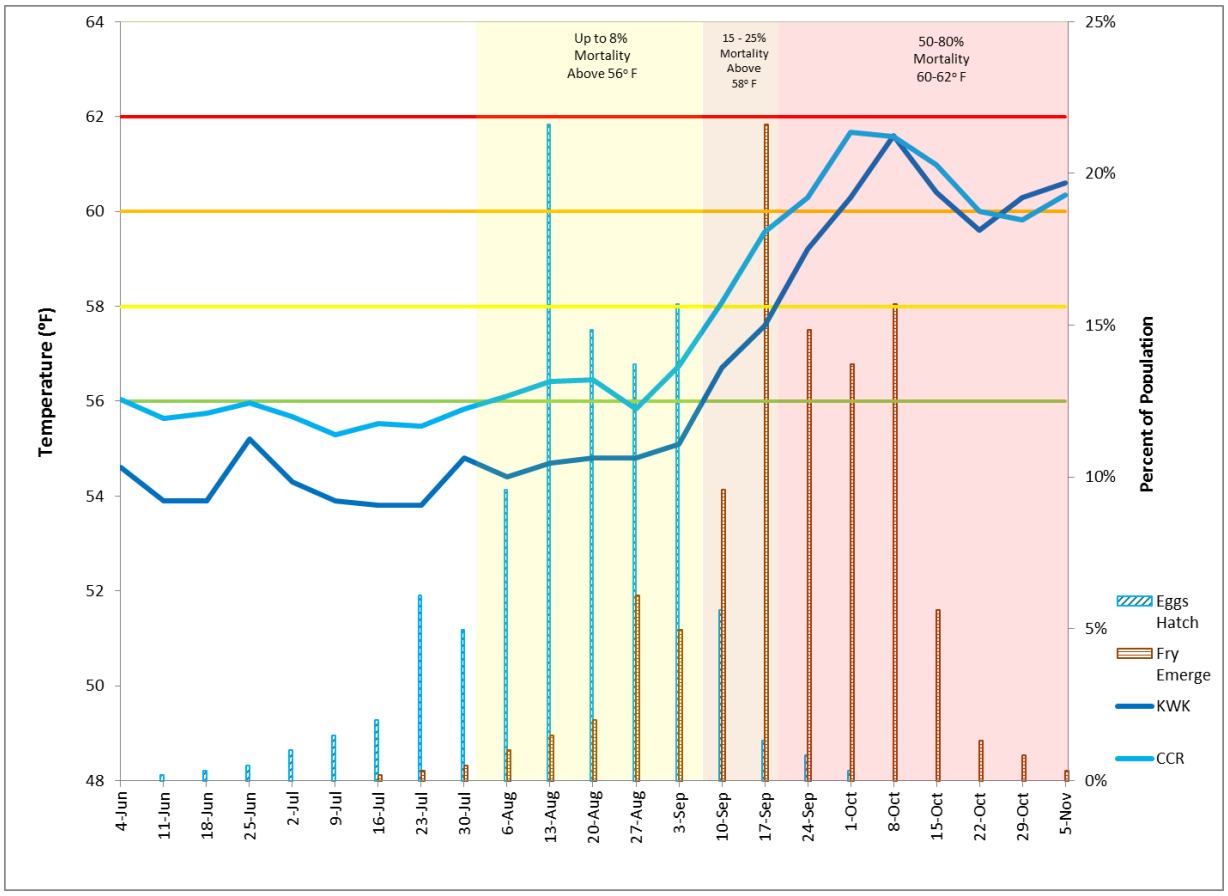


Figure 1. Water temperatures at Keswick Dam (KWK) and Clear Creek Confluence (CCR, WY14 temperature compliance point) and winter-run Chinook salmon early life history between May 1 and November 6, 2014. [2]

[2] Figure supplied by CDFW on January 20, 2015.

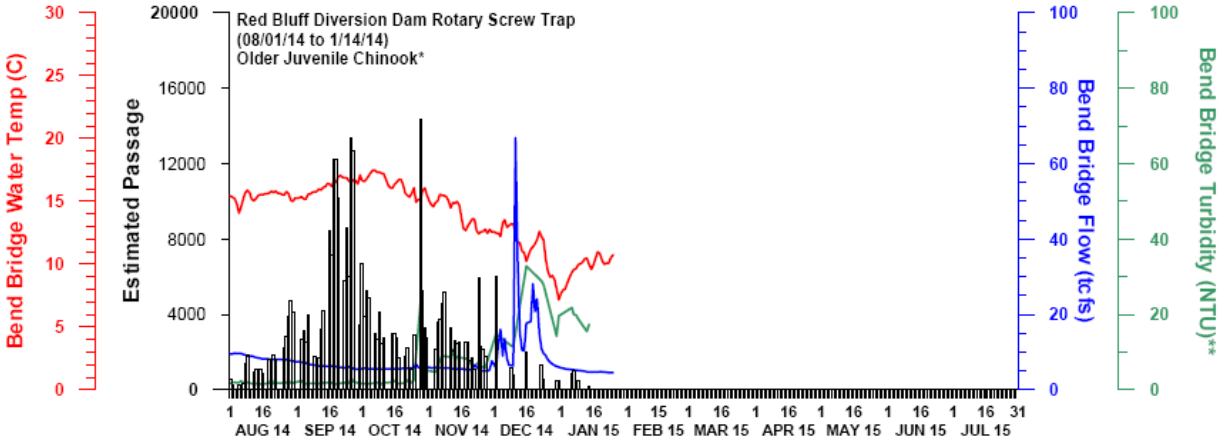


Figure 2. Daily estimated passage of Older Juvenile Chinook Salmon at Red Bluff Diversion Dam (RK 391) and associated environmental data at Bend Bridge (RK 415), BY2014. [3]

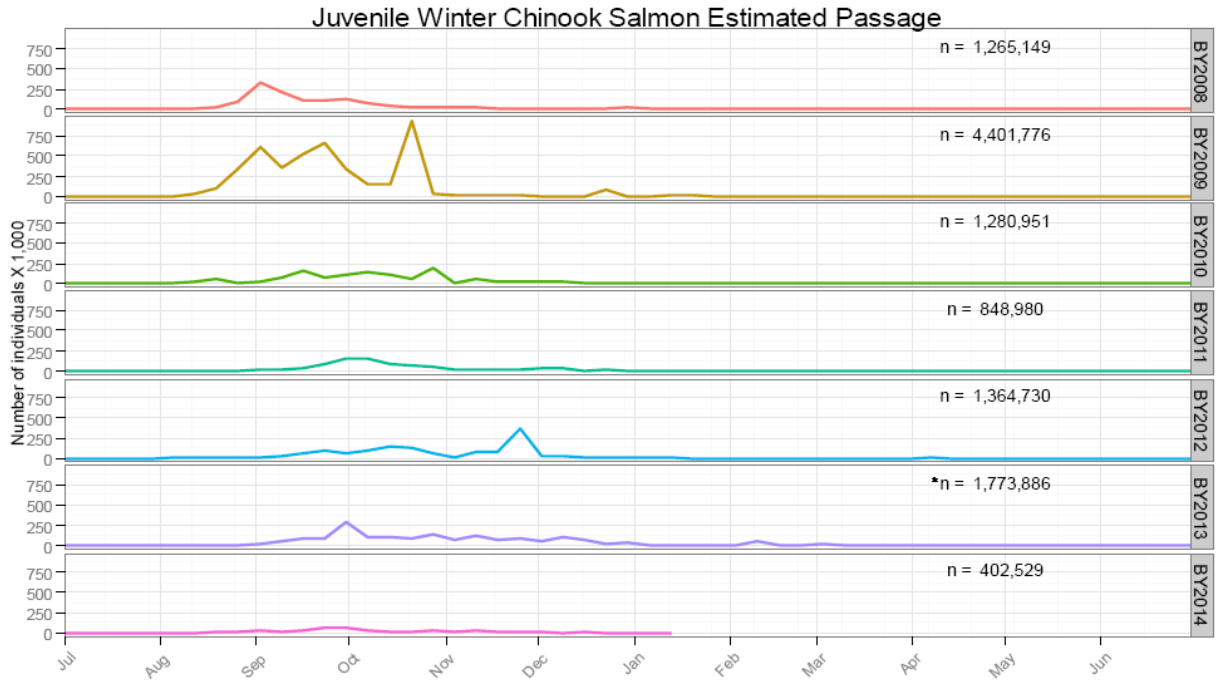


Figure 1. Weekly estimated passage of juvenile winter Chinook Salmon at Red Bluff Diversion Dam (RK391) by brood-year (BY). Fish were sampled using rotary-screw traps for the period July 1, 2008 to present .

Figure 3. Weekly estimated passage of Juvenile Winter-run Chinook Salmon at Red Bluff Diversion Dam (RK 391) by brood year (BY), BY2008-BY2014. [4]

[3] Figure supplied by DWR to DOSS on January 27, 2015.

[4] Fish were sampled using rotary-screw traps for the period July 1, 2008 to present. Winter-run passage value interpolated using a monthly mean for the period of October 1 through October 17, 2013, due to government shutdown. Figure supplied by USFWS on January 15, 2015.

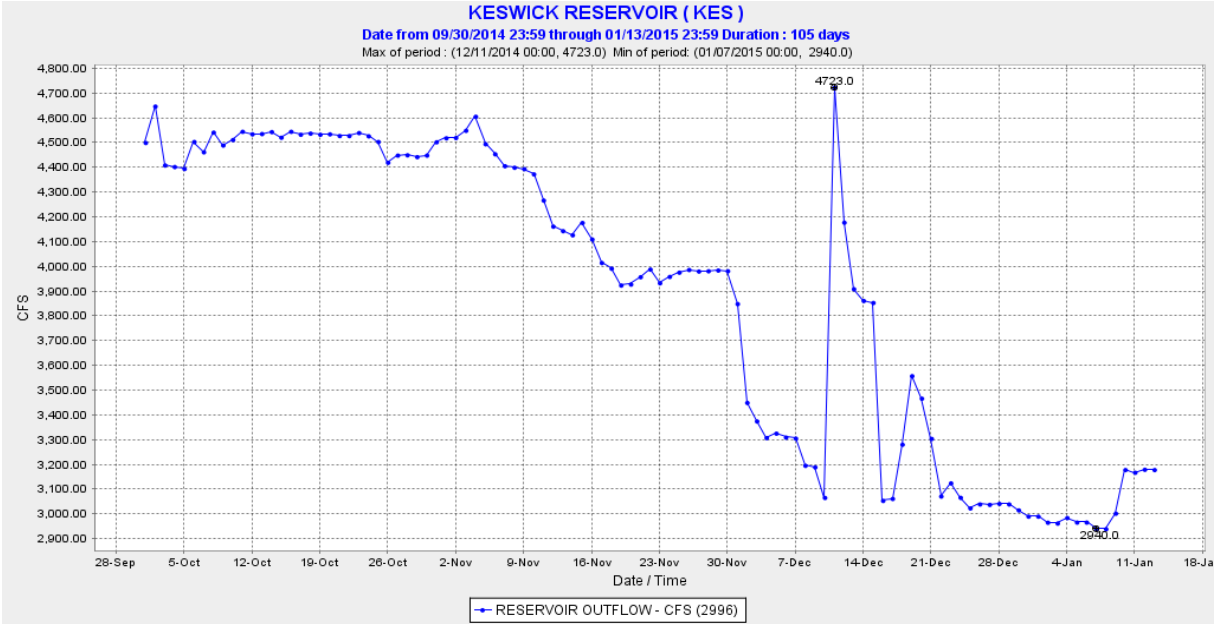


Figure 4. Keswick Reservoir outflow measured at Keswick Reservoir (KES) for water year (WY) 2015.[5]

These observations suggest that brood year (BY) 2014 winter-run Chinook salmon experienced substantial negative effects associated with drought-related environmental conditions. These effects are predicted to include significantly greater temperature mortality during the incubation of eggs and juvenile rearing stages than has previously been observed, truncation of the migration period from natal habitats due to the loss of a substantial proportion of the later portion of the incubating eggs and rearing juveniles, and significant reductions in the expression of a diversity of juvenile life history traits (parr and smolt migrants).

