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

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

May 21, 2015

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

Dear Mr. Howard:

The Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Reclamation) request a modification and renewal of the April 6, 2015 Order Modifying an Order that Approved in part and Denied in part a Petition for Temporary Urgency Changes to License and Permit Terms and Conditions Requiring Compliance with Delta Water Quality Objectives in Response to Drought Conditions (April 2015 Order). Through continued coordination between state and federal agencies, this request will help achieve the goals of the planning documents previously submitted to the State Water Board amid grave hydrologic conditions.

The existing April 2015 Order remains effective through June 30, 2015, or until amended, renewed or rescinded. The proposed changes described in the enclosed Temporary Urgency Change Petition (TUCP), if approved, would modify D-1641 requirements for July through November. The specific request seeks 1) a change in the minimum Net Delta Outflow Index (NDOI) specified in D-1641 Table 3 to reflect a monthly average 3,000 cubic-feet per second (cfs) for July. The 7-day running average shall not be less than 1,000 cfs below the specified monthly average; 2) a change in the Sacramento River Flow requirements at Rio Vista specified in Table 3 for the months of September, October and November. For these months flow shall be no less than a monthly average of 2,500 cfs. The 7-day running average shall not be less than 2,000 cfs; and, 3) extension through August 15 of the change to D-1641 Table 2 Western Delta Sacramento River salinity standards at Emmaton to a compliance location at Threemile Slough on the Sacramento River. 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.

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This request has been considered and is supported by the RTDOT, which was established to recommend additional changes to D-1641 and temporary urgency change orders necessary to address risks presented by the ongoing and severe drought. The attached petition indicates that legal users of water will not be injured by the requested changes. Also, the requested changes should not have an unreasonable impact to fish and wildlife. Reclamation and DWR have prepared 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 Resources Control Board once it is complete.

Sincerely,

David Murillo
Regional Director
Bureau of Reclamation

Date: 5/22/15

Mark W. Cowin
Director
Department of Water Resources

Date: 5/21/2015

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 [July 1, 2015] to [November 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 [5/20/15] at [Sacramento, CA].

Right Holder or Authorized Agent Signature
Chief, SWP Water Operations Office

Ronald Milligan
Right Holder or Authorized Agent Signature
Operations Manager, CVP

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). <u>This form is not a CEQA document.</u> If a CEQA document has not yet been prepared, a determination must be made of who is responsible for its preparation. <u>As the petitioner, you are responsible for all costs associated with the environmental evaluation and preparation of the required CEQA documents.</u> 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 5/20/15 at Sacramento, CA.

Water Right Holder or Authorized Agent Signature	Water Right Holder or Authorized Agent Signature
Chief, SWP Water Operations Office	Operations Manager, CVP

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 AS MODIFIED UNDER PRIOR TEMPORARY URGENCY CHANGE ORDERS ISSUED BY THE STATE WATER BOARD

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

The Department of Water Resources (DWR) and the United States Bureau of Reclamation (Reclamation) (collectively Projects) previously requested 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 specified in Water Rights Decision 1641 (D-1641). For 2015 operations, beginning in February the Executive Director approved a series of Temporary Urgency Change Orders in response to requests by DWR and Reclamation. This petition sets forth specific modifications to the April 6, 2015 Order Modifying an Order that Approved in Part and Denied in Part a Petition for Temporary Urgency Changes to License and Permit Terms and Conditions Requiring Compliance with Delta Water Quality Objectives in Response to Drought Conditions (April 2015 Order) for the months of July through November, 2015, and a corresponding renewal of the February 3, 2015 Temporary Urgency Change Order, as subsequently amended, for 180 days from July 1, 2015.

DWR and Reclamation request a modification of D-1641requirments:

- Specified in Table 3 for July to reflect a minimum monthly Net Delta Outflow Index (NDOI) of 3,000 cubic feet per second (cfs), with a seven-day running average of no less than 1,000 cfs below the specified monthly average.
- Specified in Table 3 for September, October and November to reflect a minimum monthly Sacramento River flow as measured at Rio Vista of 2,500 cfs with a seven-day running average no less than 2,000 cfs.
- Specified in Table 2 for western Delta electrical conductivity (EC) on the Sacramento River to reflect a compliance location of Threemile Slough through August 15, 2015.

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 implementation of any action that may be approved by the State Water Board, Reclamation will confirm Endangered Species Act coverage with the National Marine Fisheries Service under the 2009 NMFS CVP/SWP Long Term Operation Biological Opinion, as applicable, and Fish and Wildlife Service under the 2008 CVP/SWP Long Term Operation Biological Opinion. DWR will seek confirmation of continued coverage under the California Endangered Species Act from the California Department of Fish and Wildlife.

1) Modification of Net Delta Outflow Index

D-1641 requires a Delta outflow minimum monthly average NDOI of 4,000 cfs during the month of July. Reclamation and DWR petition the State Water Board to adopt a Delta outflow standard of a minimum monthly average NDOI during July to be no less than 3,000 cfs. The seven-day running average shall be no less than 1,000 cfs below the specified monthly average. 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 Sacramento River at Rio Vista Flow

D-1641 Table 3 dictates a minimum monthly Sacramento River flow requirements measured at Rio Vista of 3,000 cfs in the months of September and October, and 3,500 cfs in the month of November (for critically dry water years). This requirement also states that the seven-day running average Sacramento River flow measured at Rio Vista shall be no lower than 2,000 cfs during this time. Reclamation and DWR are petitioning the State Water Board to modify the D-1641 Table 3 Sacramento River at Rio Vista flow requirements to be no less than 2,500 cfs on a monthly average in September, October and November. The seven-day running average shall not be less than 2,000 cfs. 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 Western Delta Salinity Compliance Point

In a critical year, D-1641 requires the Agricultural Western Delta Salinity Standard at Emmaton have a 14-day running average of 2.78 millimhos per centimeter from April 1 to August 15. Reclamation and DWR petitioned the State Water Board to modify this requirement by moving the compliance location from Emmaton to Threemile Slough on the Sacramento River beginning April 1 and the Board approved this modification through June 30, 2015. Reclamation and DWR are petitioning to renew this modification through August 15, 2015.

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 well into 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 this petition, 66% of the state is experiencing an Extreme Drought and 46% is experiencing an Exceptional Drought, as recorded by the National Drought Mitigation Center, U.S. Drought Monitor. Recent snow survey results indicate a snowpack of 1% 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 1.6 million acre-feet (MAF)(46% of capacity), and the total combined storage at Shasta and Folsom reservoirs is also very low at about 3 MAF.

Without the requested modification Reclamation and DWR could be forced to increase releases from upstream reservoirs through the summer and fall to meet Delta requirements. 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 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 in 2015 and, in the worst case scenario, into 2016. 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.

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 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 Team

DWR and Reclamation expect to work with DFW, NMFS, and FWS to ensure that decisions made by the Real-Time Drought Operations Team (RTDOT) or proposals submitted to the State Water Board follow the principles set forth in the Interagency 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 are currently prohibited from diverting natural or abandoned flows necessary to meet in-Delta demands. 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. Continued dry conditions during the remainder of Water Year 2015 are expected to adversely affect rearing and migration conditions for Delta Smelt and Longfin Smelt, and spawning, hatching and rearing conditions for Winter-run and Spring-run Chinook salmon, and rearing conditions for Steelhead Trout, and Southern DPS Green Sturgeon. While maintaining full D-1641 flows would provide some short-term support for these species, continued dry conditions may lead to even worse impacts later in the year. For example, reduced flows in the winter may decrease survival of outmigrating juvenile salmonids, but a failure to maintain adequate reservoir storage could lead to a loss in ability to maintain cold water later in the year for Winter-run Chinook Salmon egg survival, and to provide suitable upstream conditions for Spring-run Chinook Salmon and Steelhead Trout rearing. Similarly, it is critical to maintain the ability to provide a water storage pool to support Delta Smelt and Longfin Smelt rearing and maturation later in the year. 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 water year 2015. Specifically, the proposed reduced reservoir release operations are intended to minimize adverse impacts to cold water pool for fisheries benefits, and allow for some level of salinity and temperature control later in season. Potential impacts to species of concern are described below.

Winter-Run Chinook Salmon: Based on daily monitoring data through May 5, 2015 the Delta Operation for Salmonids and Sturgeon (DOSS) work team believes that few (<1%) juvenile Brood Year 2014 Winter-run Chinook salmon remain upstream of or in the Delta and the majority (>99%) have migrated out of the Delta2. No salvage of juvenile Winter-run Chinook Salmon has occurred since March 31, 2015. The Sacramento River Temperature Task Group is monitoring the results of California

Department of Fish and Wildlife winter-run Chinook carcass surveys. Historic information suggests less that 10% of carcasses are observed by the end of May based on data collected between 2003-2014, with a substantial increase in carcasses during the first three weeks of June (Figure 2). Spawning has started later during the last four years compared to previous survey years.