Del Rosario et al. (2013) described multiple pulses of distinctly different-sized juvenile winter-run Chinook salmon typically moving through the Lower Sacramento River past Knights Landing from November to January. These pulses of fish are associated with flow pulses greater than 400m^3/s (approximately 14,000 cfs) as measured at Wilkins Slough. For juvenile winter-run Chinook salmon BY2014 (through January 20, 2015), observations at Knights Landing and Tisdale Weir rotary screw traps (RST) indicate two migration pulses of juveniles have moved downstream into the Delta. The initial pulse emigrated during a storm event in late October that did not increase river flows on the Sacramento River substantially, but did increase turbidity in the mainstem Sacramento River. The second pulse emigrated during a large storm event in mid-December (Figure 3, Table 1). As a result, it appears that winter-run Chinook salmon juveniles

[5] Downloaded from CDEC on January 14, 2015.

emigrated from the upper Sacramento River between mid-October and mid-December, and the majority of the population (>95%) has moved out of the riverine system and entered the Delta.

Based on the 2014 adult winter-run Chinook salmon escapement (3,015 spawners, including 388 collected as hatchery broodstock), NMFS recently estimated a juvenile production estimate (JPE)[6] for both natural-origin (124,251) and hatchery-produced (188,500) winter-run Chinook salmon entering the Delta during WY 2015. This year's JPE reflects a number of significant changes as a result of recommendations by the (1) Long Term Biological Opinion Independent Review Panel, (2) Interagency Ecological Program Winter-Run Project Work Team, and (3) internal discussions by NMFS with the NMFS-Southwest Fisheries Science Center. While NMFS presented three methods of calculating the JPE—historical NMFS JPE method, Cramer Fish Science (CFS) Model, and the Juvenile Production Index (JPI) from USFWS—NMFS decided that the JPI method was a better fit because both the NMFS JPE and CFS models inaccurately represented the extreme drought conditions and associated early life stage losses due to high temperatures that occurred in 2014 as described previously (Figure 1). On the basis of the JPE, the authorized level of incidental take under the 2009 biological opinion for the Long Term Operations for the combined CVP/SWP Delta pumping facilities from October 1, 2014 through June 30 2015 was set at 2,490 natural (non-clipped, i.e., wild) winter-run Chinook salmon juveniles. The incidental take for hatchery-produced winter-run Chinook salmon juveniles was set at 1,885.

Due to the very low estimated abundances of juvenile winter-run Chinook salmon entering the Delta, observational data from sampling programs could be negatively biased due to rarity of observing winter-run Chinook salmon in the monitoring efforts. Nonetheless, observations from the Delta Juvenile Fish Monitoring Program's beach seining and trawling surveys, and special drought monitoring surveys (i.e., trawling efforts at Jersey and Prisoners Point) to date support the conclusion that winter-run Chinook salmon have migrated downstream and are currently rearing extensively in the Lower Sacramento and Delta survey regions (Table 2). Natural origin winter-run Chinook salmon have been observed weekly in very low densities at the CVP and SWP facilities since December 14, 2014 (combined loss =110, as of January 26, 2015); this also suggests that some juveniles are also present in the south Delta waterways. Finally, few winter-run Chinook salmon juveniles have been observed at Chipps Island suggesting that the majority of the population has not yet migrated to the ocean and is currently rearing in the Delta (Table 2). This broad distribution of juvenile winter-run Chinook salmon across the Delta during the winter

[6] http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/20150116_nmfs_winter-run_juvenile_production_estimate_nr.pdf

Table 1. Raw weekly fish observation data from Tisdale and Knights Landing rotary screw traps in WY2015.[7]

	Tisdale								Knights Landing							
	Wild Juveniles					Ad clipped			Wild juveniles					Ad clipped		
	Fall	Spring	Winter	Late fall	Steelhead	Salmon	Steelhead	Weekly total	Fall	Spring	Winter	Late fall	Steelhead	Salmon	Steelhead	Weekly total
10/4/2014 - 10/10/2014	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
10/11/2014 - 10/17/2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/18/2014 - 10/24/2014	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
10/25/2014 - 10/31/2014	0	2	117	2	0	0	0	121	0	1	95	4	0	0	0	100
11/1/2014 - 11/7/2014	0	1	2	0	0	0	0	3	0	0	2	0	0	0	0	2
11/8/2014 - 11/14/2014	0	0	1	0	0	0	1	2	0	0	2	0	0	0	0	2
11/15/2014 - 11/21/2014	0	0	3	1	0	0	0	4	0	0	3	0	0	0	0	3
11/22/2014 - 11/28/2014	0	0	3	0	0	0	0	3	0	0	2	0	0	0	0	2
11/29/2014 - 12/5/2014	0	0	7	0	0	2	0	9	0	0	2	0	0	0	0	2
12/6/2014 - 12/12/2014	10	14	10	2	0	5	0	41	17	50	32	8	0	24	0	131
12/13/2014 - 12/19/2014	169	9	0	2	0	2	0	182	148	88	5	1	0	4	0	246
12/20/2014 - 12/26/2014	654	35	24	5	1	6	0	725	411	112	14	4	0	8	0	549
12/27/2014 - 1/2/2015	148	22	1	1	0	0	0	172	13	6	0	1	0	0	0	20
1/3/2015 - 1/9/2015	91	61	6	0	2	0	0	160	15	13	0	2	0	2	0	32
Species Totals	1072	144	174	13	3	15	1		604	278	158	21	0	38	0	

[7] Data updated through January 9, 2015. These raw catch numbers have not been expanded to account from inoperable traps, sampling period variation, and sampling cone variation.

is common and was described initially by Erkkila *et al*. (1951) prior to the initiation of CVP operations in the early 1950's.

Table 2. Weekly Fish Observation Data from the Delta Juvenile Fish Monitoring Program in WY2015.[8]

	Wild juveniles					Ad clipped		
Beach Seine Region	**Fall**	**LateFall**	**Spring**	**Winter**	**Steelhead**	**Chinook**	**Steelhead**	**Weekly Total**
Bay East	0	0	0	0	0	0	0	0
Bay West	0	0	0	0	0	0	0	0
Central Delta	3	0	1	0	0	0	0	4
Lower Sacramento	22	0	3	6	0	0	0	31
North Delta	23	0	8	0	0	1	0	32
Sacramento	263	8	177	54	1	13	0	516
South Delta	0	0	0	0	0	0	0	0
San Joaquin	0	0	0	0	0	0	0	0
Trawl								
Sacramento	103	5	21	15	0	16	0	160
Chipps	2	20	0	5	0	62	0	89
Jersey Point	22	1	3		0	0	0	26
Prisoners Pt	5	1	3	1	0	0	0	10
Species Total	443	35	216	81	1	92	0	

The observations described herein (i.e., RBDD, Tisdale, and Knights Landing RSTs; Delta Juvenile Fish Monitoring Program's beach seining and trawling surveys, and special drought monitoring [i.e., trawling surveys at Jersey and Prisoner's Point]), have been reviewed by the Delta Operation for Salmon and Sturgeon (DOSS) work team to evaluate the distribution of winter-run Chinook salmon juveniles in the Central Valley. Based on the currently available data, DOSS estimates that the majority (>95%) of winter-run Chinook salmon are in the Delta, while <5% either remain upstream of Knights Landing or have already exited the Delta past Chipps Island. This estimate is based on the best professional judgment of the biologists participating on the DOSS work team.

At this time, adult winter-run Chinook salmon are starting to enter the Sacramento River system and have begun to migrate to the upper reaches of the river. These adult winter-run Chinook salmon must hold in the upper Sacramento River between the RBDD and the impassable Keswick Dam until they are ready to spawn during the summer. These fish require cold water holding habitat for several months prior to spawning to allow for maturation of their gonads, and then subsequently require cold water to ensure the proper development of their fertilized eggs, which are highly sensitive to thermal conditions during this embryo development period (*i.e.*, embryogenesis). Adults returning to the river in 2015 are predominantly members of the cohort

[8] Data updated through January 13, 2015.

from BY2012 (assuming a 3-year cohort cycle). Based on cohort replacement rate (CRR) estimates, BY2012 had the fifth lowest CRR since 1992.

Spring-run Chinook Salmon

The 2014 spawning run of spring-run Chinook returning to the upper Sacramento River was lower in four of seven locations compared to the 2013 escapement, with considerably lower escapement observed in Butte Creek and Feather River Hatchery (Table 3).

Table 3. Spring run Chinook escapement in 2013 and 2014.

Location	2013	2014	Source
Battle Creek	608	429	Laurie Earley, USFWS
Clear Creek	659	95	
Antelope Creek	0	7	Matt Johnson, DFW
Mill Creek	644	679	
Deer Creek	708	830	
Butte Creek	16783	4815	Clint Garman, DFW
Feather River Hatchery	4294	2825	Penny Crenshaw, DWR

Spring-run Chinook salmon eggs in the Sacramento River underwent significant, and potentially complete, mortality due to high water temperature downstream of Keswick Dam starting in early September when water temperatures downstream of Keswick Dam exceeded 56^{o}Fahrenheit (F) (see water temperatures during September and October in Figure 1). Spawning of spring-run Chinook salmon in the Sacramento River Basin occurs approximately from mid-August through mid-October, peaking in September. This peak in spawning activity corresponded with the high Sacramento River temperatures downstream of Keswick Dam throughout the fall of 2014, and illustrates the potential for high egg and alevin mortality. Spring-run Chinook salmon eggs spawned in the tributaries to the Sacramento River may also have experienced warmer temperatures this year due to low flows through late October, as well as scouring or sedimentation during rain events from late October through December. Extremely few juvenile spring-run Chinook salmon have been observed this year migrating downstream past RBDD (Figure 5) during high winter flows, when spring-run Chinook salmon originating from the upper Sacramento River, Clear Creek, and other northern tributaries are typically observed to outmigrate. While, as noted for winter-run Chinook, the rotary screw traps at RBDD were operated for just 8 of 31 days during December 2014[9], the low RBDD passage estimates are a concern. A second pulse of juvenile spring-run Chinook salmon typically migrate past RBDD in the springtime (Poytress et al. 2014). However, this second pulse appears to positively bias

[9] Biweekly reports from RBDD are available at: http://www.fws.gov/redbluff/RBDD%20JSM%20Biweekly/2014/rbdd_jsmp_2014.html

estimates of spring Chinook passage due to the millions of unmarked fall-run Chinook salmon hatchery production fish falling into the spring-run Chinook salmon category based on the length-at-date run assignments (Poytress et al. 2014).

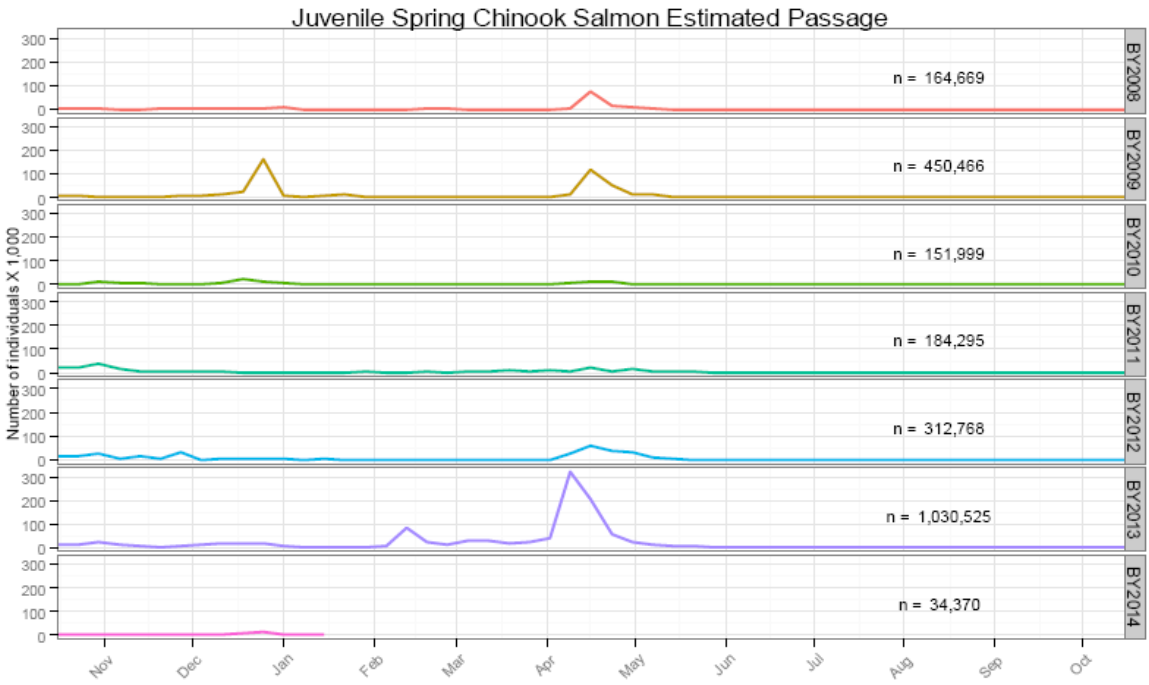


Figure 5. Weekly estimated passage of Juvenile Spring-Run Chinook Salmon at Red Bluff Diversion Dam (RK 391) by brood year (BY).[10]

In fall 2014, yearling spring-run Chinook salmon from Mill and Deer creeks experienced flow and temperature conditions typically associated with the outmigration of this life history expression from these tributaries. Although not currently monitored with RSTs, these tributaries have experienced flows (Figure 6-7) exceeding "First Alert" thresholds identified in the NMFS BiOp Action IV.1.2. Recent analyses of multiple years of RST data have determined that 99% of outmigrating yearlings are captured at flows greater than 95 cfs (Kevin Reece, DWR, pers. comm.). Based on the currently available data, DOSS estimates that the majority (80-90%) of yearling spring-run Chinook salmon are in the Delta, while <5% remain upstream of Knights Landing and <15% have already exited the Delta past Chipps Island. This estimate is based on the best professional judgment of the biologists participating on the DOSS work team.

Spring-run young-of-the-year (YOY) sized Chinook salmon juveniles have been observed at the Tisdale Weir and Knights Landing RSTs since early December, 2014 (Table 1). Likewise,

[10] Fish were sampled using rotary-screw traps for the period July 1, 2008 to present. Figure supplied by USFWS on January 15, 2015.

juvenile YOY spring-run Chinook have been observed in the catch from multiple Delta beach seine regions, and in the standard trawling and special drought monitoring trawling surveys, including those in the Central Delta. However, as of January 18, 2015, neither yearling nor YOY spring-run Chinook salmon have been observed at the state and federal fish collection facilities in the South Delta. Based on the currently available data, DOSS estimates up to half (25-50%) of YOY spring-run Chinook salmon are in the Delta, while 50-75% remain upstream of Knights Landing and <5% have already exited the Delta past Chipps Island. This estimate is based on the best professional judgment of the biologists participating on the DOSS work team.

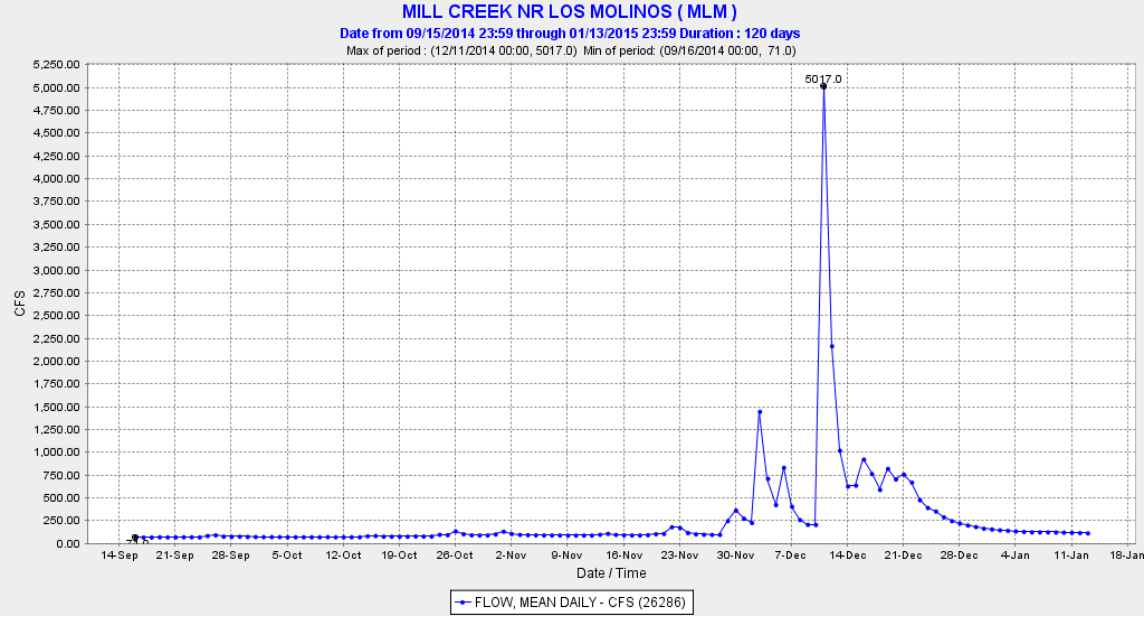


Figure 6. Mill Creek mean daily flow (cubic feet per second) measured near Los Molinos (MLM) during WY2015.[11]

[11] Downloaded from CDEC on January 14, 2015.

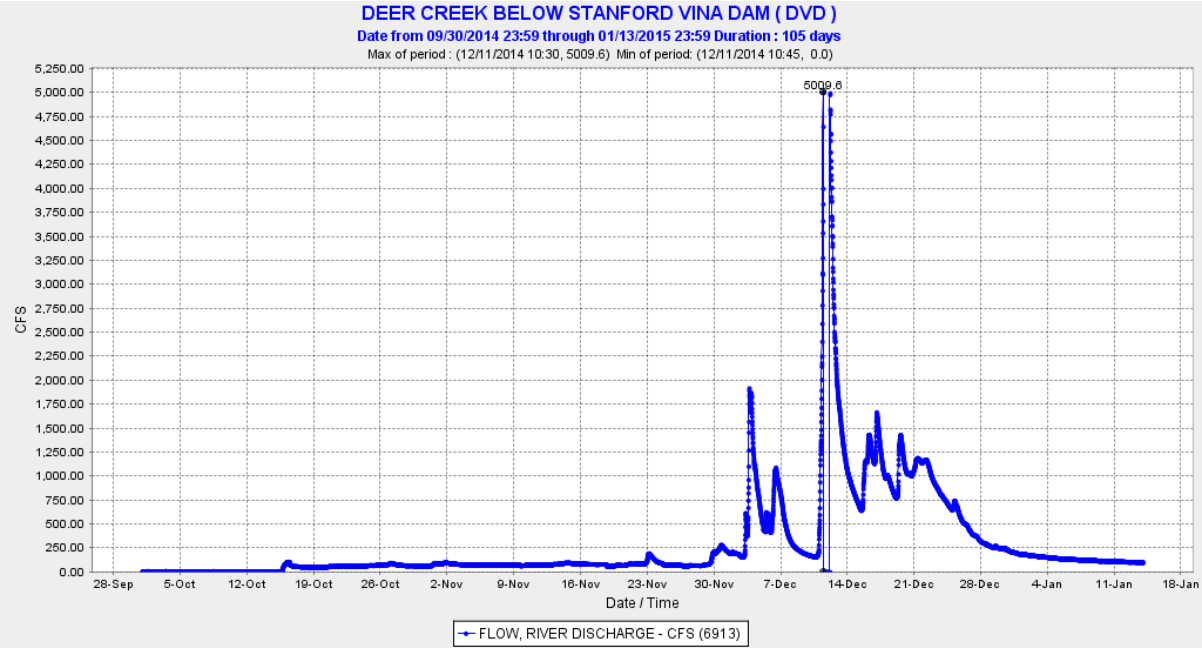


Figure 7. Deer Creek discharge (cubic feet per second) measured downstream of Stanford Vina Dam (DVD) during WY2015.[12]

Steelhead

California Central Valley steelhead (*Oncorhynchus mykiss*) smolts are seldom recovered in Sacramento River and Delta fish monitoring efforts due to sampling biases related to their larger size and enhanced swimming ability. False negatives (*i.e.*, zero catches when the target species is present) are more likely with steelhead smolts than smaller older juvenile Chinook salmon, but historic data can be assessed to consider their typical periodicity in Delta monitoring efforts. Between 1998 and 2011, temporal observations of wild steelhead juveniles (n=2,137) collected in Delta monitoring efforts occurred less than 10% of the time in January, >30% of the time during February, and >20% of the time during March.

Observed patterns of outmigrating *O. mykiss* from BY2014 at RBDD appear most similar to that of BY2011 (Figure 8); however, there was no peak migration observed in the typical August/September period. For WY2015 (as of January 12, 2015), five unmarked (two on 10/15/2014; and three between 1/7/2015 and 1/11/2015) and 828 marked steelhead (1/7/2015 to 1/12/2015) were captured at the GCID RST. The latter marked fish likely originated from a Coleman release of 688,000 brood year 2014 steelhead (100% marked with adipose clip only) in the Sacramento River at Bend Bridge (fish released in two groups: 144,700 on January 2, 2015, and 543,300 on January 5-9, 2015). For WY2015 (as of January 23, 2015), three unmarked (two captured between 1/5/2015 and 1/8/2015, and one on 12/22/2014) and 11 marked steelhead (first on 11/8/2014, 10 since 1/12/2015) were observed at the Tisdale Weir RST; and 12 clipped steelhead were captured at Knights Landing RST as of 1/22/2015.

[12] Downloaded from CDEC on January 14, 2015.

For WY2015 (as of January 23, 2015), one steelhead (acoustic tagged) was observed in the Sacramento beach seine monitoring at Miller Park (300mm fish on 12/8/2014); one clipped steelhead was observed at Sherwood Harbor on 1/23/2015, but not at any of the other trawl locations (i.e, Chipps Island Trawl, Mossdale Trawl, or Jersey Point/Prisoner's Point Trawl); and three steelhead were observed at the SWP (one unmarked on 11/16/2014 for a total salvage of 4, two clipped: one each on 1/23/15 and 1/25/15 for a total salvage of 8) and none at the CVP fish collection facilities at the South Delta CVP/SWP export pumps.