Modification of Net Delta Outflow Index
Based on the spatio-temporal distribution of Winter-run Chinook Salmon during July, there should not be an effect of the Project Description's modification of the Net Delta Outflow Index standard.
Modification of Rio Vista Flow Requirement
Based on the spatio-temporal distribution of Winter-run Chinook Salmon during September, there should not be an effect of the Project Description's modification of the Rio Vista Flow Requirement.
Modification of Western Delta Salinity Compliance Point
Based on the spatio-temporal distribution of Winter-run Chinook Salmon between July 1 and August 15, 2015 there should not be an effect of the Project Description's modification of Western Delta Salinity Compliance Point.

Spring-run Chinook Salmon: Based on daily monitoring data through May 5, 2015 the DOSS work team believes that a minority (20%) of young-of-year Brood Year 2014 Spring-run Chinook Salmon remain upstream of or in the Delta and the majority (80%) have migrated out of the Delta3. DOSS believes that more than 99% of BY 2013 yearling Spring-run Chinook Salmon have migrated out of the Delta. Spring-run sized juvenile Chinook have been salvaged every week since the week of March 30, 2015.

Modification of Rio Vista Flow Requirement
Based on the spatio-temporal distribution of adult Spring-run Chinook Salmon during July, there should not be an effect of the Project Description's modification of the Net Delta Outflow Index standard.
Modification of Western Delta Salinity Compliance Point
Based on the spatio-temporal distribution of Spring-run Chinook Salmon adults and eggs during September, there should not be an effect of the Project Description's modification of the Rio Vista Flow Requirement.
Modification of Western Delta Salinity Compliance Point
Based on the spatio-temporal distribution of adult Spring- run Chinook Salmon between July 1 and August 15, 2015 there should not be an effect of the Project Description's modification of Western Delta Salinity Compliance Point.

Longfin Smelt: In Bay Study trawls conducted during early January, 2015, the majority of adult Longfin Smelt were detected in Suisun Bay, the Confluence area, and the lower Sacramento River (Figure 28). By early April, the distribution was shifted westward, with catch occurring in San Pablo Bay and the Confluence area (Figure 29). No adult Longfin Smelt have been collected in salvage or in the Central or South Delta in the Bay Study sampling, from January-April 2015.

Fish surveys, including the Early Warning Monitoring that occurred at Jersey Point, and salvage suggest there were Longfin Smelt spawning in the West, North and South Delta this year. Based upon the most recent 20mm survey data the majority of juvenile Longfin Smelt appears to be distributed in the lower Sacramento near the confluence and in Montezuma Slough and with lower densities in near Franks Tract in the South Delta.

Longfin Smelt larvae were detected at 4 of 12 Lower San Joaquin River (SJR) and South Delta sampling stations during Smelt Larva Survey #4, conducted February 17-19, 2015. However, subsequent Smelt Larva Survey sampling indicated densities of Longfin Smelt larvae in the South Delta diminished in following weeks while densities increased in the lower SJR.

While larvae in these southern areas will be at risk of entrainment during operations due to their proximity to the export facilities, the minimal export levels should result in a low level of risk. In addition, larvae in the south Delta only represent approximately 3.5% of the total larval catch in SLS #6 east of Carquinez Straights based upon Catch Per Unit Effort (CPUE). Larvae were initially detected at the CVP and SWP salvage facilities, (on February 27 and March 3, respectively). Detection of age-0 Longfin Smelt in larval fish sampling at the facilities continued to be intermittent in March and increased to near daily detections during the latter half of April.

In WY2015 no adult Longfin smelt were observed at the salvage facilities. Based on salvage data from WY1994 through WY2015 the first 5% of total yearly salvage typically occurs in early February, and salvage of any Longfin smelt prior to December occurred in only one year during the past 21 years (WY2001). Longfin smelt migration does not appear to correlate with any single environmental variable, and the population may have a more generalized seasonal migration response. Therefore, there is potential for some migration to occur during the end of the currently proposed action with or without the occurrence of any change in predicted environmental conditions, such as a large precipitation or flow event although the probability of a large migration event during the period of the proposed actions is low. There is a moderate level of certainty in this conclusion.

Given the limited distribution of larvae and juveniles in the Central and South Delta, and the very low levels of projected exports, the proposed action will not substantially raise the entrainment risk of the Longfin Smelt population. The maximum change in daily tidal flow at Jersey Point resulting from the proposed actions is less than 500cfs, and for the majority of the period the change is less pronounced. Additionally, larval Longfin Smelt salvage has historically decreased as south Delta water temperatures rise in the spring months. Therefore salvage is likely to continue declining through the action period, and little increase in entrainment effects on BY2015 Longfin Smelt resulting from the proposed actions are expected. However, a demonstrated positive relationship between Longfin Smelt abundance and winter-spring Delta outflow (Kimmerer 2002; Rosenfeld and Baxter 2007) suggests reduced outflow in April under the proposed action will result in some reduction in overall abundance. Furthermore, the operation of West False River Emergency Drought Barrier has the potential to delay or inhibit westward migration of juvenile longfin that were in the Franks Tract area and regions further south. The modifications proposed are not likely to result in a substantial degradation of rearing habitat for Longfin Smelt over conditions that would be experienced in a dry year. There is a moderate level of certainty about this conclusion.