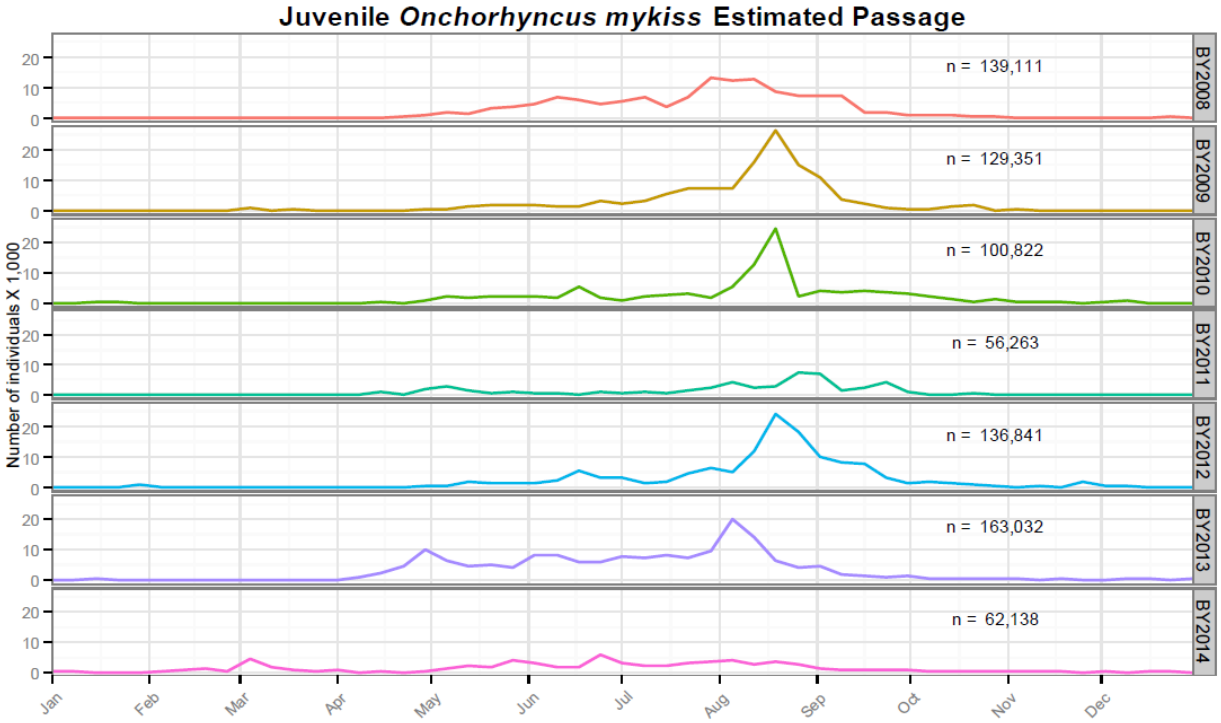


Figure 8. Weekly estimated passage of *O. mykiss* at Red Bluff Diversion Dam (RK 391) by brood year (BY).[13]

Green Sturgeon

Information on green sturgeon is extremely limited. Adult green sturgeon will migrate into the upper Sacramento River through the Delta between March and June. Spawning in the upper Sacramento River was documented during 2014. A review of telemetric data found 26 tagged green sturgeon entered the San Francisco Bay with only half migrating upstream of RBDD (M. Thomas, UC Davis, pers. comm.). Adult green sturgeon have been observed to overwinter in the Sacramento River, and a number of the tagged 2014 adults still appear to be present in the upper Sacramento River as of January 14, 2015 (R. Chase, Reclamation, pers. comm.). Larval green

[13] Fish were sampled using rotary-screw traps for the period July 1, 2008 to present. Figure supplied by USFWS on January 15, 2015.

sturgeon were observed at RBDD (n=319). This was greater than the long-term average of 186 fishes (Figure 9). At RBDD, two juvenile green sturgeon were also observed in the fall of 2014.

At GCID, ten juvenile green sturgeon (TL= 110-285) were observed from September 2014 to January 19, 2015. Green sturgeon observations are extremely rare in the Delta primarily related to the use of monitoring gear types that are not designed to sample the benthic habitats where green sturgeon are most likely to be found if they are present. Although the lower Sacramento and Delta fish monitoring surveys do not target benthic environments they have captured juvenile green sturgeon in the past, but no sturgeon have been observed in those surveys in recent years. Likewise, green sturgeon have not been observed at the state and federal fish collection facilities in the South Delta in recent years. In 2011 more than 3,000 juvenile green sturgeons were captured in the RSTs at RBDD, however no green sturgeon were observed in any of this years' river, Delta, or Bay fish monitoring surveys.

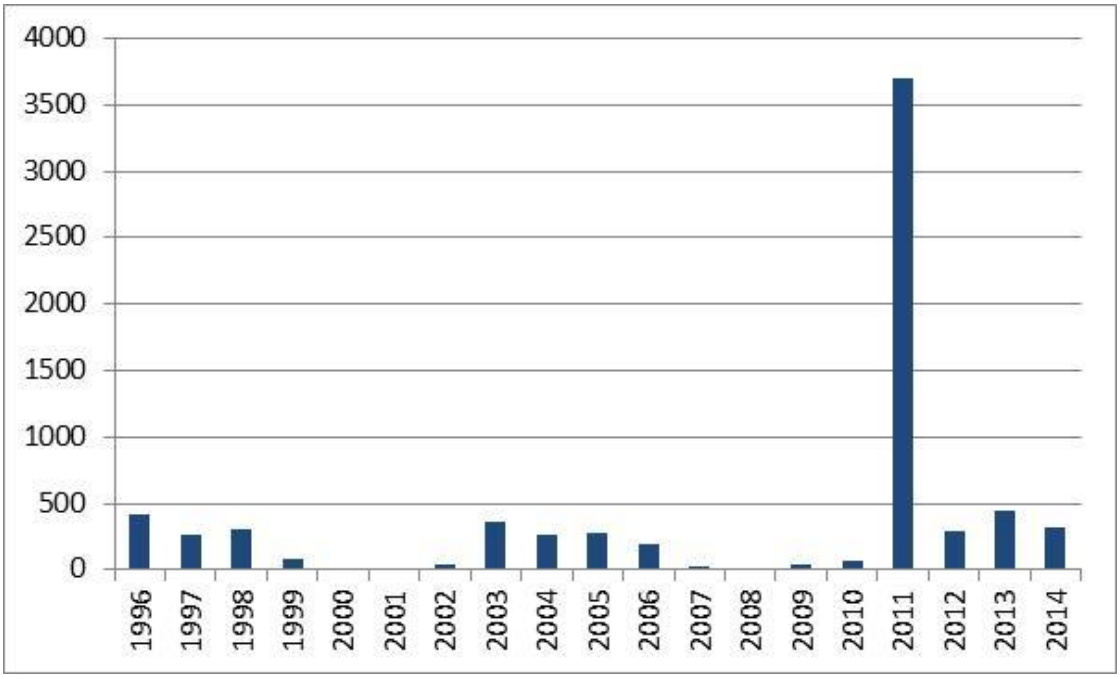


Figure 9. Larval Green sturgeon counted at Red Bluff Diversion Dam rotary screw traps.[14]

[14] The annual average catch is 426 fish. In 2011, an egg was observed directly upstream of the rotary traps; thus, the large number of fish in 2011 represents a unique sampling of a spawning event (Josh Gruber, USFWS, pers comm.). If 2011 data is removed, the annual average of juvenile green sturgeon counted is 183 fishes.

Proposed Action

See Project Description for February – March 2015 Drought Response Actions provided to support Endangered Species Act consultation (Reclamation 2015).

Analytical Framework

Methods and Metrics

A conceptual model for impacts from drought management actions was developed as part of an interagency assessment of the WY2014 drought on winter-run Chinook salmon. The conceptual model describes freshwater behavioral responses to indicators of environmental conditions (e.g., outflow, inflow, Delta Cross Channel [DCC] gates, and exports) that are expected to be affected by the Petition's Project Description. The NMFS BiOp (2009) was reviewed regarding biological linkage to these various actions.

This conceptual model was modified to provide a qualitative assessment of effects predicted to be linked to the four elements of this WY 2015 February and March Project Description: (1) modification to D-1641 Net Delta Outflow Index (NDOI), (2) modification to D-1641 export limits, (3) modification to the D-1641 DCC gate operation, and (4) modification of D-1641 San Joaquin River flow standard. This model highlights the biological linkages between drought management actions in the project description with predictions that can be assessed from the literature and modeling completed (Figure 10). Although OMR modifications are not proposed in the Project Description, they may be incorporated into a Temporary Urgency Change Petition (TUCP) request at a later date.

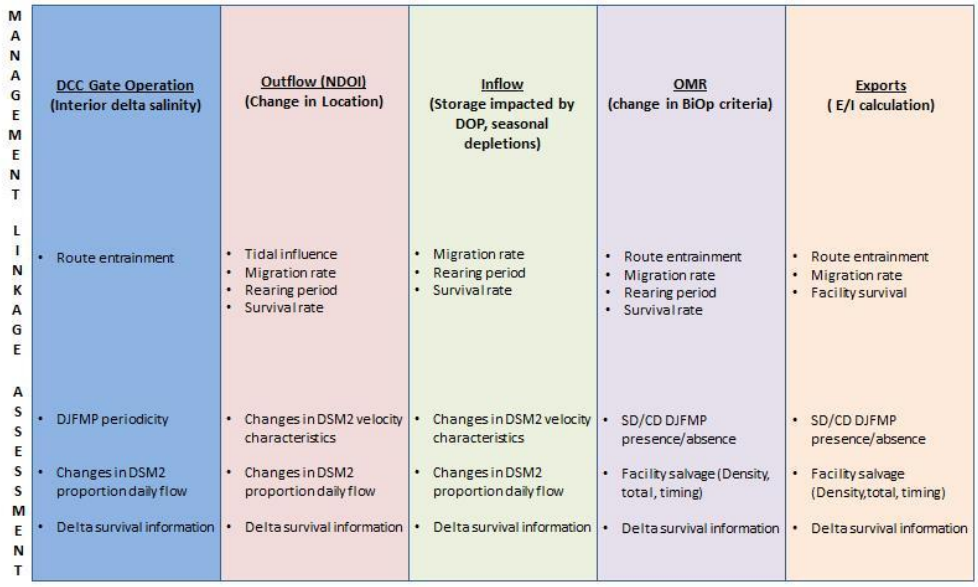


Figure 10. Conceptual model of drought contingency plan elements and their biological linkage to salmonids and assessment information available for evaluation.

To evaluate February and March impacts to listed species due to Delta hydrodynamics caused by the proposed action's changes in outflow and exports, Delta Simulation Model II (DSM2) simulations were performed and evaluated for three different regulatory and operational management decision scenarios (Table 4). It is likely that actual conditions will differ somewhat from the modeled scenarios. Recent meteorological patterns appear to show a decoupled Sacramento and San Joaquin Valley storm pattern (with more rain falling in the Sacramento River basin), and if this continues, it is possible that actual Sacramento River outflow at Freeport could reach the modeled quantities, while actual San Joaquin outflow would not. In particular, if San Joaquin River flows at Vernalis remain low (<850 cfs) and pumping is increased as outflow is greater than 7,100 cfs, there may be a greater impact to San Joaquin fish than indicated in the results of the modeled scenarios. This increases the uncertainty of assessments of impacts to San Joaquin River steelhead.

Table 4. DSM2 regulatory and operational scenarios for February and March 2015 developed for biological review.

Scenario Name	Outflow (cfs)	Freeport flow (cfs)	Vernalis flow (cfs)	Combined Exports (cfs)	OMR (cfs)
4,000 Outflow	4,000	5,600	500	1,500	-1,400
5,500 Outflow	5,500	9,100	500	3,500	-3,200
99% Mod	7,100	11,700	850	6,000	-5,000
90% Least	11,400	15,300	1,400	6,400	-5,000

DSM2 modeling outputs for each scenario were used to evaluate the distribution of 15-minute flow and velocity values for multiple channels including:

- Upstream of Head of Old River (Channel 6)
- Downstream of Head of Old River (Channel 9)
- Upstream of Stockton Deepwater Shipping Channel (Channel 12)
- Downstream of Stockton Deepwater Shipping Channel (Channel 21)
- Turner Cut (Channel 173)
- Columbia Cut (Channel 160)
- Downstream of Head of Old River (Channel 54)
- Grant Line Canal (Channel 81)
- Old River at San Joaquin River (Channel 124)
- Jersey Point on San Joaquin River (Channel 49)
- Sherman Island on Sacramento River (Channel 434)
- Three Mile Slough near San Joaquin River (Channel 310)
- Sherman Island on San Joaquin River (Channel 50)

- Sacramento River upstream of Delta Cross Channel (Channel 421)
- Sacramento River upstream of Georgiana Slough (Channel 422)
- Sacramento river downstream of Georgiana Slough (Channel 423)
- Sacramento River near Cache Slough (Channel 429)

Hydrodynamic metrics, such as daily proportion positive velocity and daily mean velocity, were used to assess changes in the Delta at these locations. Daily proportion positive velocity is the percentage of the day that river flows have a positive velocity value (flows in downstream direction). Daily mean velocity is the average of all velocities values summed over the 24 hour period which takes into account the effects of tidal stage on velocity magnitudes. Distributions of these hydrodynamic metrics under the different outflow and export ranges for each scenario were also examined to qualitatively describe comparisons between different operational conditions likely to occur under the Project Description.

We discuss effects within the Delta during February and March using currently available species distribution and abundance data along with expected upcoming life stage periodicity information. To evaluate impacts to listed species due to Delta outflow changes, DCC gate configuration, and Delta hydrodynamics caused by the proposed February – March 2015 drought response actions, relevant peer-reviewed literature on these factors and fish biology, behavior, and survival are reported. Results from these sources were used to describe modified operation of the DCC gates on reach-specific and through Delta survival.

Effects Analysis

January Forecasts

Current storage in Shasta and Folsom reservoirs is greater than in January 2014, yet remains low compared to long term historical conditions. Storage in Trinity, Oroville, and New Melones reservoirs remains lower than January 2014 storage levels in these reservoirs. CVP/SWP operators and fishery agencies have been attempting since fall 2014 to conserve cold water pools system-wide in these reservoirs for listed species' summer temperature and habitat requirements. The January 50%, 90%, and 99% exceedance forecasts for WY 2015 projects reservoir volumes throughout spring and summer operations that are below their historic averages for those months (Tables 5 -7). Actual January 2014 Delta conditions are between the 90% and 99% exceedance forecasts (Table 8).

End-of-April (EOA) storages, representing the end of the reservoir storage conservation period, are projected to be between approximately 3,030 TAF (90% forecast) and 4,140 TAF (50% forecast) in Shasta Reservoir. Although there remains a significant range of possible temperature management outcomes for the Sacramento River, neither forecast allows for targeting the furthest downstream temperature compliance point target of 56°F between April and September

at Bend Bridge. Additionally, if the 90% forecast is realized, maximum Shasta Reservoir elevation would limit the flexibility of the Shasta Temperature Compliance Device to only the Middle, Lower, and Side gates, which is similar to temperature control condition in WY2014. Furthermore, the considerable precipitation that would be necessary to attain a 50% forecasted EOA Shasta Reservoir storage appears highly unlikely since recent meteorology has reflected less precipitation than was anticipated under even the 90% forecast.

These factors are reasonably likely to result in extremely high egg mortality or even complete failure of natural brood year 2015 spring-run Chinook and winter-run Chinook below Keswick due to water temperature exceedances above critical thresholds. Relaxation of Delta outflow standards and Vernalis flow standards, while still continuing to meet required tributary releases from Oroville, Folsom, and New Melones (Reclamation 2015), will enhance the opportunities for summertime cold water management across CVP/SWP operated reservoirs in WY2015.

Table 5. 50% Exceedance Forecast

January 1 - 50% HYDROLOGIC EXCEEDENCE

END OF MONTH STORAGES (TAF)

RESERVOIRS	2015								
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Trinity	917	1019	1172	1287	1199	1080	958	867	783
Shasta	2188	2843	3498	3835	3898	3611	3195	2856	2733
Folsom	491	486	587	646	878	935	825	694	642
Oroville	1463	1933	2431	2742	2900	2910	2374	1883	1523
New Melones	583	635	684	675	655	597	502	397	322

MONTHLY AVERAGE RELEASES (CFS)

RESERVOIRS	2015								
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Trinity	300	300	300	550	4200	2100	1100	450	450
Sacramento	3250	3250	3250	5000	7000	10700	11050	9500	6200
American	900	5000	4700	4550	2100	2300	3400	3700	2250
Feather	950	950	800	1800	1050	1050	8600	8050	6950
Stanislaus	200	200	200	650	750	500	350	350	250

DELTA SUMMARY (CFS)

	2015								
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Rio Vista Flows	11150	27100	22300	13950	8200	6250	10600	10100	8850
Sac River at Freeport	13250	31750	26350	17250	11450	11700	19800	18950	16600
SJ River at Vernalis	1450	3150	3000	2650	3100	1400	1100	1050	950
Computed Outflow	13000	31900	27150	17950	11400	7500	6500	5450	4450
Combined Project Pumping	3550	5100	3300	1550	1600	2400	10500	11250	11200

Table 6. 90% Exceedance Forecast.

January 1 - 90% HYDROLOGIC EXCEEDENCE

END OF MONTH STORAGES (TAF)

RESERVOIRS	2015								
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Trinity	888	926	1007	1075	967	862	761	658	599
Shasta	2036	2389	2751	2889	2815	2566	2261	1994	1875
Folsom	465	537	640	642	646	488	316	229	210
Oroville	1403	1641	1926	2067	2037	1874	1682	1523	1485
New Melones	543	544	537	492	411	333	255	180	123

MONTHLY AVERAGE RELEASES (CFS)

RESERVOIRS	2015								
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Trinity	300	300	300	550	2900	800	450	450	450
Sacramento	3250	3250	3250	4500	6400	8750	8500	7750	4900
American	900	1700	1900	3150	2500	4000	3800	2550	1350
Feather	950	950	800	1050	1300	1950	1400	1300	1200
Stanislaus	200	200	300	550	500	550	400	350	250

DELTA SUMMARY (CFS)

	2015								
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Rio Vista Flows	9450	12200	9800	7400	5800	5300	2650	2600	2600
Sac River at Freeport	11300	14550	12000	9700	8600	10450	8550	8350	7800
SJ River at Vernalis	1050	1400	1600	1450	1450	1050	900	750	750
Computed Outflow	9650	12750	12250	9250	7100	7100	4250	4350	4200
Combined Project Pumping	3550	4350	1800	1150	1150	1200	1250	1400	2300

Table 7. 99% Exceedance Forecast.

January 1 - 99% HYDROLOGIC EXCEEDENCE

END OF MONTH STORAGES (TAF)

RESERVOIRS	2015								
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Trinity	860	894	920	929	843	769	704	637	576
Shasta	1966	2173	2393	2424	2242	1843	1397	1070	936
Folsom	440	499	523	520	484	347	251	217	182
Oroville	1374	1516	1704	1762	1681	1468	1250	1027	1023
New Melones	543	544	537	491	409	331	254	178	122

MONTHLY AVERAGE RELEASES (CFS)

RESERVOIRS	2015								
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Trinity	300	300	300	600	1500	800	450	450	450
Sacramento	3250	3250	3250	4500	7000	10000	9850	7800	4900
American	900	800	1950	2000	1750	3050	2200	1200	1100
Feather	950	950	800	1650	1700	2700	2400	3100	950
Stanislaus	200	200	300	550	550	550	400	350	250

DELTA SUMMARY (CFS)

	2015								
	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
Rio Vista Flows	7800	7550	7050	6100	5750	5850	2900	2600	2000
Sac River at Freeport	9350	9200	8800	8200	8550	11200	8950	8400	6950
SJ River at Vernalis	1050	850	850	1750	1550	300	250	350	350
Computed Outflow	7050	7100	8050	7800	7100	7100	4200	4300	4050
Combined Project Pumping	3550	3350	1300	900	850	900	900	900	900

Footnote: These forecast numbers include adjustments to January inflows based upon observed conditions through mid-January.

Table 8. January to September 2014 Actual Reservoir Storage, Releases, and Delta Conditions[15].

Actual 2014 (January - September)

EOM Storages (TAF)

Reservoirs	2014								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Trinity (Trinity Lake) CLE	1187	1306	1281	1196	1062	865	697	606	561
Shasta (Shasta Dam) SHA	1773	2198	2408	2177	1851	1575	1342	1157	1108
Folsom (Folsom Lake) FOL	304	436	546	547	470	406	381	344	304
Oroville (Oroville Dam) ORO	1406	1716	1876	1734	1511	1252	1100	1075	953
New Melones (New Melones Reservoir) NML	1060	1036	917	799	712	625	553	519	513

Monthly Average Releases (CFS)

Reservoirs	2014								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Trinity (Trinity Lake) CLE	534	392	499	1669	1813	2366	3244	2668	1547
Sacramento (Keswick) KES	3084	3060	2766	3096	6839	8972	9203	7665	5558
American (Nimbus) NAT	745	650	614	718	1387	2107	1997	1505	1398
Feather (Oroville Dam) ORO	1624	729	641	881	3678	4930	5419	3387	1919
Stanislaus (Goodwin) GDW	295	255	403	1553	1259	270	316	232	184

Delta Summary (CFS)

	2014								
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Rio vista	4214	8144	11814	7212	3542	4524	3828	3389	3366
Sac River at Freeport	6511	10811	14815	9595	5645	8854	8853	8461	8249
SJ river at Vernalis	856	822	844	1770	1528	319	254	307	410
NDOI (outflow)	4780	11145	12721	7912	4174	5407	4085	3419	3202

[15] Data from http://cdec.water.ca.gov/reservoir.html. Table supplied by CDFW on January 26, 2015.

During February and March a continuation of Keswick minimal releases at the levels identified in the TUC Petition is hypothesized to increase the time needed for Chinook and steelhead smolts to emigrate down the Sacramento River, which will result in reduced outmigration survival (Singer et al 2013) and a reduced smoltification window (McCormick et al 1998). In contrast, any predicted increases in reservoir storage that may be realized by operating to the TUC Petition's outflow range will be critical to any measures to maintain water temperatures necessary for the biological needs of winter-run Chinook, spring-run Chinook, steelhead, and green sturgeon downstream of these reservoirs over the summer and fall of 2015. It should be noted that these January forecasts include later upstream impacts to BY 2015 fishes, including redd dewatering. Thus, this reduced outflow range in February and March is a proactive approach by Reclamation and DWR to immediately implement appropriate contingency measures that may benefit BY 2015 cold water listed species, as required in NMFS BiOp Action I.2.3.C.

Net Delta Outflow Index Modification

Although the NMFS BiOp (2009) does not contain NDOI standards, it did assume NDOI standards would be met. Based on the conceptual model, the reduction in outflow, as identified in the Petition's Project Description, may impact juvenile salmonids migrating through the North Delta between Sacramento and Rio Vista, where Sacramento River flows meet the tidally dominated western Delta. Currently, the greatest presence of salmonids in the Delta has been detected in the Lower Sacramento River and North Delta regions (DOSS 2015). The proposed reduction in minimum Delta outflow from a monthly average of 7,100 cfs to 4,000 cfs is lower than those under minimum standards to meet the D-1641 NDOI standards in February and March. This proposed reduction may reduce survival of juvenile salmonids migrating through the Lower Sacramento River and North Delta by increasing rates of predation mediated by hydrodynamic mechanisms (i.e. transit times, turbidity). However, once migrating fish reach the tidally-dominated regions in the western Delta (i.e. Rio Vista towards Chipps Island), South Delta, or Central Delta under the Petition's NDOI outflow threshold (4,000 cfs), they are likely to encounter a daily proportion of positive velocities and a mean velocity that are not substantially different from outflow conditions observed when a 7,100 cfs NDOI standard is being achieved (Table 9, Figures 11-12). This is due to the greater influence tides have in these

Table 9. DSM2 Results for Daily Proportion Positive Flows at Each Channel Node[16]. Note that Freeport and Vernalis flows are different between scenarios; see Table 4 for details. The DJFMP Seine Region Containing the Channel Node was identified from USFWS metadata.

Modeled NDOI	4000	5500	7100	Difference between NDOI 7100 and 4000	Difference between NDOI 7100 and 5500	DJFMP Seine Region
Modeled OMR	-1400	-3200	-5000			
Modeled Export	1500	3500	6400			
Channel Node						
6	0.76	0.76	0.88	-0.12	-0.12	San Joaquin
9	0.56	0.56	0.56	0.01	0.00	San Joaquin
12	0.54	0.54	0.54	0.01	0.00	South Delta
21	0.53	0.53	0.53	0.00	0.00	South Delta
49	0.52	0.52	0.52	0.00	0.00	Central Delta
50	0.52	0.52	0.51	0.00	0.00	Central Delta
54	0.79	0.83	0.90	-0.11	-0.07	San Joaquin
81	0.43	0.37	0.42	0.01	-0.05	South Delta
124	0.45	0.44	0.43	0.02	0.01	South Delta
160	0.52	0.51	0.50	0.01	0.00	South Delta
173	0.50	0.49	0.48	0.01	0.00	South Delta
310	0.51	0.50	0.50	0.01	0.01	Central Delta
421	0.73	0.84	0.94	-0.21	-0.10	North Delta
422	0.72	0.82	0.91	-0.19	-0.10	North Delta
423	0.64	0.68	0.73	-0.08	-0.04	North Delta
429	0.60	0.64	0.67	-0.06	-0.03	North Delta
434	0.53	0.53	0.53	-0.01	0.00	Central Delta

[16] A map of DSM2 node locations is available at: http://baydeltaoffice.water.ca.gov/modeling/deltamodeling/models/dsm2v6/DSM2_Grid2.0.pdf

Figure 11. Maps of the Delta with Key Channels Color-Coded for Daily Proportion Positive Velocity.

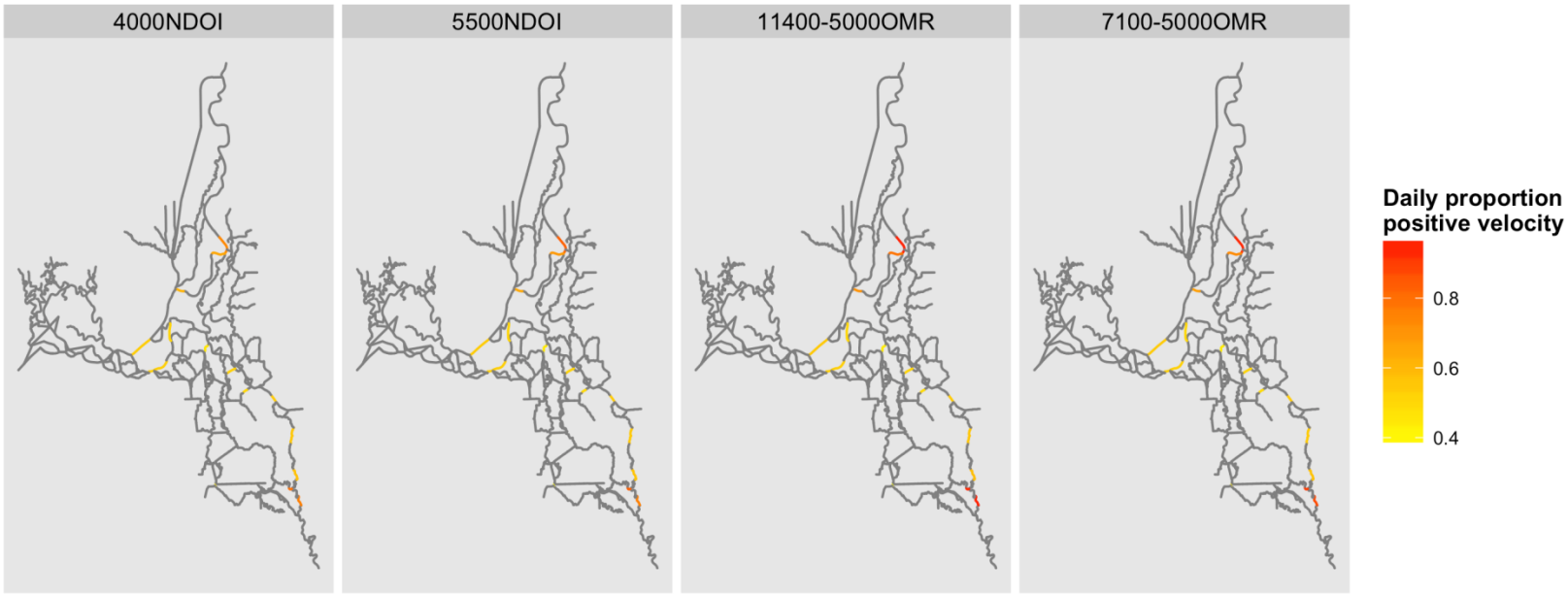
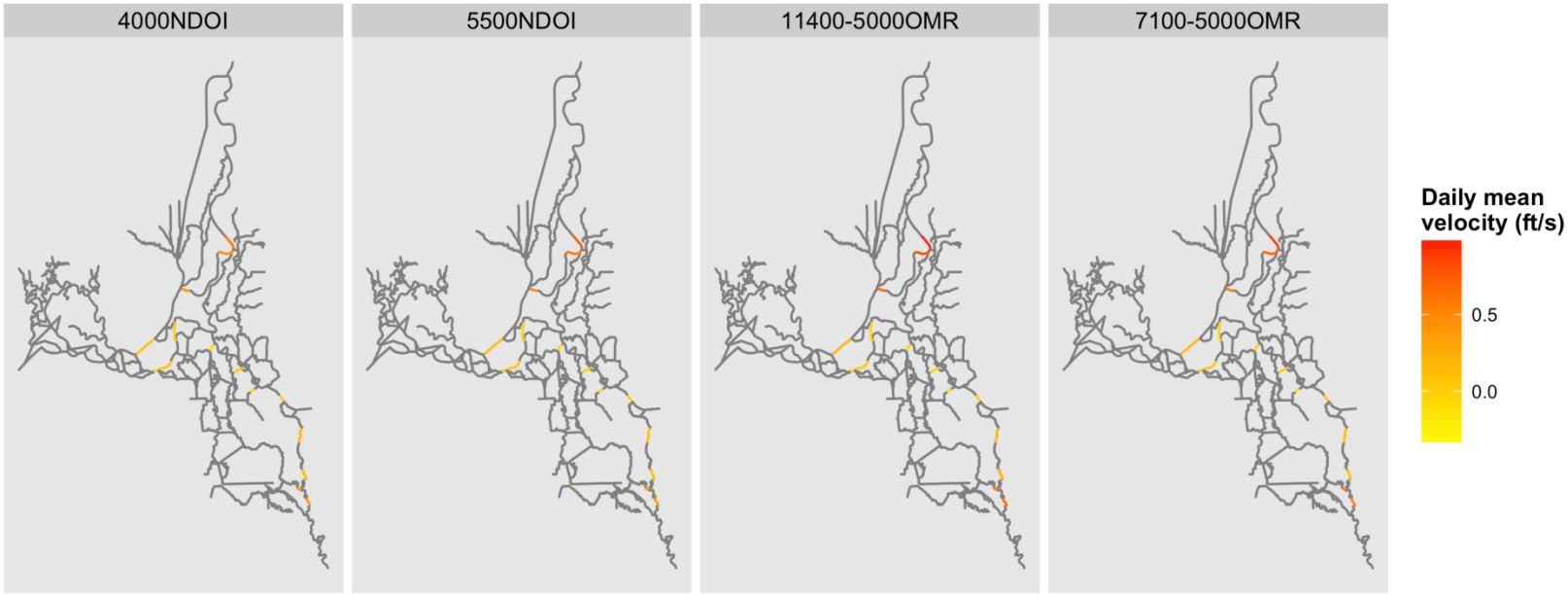


Figure 12. Maps of the Delta with Key Channels Color-Coded for Daily Mean Velocity Generated from DSM2.



regions under low Delta inflows. There is high certainty in our understanding of how hydrodynamics are affected in these regions by the Petition's Project Description.

In the North Delta, DSM2 modeling between 7,100 and 4,000 NDOI levels demonstrate a decrease in outflow, which will impact the Delta hydrodynamics in two ways that will influence Salmonid migration speed and patterns. These hydrodynamic processes influence survival by changing juvenile salmonids exposure to predators in the Lower Sacramento River and other relevant reaches (i.e. Georgiana Slough, Delta Cross Channel, Sutter and Steamboat sloughs). First, reduced outflow may increase tidal excursion in the upstream direction over a greater spatial range (reduced daily proportion of positive velocities) into the Lower Sacramento River region. These increased upstream tidal excursions appear to increase the duration of reverse flows into Georgiana Slough and/or an open DCC gates (Table 9), which likely increases entrainment into these waterways. Survival rate in the main stem Sacramento River or in one of the multiple distributary channels is decreased due to the longer duration of the downstream emigration phase resulting from reduced flows as compared to periods of greater downstream flows (greater NDOI). Also, the increased tidal excursion may increase entrainment into Sutter and Steamboat sloughs by creating greater probability of flow convergence at these junctions. However, due to the lower flows the time needed to migrate downstream through these two migratory corridors is also expected to increase, resulting in diminished survival compared to higher flows. There is high certainty in our understanding of the biological processes affected by reduced outflow along the Sacramento River salmonid migration corridor.

Second, DSM2 results show reduced NDOI will cause the daily mean channel velocity along the Sacramento River and North Delta to be less positive even at channels along the Sacramento River at Sherman Island and near Cache Slough (Figure 12). When the DCC gates are open, the daily mean channel velocity becomes even less positive in these reaches. Reducing outflow likely causes a decrease in the daily proportion of positive velocities through the Sacramento River downstream of Sutter and Steamboat sloughs confluences with the Sacramento River. A review of a similar NDOI modification (Reclamation 2014a) indicated that the impacts of reduced NDOI on the proportion of daily positive flows and mean daily velocities propagate up to Sutter and Steamboat Sloughs, although this effect was not modeled for this Petition. Additionally, Georgiana Slough flows become less positive as tidal excursion causes flow reversals in this channel when outflow is reduced. When the DCC gates are open, the daily proportion of positive velocities further decreases in the Sacramento River upstream of the DCC gates and more noticeably between the DCC gate and Georgiana slough. When the DCC is open, there is a reduction in the daily proportion of positive flows through Georgiana Slough. There is high certainty in our understanding of how hydrodynamics is affected in these regions by the Petition's Project Description.

Decreased daily proportion of positive velocities and daily mean channel velocities, due to the Petition's reduced outflow range, will increase migrating salmonids' residence time in the North

Delta, which likely exposes them to increased predation and mortality rates. There are no models to quantify the increase in mortality rates due to reduced flows in this reach, however comparisons may be made. The DCC's capacity is 3500cfs, which is in range of the Petition's change to the outflow standard. Two telemetry studies reported on changes in reach-specific survival when the DCC was open and closed, which provide a comparison for survival through the North Delta reach and downstream when this quantity of daily flow is removed from the channel. The average difference in survival rates for salmonids through the North Delta from Sutter and Steamboat sloughs to Rio Vista when the DCC was open (n=7, survival ranged from 0.012-0.306) versus closed (n=3, survival ranged from 0.099-0.233) was 3.4% (Table 2 in Romine et al. 2013). Perry et al. (2010) had a single measurement of survival in this reach when the DCC gates were open vs. closed and the difference was 12.1%. Reach-specific survival showed large variations within and between studies, and factors other than travel time and flow are suggested to have contributed to variations in survival estimates including environmental conditions and temporal shifts in predators (Perry et al. 2010) and tag failure (Romine et al. 2013). A previous study of steelhead (Singer et al. 2013) did not demonstrate interior routes to have the lowest survival. In that study, steelhead smolt survival was estimated to be higher through the eastern Delta route (i.e. Georgiana Slough, Mokelumne River, and San Joaquin River routes) than the western Delta route (Sutter and Steamboat sloughs) in one of two years studied, although survival was highest along the Sacramento River mainstem route in both years. There is moderate certainty in our understanding of the survival processes affected by flow associated with the DCC and Georgiana Slough migration routes.

BY2015 adult winter-run Chinook salmon may be affected by the Petition's proposed reduction in outflow, which would reduce detectable flow signal for upriver migration and may lead to longer transit times and increased predation mortality. Juveniles and sub-adult green sturgeon rearing and utilizing the Delta are not expected to be affected by the change in inflows to the Delta during February and March. Adult green sturgeon will be present in the Delta during the month of February, and are expected to migrate through the North Delta starting in March. Over the course of juvenile rearing in the Delta (1 to 3 years) the fish are exposed to a wide variety of flows, depending on where they happen to be at a particular moment. In most of the Delta where green sturgeon are expected to be rearing, flows are tidally dominated. There is low certainty in our understanding of the adult salmonid and green sturgeon biological processes affected by flow in the Delta.

Modification of Export Limits

Action IV.2.3 in the 2009 NMFS BiOp specifies fish loss density, daily older juvenile Chinook salmon and wild steelhead loss, and loss of surrogate hatchery releases of winter-run and late-fall run Chinook salmon as triggers to reduce the vulnerability of emigrating ESA-listed salmon and steelhead to entrainment into South Delta channels and at the pumps between January 1 and June 15. A calendar-based requirement, starting on January 1, is for the 14-day OMR average flow to be no more negative than -5,000cfs. Under the Petition's Project Description, these triggers will

continue to be used to manage such that the 5-day net average OMR flow is not more negative than a calculated -3,500 or -2,500cfs OMR flow until fish densities return below levels of concern.

During February and March, juvenile and adult salmonids may experience South Delta hydrodynamic conditions under the Petition's Project Description that could result in greater export rates than were observed with modified NDOI targets during similar periods in WY2014. These modified export limits (subject to a 35% Export/Inflow standard per D-1641[17]) may occur when NDOI is less than 7,100 cfs but greater than 5,500 cfs. These export limits allow for combined pumping of 1,500 cfs when NDOI is less than 5,500 cfs. Old and Middle River conditions under these inflow and export management scenarios are predicted to be approximately -3,200 to -1,400 cfs. If precipitation events occur that enable Reclamation to comply with D-1641 standards and DCC gate closure requirements, then export levels may increase at the CVP/SWP. OMR management per NMFS BiOp Action IV.2.3 will continue to use fish loss density, daily loss, and loss of specific hatchery releases of late-fall and Winter-run Chinook salmon as triggers to reduce the vulnerability of emigrating ESA-listed salmon, steelhead, and green sturgeon to entrainment into South Delta channels and at the pumps between February 1 and March 30. Daily flows in Old and Middle River averaged approximately -4,885 cfs in December, 2014 and approximately -4140 cfs in January 2015 (through January 22) (Figure 13).

When comparing the Petition's Project Description's modeled conditions when NDOI is 4,000 cfs and OMR is -1,400 cfs to conditions when NDOI is 7,100 and OMR is -5,000 cfs, the majority of modeled channels in the South and Central Delta regions show no change in the mean daily proportion positive velocities under the lower NDOI. The only observed change in the metrics evaluated between these runs occurred at Columbia Cut, where with the NDOI of 4,000 cfs and OMR at -1,400 cfs, the daily average velocity becomes positive (0.01), instead of remaining negative (-0.01) similar to observed when NDOI is modeled at 7,100 cfs (0.02). The intermediate modeling with NDOI of 5,500 cfs and exports of 3,500 predicted similar conditions in the South and Central Delta regions compared to the model run with NDOI of 7,100 cfs and an OMR value of -5,000 cfs. These modeling results suggest that daily proportion of positive velocities may be quite balanced (i.e. similar frequencies of positive and negative velocities) rather than more riverine (i.e. predominantly positive velocities) at the intermediate or low NDOI condition in these regions and achieve similar tidal hydrodynamics throughout the San Joaquin River and South Delta.

[17] As in WY 2014, the E/I standard will be implemented using the inflow averaging period (3-day or 14-day) that allows the greatest exports.

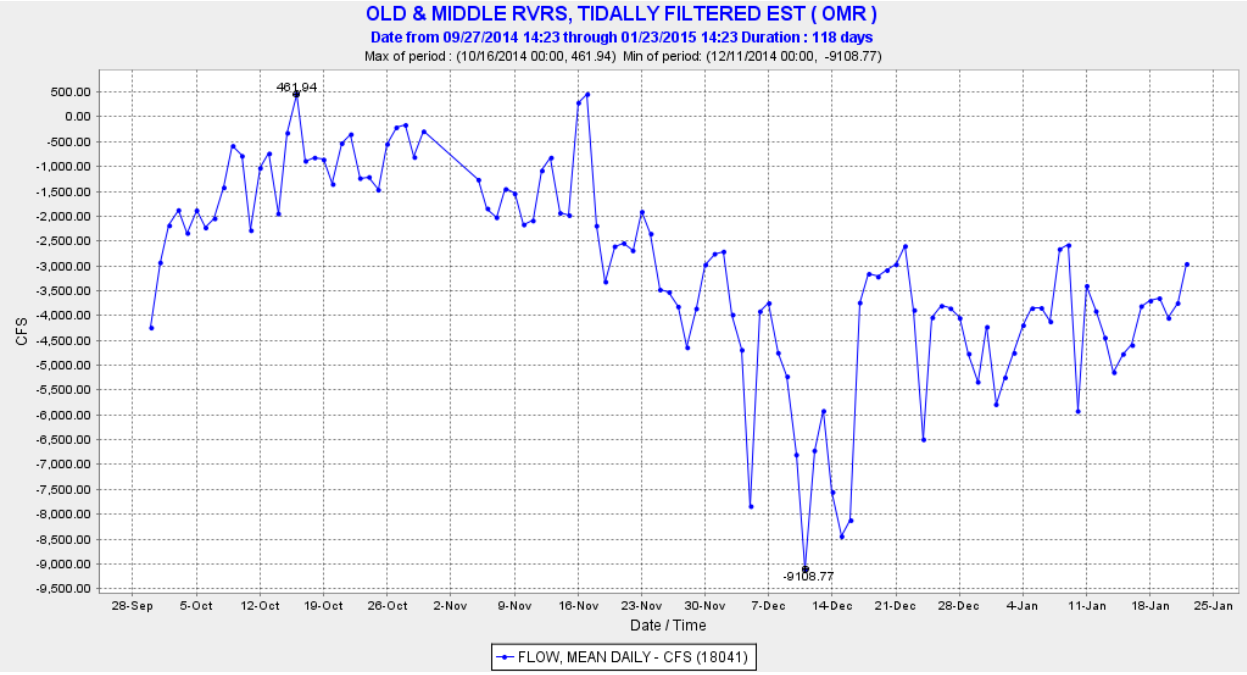


Figure 13. Old and Middle Rivers tidally-filtered daily flows (cubic feet per second) measured at Old & Middle Rivers (OMR) for WY 2015.[18]

The conditions may increase transit rates for salmonids, reduce dispersion of tributary turbidity input, and provide stable conditions for non-native vegetation supporting predaceous fish species, which cumulatively reduces survival rates of juvenile salmonids along the San Joaquin River migration corridor and in the South Delta region. There is low certainty in our understanding of the biological and environmental processes affected by NDOI and exports along the San Joaquin River salmonid migration corridor.

The mean daily proportion positive velocities become less frequently positive in the NDOI 5,500 cfs model than in the NDOI 4,000 cfs model run in Grant Line Canal due to higher pumping and increased San Joaquin flow reaching the facilities without increased San Joaquin River flow at Vernalis. Reduced Vernalis flows in the NDOI 4,000 cfs and NDOI 5,100 cfs models shows the same reduction in mean daily proportion positive velocities upstream of Head of Old River due to similarly modeled San Joaquin River flows at Vernalis. Under greater exports when the NDOI is 7,100 cfs and OMRs are -5,000 cfs, South Delta locations proximal to the facilities (Grant Line Canal) show greater proportions of mean daily proportion positive velocities than when NDOI was modeled at 4,000 cfs and OMRs are 1,400 cfs. This would indicate that the effect of greater exports increases the mean daily proportion of positive velocities towards the facilities in these channels. Greater positive velocities may support outmigration through the Delta; however it may increase salvage and loss of salmonids in the South Delta region if these flows are towards the facilities it may increase facility salvage and loss of salmonids. This is particularly

[18] Downloaded from CDEC on January 23, 2015.

the case for San Joaquin River steelhead entering the South Delta through Old River. There is moderate certainty in our understanding of the biological processes affected by exports in South Delta salmonid migration corridors and fish collection facilities at the CVP/SWP pumps.

Impacts to juvenile and subadult life stages of green sturgeon are anticipated to remain minimal. Age 1 to 3 green sturgeon are expected to be rearing in the Delta, and are typically exposed to a broad spectrum of flows over the course of the year during this life history phase and freely move throughout the Delta to find suitable conditions for their needs. There is low certainty in our understanding of the biological processes in green sturgeon affected by exports in the South Delta region and fish collection facilities at the CVP/SWP pumps.

Delta Cross Channel Gate Modification

The 2009 BiOp (NMFS 2009) and D-1641 include a calendar-based closure of the DCC Gates between February 1 and May 20 to protect winter-run, spring-run, and fall-run Chinook salmon and steelhead from entrainment into the Interior Delta. Studies have shown that the mortality rate of the fish entrained into the DCC and subsequently into the Mokelumne River system is higher than for fish that remain in the mainstem corridor (Perry and Skalski 2008; Vogel 2004, 2008). Closure of the DCC gates during periods of salmon emigration eliminates the potential for entrainment into the DCC and the Mokelumne River system with its high mortality rates. In addition, closure of the gates appears to redirect the migratory paths of emigrating fish into channels with relatively less mortality (*e.g.,* Sutter and Steamboat sloughs), due to a redistribution of river flows among the channels. The overall effect is an increase in the apparent survival rate of these salmon populations as they move through the Delta. There is high certainty in our understanding of the biological processes in salmonids affected by DCC gate operations.

A series of studies conducted by Reclamation and U.S. Geological Survey (USGS, Horn and Blake 2004) used acoustic tracking of released juvenile Chinook salmon to follow their movements in the vicinity of the DCC under different flows and tidal conditions. The study results indicate that the behavior of the Chinook salmon juveniles increased their exposure to entrainment through both the DCC and Georgiana Slough. Horizontal positioning along the east bank of the Sacramento River during both the flood and ebb tidal conditions enhanced the probability of entrainment into the two channels. Upstream movement of fish with the flood tide demonstrated that fish could pass the channel mouths on an ebb tide and still be entrained on the subsequent flood tide cycle. In addition, diel movement of fish vertically in the water column exposed more fish at night (~70%) to entrainment into the DCC than during the day (~30%; Jon Burau, pers. comm.). Perry et al. (2010) included two releases of acoustically-tagged late fall-run Chinook salmon to evaluate the impact of DCC gate opening of reach specific and total Delta survival. Mainstem survival downstream of the DCC gate was lower when they were open (0.443) than when the closed (0.564). During 2008-2009, ten releases of juvenile late fall run Chinook salmon were made by USGS (Romine et al. 2013, Table 10) and through Delta survival was greater when the DCC gates were closed (0.170) than when they were open (0.123). These

values are negatively biased due to tag failure (Romine et al. 2013). Perry et al. (2010) observed through-Delta survival to be greater with the DCC closed (0.543) than open (0.351), principally due to increased survival through the Sutter and Steamboat sloughs route from 0.263 to 0.561. In addition to the Petition's effects on emigrating juvenile salmonids, the Petition's opening of the DCC may increase straying of returning winter-run Chinook adult salmon on the Sacramento River mainstem by diverting a portion of the Sacramento River flows through the forks of the Mokelumne River and Central Delta. This will lead to false attraction and hence straying into these waterways.

Table 10. Average Values for Releases Described in Romine et al. (2013). Seven releases occurred with DCC open and three releases occurred with it closed.[19]

DCC Position	S_A	S_B	S_C	S_D	Ψ_A	Ψ_B	Ψ_C	Ψ_D	S_{TOTAL}
Open	0.143	0.1	0.098	0.159	0.486	0.267	0.064	0.182	0.123
Closed	0.177	0.205	-	0.102	0.521	0.276	-	0.202	0.17

During the fall and early winter when juvenile listed salmonids are not typically present in the Lower Sacramento River and Delta, action triggers in the Chinook salmon Decision Tree use fish monitoring catch indices from Knights Landing and Sacramento River to detect substantial winter-run Chinook migration into the lower Sacramento River. Catch index exceedance values were based on analyses of historic screw trap, beach seine, and trawl data (Chappell 2004). Historic analyses (Chappell 2004) modified the "critical trigger" and duration of DCC gate closure in the Chinook Salmon Decision Tree. Multiple exceedance levels were identified to modify DCC operations in a manner that reduces risks due to the elevated presence of spring-run and winter-run Chinook salmon upstream of the Delta. The Knights Landing Catch Index Catch Index of 23.2 on October 31, 2014 triggered closure of the DCC gates on November 2, 2014.

Currently, the greatest presence of winter-run Chinook salmon in Delta monitoring efforts appears to be in the Lower Sacramento River and the North Delta regions, and a majority of spring-run Chinook are also in these areas (DOSS 2015), which are proximal to the DCC. When emigrating salmonids are in proximity of the DCC gates they are vulnerable to entrainment through the DCC when the gates are open. Based on the conceptual model, greater percentages of ESA-listed salmonids, including hatchery winter-run Chinook, continue to enter the Delta through February and March, there is an increasing risk of exposure as greater proportions of these populations enter the Delta through the winter and spring.

[19] *S*= survival and Ψ=route entrainment; Routes: A=Sacramento, B=Sutter and Steamboat, C= DCC route, D= Georgiana Slough route

Vernalis Flows Modification

Under D-1641, the minimum monthly average flow objective in the lower San Joaquin River (measured at Airport Way Bridge, Vernalis) during February and March is 710 cfs or 1,140 cfs[20] during critically dry years such as WY 2015. The Project Description reduces the Vernalis monthly average base flows to 500 cfs for February and March.

Based on the conceptual model, the Petition's Project Description to reduce flows at Vernalis to less than the Critical WY D-1641 flow objective may reduce survival of juvenile salmonids migrating through the lower San Joaquin River. This change will increase their migration travel time, which increases their exposure to degraded habitats and predators. Reduced Vernalis flows, in combination with reduced NDOI, results in a reduction in the daily proportion of positive flows along the lower San Joaquin River downstream of the Head of Old River (Table 9). Although only a limited number of Lower San Joaquin River channels were assessed there did not appear to be an increase in the daily proportion of negative flows in these channels downstream of the Stockton Deepwater Ship Channel. Along Grant Line Canal, the DSM2 run with the more negative OMR flows (NDOI 7,100, OMR -5,000) had greater positive flows towards the facilities than compared to the run with very low NDOI and OMR flows of 4,000 cfs and -1,400 cfs, respectively. This suggests that a more positive OMR leads to greater tidal conditions (i.e. more balanced daily proportion of positive velocities and daily mean channel velocities) in local waterways such as Grant Line Canal, which will likely increase migrating salmonids' residence time in these waterways, and increase their exposure to predation and mortality. Effects of increasing exports and creating more negative OMR conditions in South Delta waterways north of the CVP/SWP export facilities would likely show an increase in the magnitude of negative velocities and a reduction in the daily average magnitude of flow velocities, indicating that less water was moving downstream to the ocean (positive direction) and more water was moving towards the export facilities. This would also lead to increasing the residence time of salmonids in these waterways, with a corresponding reduction in survival. The modeling conducted for the Project Description did not include these additional waterways.

There are no models to quantify the increase in mortality due to reduced flows in this reach; however, comparisons may be made using results from recent acoustic tagging studies of juvenile San Joaquin steelhead migration and survival through the South Delta (Buchanan et al. 2014). Although there are only two years of data and these studies were conducted during the spring (late March through June) under higher flow conditions (>3,000 cfs) and variable Head of Old River Barrier (HORB) status (in or out), they provide an indication of possible relative survival and travel time differences. Average survival rates of tagged steelhead released at Durham Ferry from the lower San Joaquin River through the Delta ranged from 0.38 to 0.69

[20] The higher flow objective applies when the 2-ppt isohaline (measured as 2.64 mmhos/cm surface salinity) is required to be at or west of Chipps Island.

(SE≤0.05) in 2011 when San Joaquin River flows were high (>15,000 cfs at Vernalis) and no HORB was installed. Average survival rates through the Delta ranged from 0.24 to 0.32 (SE≤0.03) in 2012 when river flows were considerably lower (about 3,000 cfs) and the HORB was installed. The median travel time of tagged steelhead from Durham Ferry to the Head of Old River was 5–6 days in both years, and ranged up to 28 days in 2011 and 35 days in 2012. These results, albeit not directly comparable due to timeframes and HORB conditions, provide limited evidence that steelhead survival may be reduced by proposed Vernalis flow requirements. Additionally, it appears that median travel times of surviving migrants are generally independent of flow level; however, travel times took up to an additional seven days for some migrants under lower flow conditions. This hints at the possibility that lower survival in 2012 may be associated with increased travel times of those fish not surviving. There is low certainty in our understanding of the hydrodynamic and biological processes in steelhead affected by exports along the San Joaquin River and in the South Delta.

Although travel times may increase and survival be reduced under lower flows, only about 5% of the total number of steelhead captured in the lower San Joaquin River during Mossdale trawling surveys (1997-2003) have been collected in February and March, and most were greater than 200 mm (one 115 mm). These surveys indicate that few, if any, juvenile steelhead can be expected to migrate in the lower San Joaquin River during February and March and, those that do migrate during this period will be less susceptible to predation due to their larger size. Given the low likelihood that steelhead will be migrating during this period, but the moderate to high potential for lower flows to effect migration travel times and survival for any juvenile steelhead migrating during February and March, changes in hydrodynamic conditions under the Project Description may have a moderate effect on juvenile steelhead in the lower San Joaquin River. There is moderate uncertainty in this prediction based on the unknown number and size of juvenile steelhead attempting to migrate through the lower San Joaquin River during February and March this year, and their behavioral response to flows as low as 500 cfs in the lower San Joaquin River.

Cumulative Effects of Action

The Petition's action to: 1) Reduce the D-1641 Delta outflow standard for February and March from at least 7,100 cfs to 4,000 cfs, 2) Allow exports of up to 3,500 cfs when NDOI is between 7,100 cfs and 5,500 cfs, exports of 1,500 cfs when NDOI is below 5,500 cfs, and exports up to those achieving OMR flows no more negative than -5,000 cfs when NDOI is greater than 7,100 cfs, 3) Modify the D-1641 and NMFS BiOp DCC gate operations using the triggers matrix in Attachment G of Reclamation 2014b, and 4) Reduce the D-1641 Vernalis flow to 500 cfs, will affect the abundance and spatial distribution of juvenile winter-run and spring-run Chinook salmon, steelhead, and green sturgeon. The modifications to outflow and DCC gate operations as part of the proposed action may affect the spatial distribution and abundance of adult winter-run Chinook salmon and green sturgeon. Life history diversity of steelhead may be affected due to

reduced survival through the San Joaquin River migration corridor. There is moderate certainty in these analyses due to the limited variability in the modeling and potential for actual hydrodynamic conditions to vary from modeled conditions, especially on the San Joaquin River.

The proposed Project Description's modification of outflow, exports, and Vernalis flows may reduce survival of juvenile listed salmonids, steelhead and green sturgeon, and may modify their designated critical habitat. The modification of juvenile winter-run and spring-run Chinook salmon and steelhead survival due to changes in outflow would occur primarily in migratory corridors in the North Delta due to increased entrainment into the Interior Delta. Steelhead survival may also be reduced along the mainstem San Joaquin River downstream of the Stanislaus River until tidal hydrodynamics dominate this channel upstream of the Stockton Deepwater Ship Channel. The location where tides influence outflow will move upstream of the Head of Old River, thus leading to increased entrainment of steelhead toward the CVP/SWP facilities. The Petition's action to reduce Delta outflow keeps the CVP/SWP operation proactively compliant with implementation of NMFS RPA I.2.2C and I.2.3C. The Petition's outflow action will enhance the potential to operate summer reservoir releases by potentially increasing the ability to control in-river water temperatures. This may decrease the endangerment to brood year 2015 by reducing mortality to incubating winter-run and spring-run Chinook eggs and holding adults during the summer of 2015.

Modeling of the Petition's intermediate export limits when NDOI is between 5500 and 7,100 cfs suggests that exports at intermediate values (3500 cfs) lead to greater mean daily proportion of positive velocities in the South Delta proximal to the facilities from the San Joaquin River (i.e Grant Line Canal) but not along the San Joaquin River migration route's channels. This modeling suggests hydrodynamics in this South Delta region proximal to the facilities may reduce local salmonid travel times towards the facility, while San Joaquin River hydrodynamics do not change and travel times remain similar. Although not modeled, the South Delta waterways north of the CVP/SWP export facilities are likely to have decreased daily proportion of positive velocities when exports are increased, which may increase residence time of rearing salmonids. These effects may increase unmeasured mortality in the South Delta region by increasing entrainment towards the facilities where pre-screen mortality is likely very high due to unprecedented nonnative vegetation problems and also maintain long transit times on the San Joaquin River where exposure to degraded habitat and predaceous species is constant.

Under the driest conditions, if NDOI reaches 5,500 cfs, the CVP/SWP will reduce exports to 1,500 cfs, which increases positive flows in the South and Central Delta relative to the baseline condition of NDOI 7,100 cfs and OMR no more negative than -5,000 cfs. Under these driest conditions, there will be reduced entrainment and salvage of listed species at the CVP/SWP fish collection facilities adjacent to the South Delta export facilities.

The Petition's DCC gate operation will minimize the additional mortality risk to juvenile outmigrating and rearing winter-run and spring-run Chinook and juvenile steelhead, since the DCC gate operations matric limits DCC flexibilities when migrating ESA-listed salmonids are present in the Lower Sacramento River region. During the period the gates are open, exports will be limited to 1,500 cfs. This export limit along with the implementation of the DCC gate operations matrix will minimize entrainment of existing rearing fish in the Interior and South Delta. The Petition's DCC gate operations may also cause straying of adult winter-run Chinook and green sturgeon.

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