Like other species, inhabiting the Delta, Longfin Smelt are likely to experience poor recruitment this year due to effects of the continuing drought. Low spawning and larval detection rates this year seem to support these predicted low survival rates. The reduction in outflow due to the proposed action may have some negative impact on Longfin spawning and recruitment, though this effect is hard to quantify given the already poor environmental conditions due to the drought.

Delta Smelt: Effects on Delta Smelt from changes in conductivity in the lower San Joaquin River are anticipated to be minor because they are within physiological tolerance ranges for salinity in which Delta Smelt are captured (Nobriga et al. 2008). With X2 positioned above the Sacramento-San Joaquin confluence, it is possible that salinities downstream may reach levels that are less suitable for juvenile Delta Smelt and prevent substantial seaward movement to areas where the marine influence and larger water bodies maintain cooler water temperatures, although EC values at Collinsville are projected to remain below levels at which 100% survival occurred in laboratory salinity tolerance studies (Komoroske et al. 2014).

The proposed modifications will result in lower outflows that may reduce survival of out-migrating juvenile Delta Smelt that are currently in the interior Delta. For example, lower flows increase migration time and increase exposure to degraded habitats and predators. However, the projected OMR flows are at minimum levels and therefore are not likely to directly result in substantial additional impacts over unmodified conditions. For smelt residing in the North Delta, reduced outflow, while limiting the available habitat and its quality, is not expected to result in increased risk of entrainment. There is a low level of uncertainty in this conclusion.

Lower flows are expected to increase hydraulic residence times, potentially resulting in improved planktonic production (Lucas et al. 2009). However, a specific effect is difficult to predict because benthic grazing can offset these benefits and hence the response of the food web to changes in flow is unclear. There is a high level of uncertainty about this conclusion.

If the recent SKT survey results reasonably reflect the current distribution of Delta Smelt, there is an absence of adult Delta Smelt in the central and south Delta (SKT #4). Entrainment of adults is unlikely to be a management issue for the rest of this year. Published analyses of a 13-year dataset of salvage records at the CVP/SWP fish collection facilities indicate that increased salvage of adult Delta Smelt at the CVP/SWP occurs when turbidities increase in the South Delta and Old and Middle River flows are highly negative (Grimaldo et al. 2009). Given the present low level of pumping and low turbidity in the South Delta, movement of remaining adults into areas of elevated entrainment risk is not expected. The salvage of adult Delta Smelt typically ends by May. After the onset of spawning, salvage of adults diminishes, with the regulatory focus shifting to protection of larvae/juveniles by the end of March (as determined by water temperatures or biological triggers; FWS BO 2008). Some two-year-old fish survive through the summer to spawn the following year, but this is uncommon (2.3% to 9.3% of population in 2002 and 2003, respectively; Bennett 2005). Although the proportion of fish in this category is typically small, these age 1+ Delta Smelt produce more eggs than age 1 adults and have a disproportionate effect on the population (Bennett 2005). We hypothesize that these age 1+ fish will have a greater ability to move out of areas of poor habitat quality due to their size and broader salinity tolerance, and thus will be more likely to survive compared to juvenile Delta Smelt (discussed below). For these reasons the remainder of our discussion regarding Delta Smelt during the summer will focus on effects on larvae and juveniles.

The distribution of newly hatched larval Delta Smelt in the lower San Joaquin River is assumed to be similar to the distribution of adults, which are not currently present and therefore not at a high risk of entrainment. Recent larval survey results further support this assumption. The entrainment risk of larval Delta Smelt produced in the lower San Joaquin River is expected to be moderated by the maintenance of Index OMR flows substantially less negative than -5000 cfs on a 14-day running average under the proposed action for the duration of the RPA action. There is potential that undetected larval Delta Smelt are located in the South Delta closer to the export facilities and these may be at a higher risk of entrainment. However, based on simulated fates of neutrally buoyant particles (Kimmerer and Nobriga 2008), any Delta Smelt southeast of Jersey Point in the Central/South Delta may be entrained at the south Delta export facilities even at minimum export levels. There is a low level of uncertainty about this conclusion.

Salvage of juvenile Delta Smelt during the summer and fall months is reported to be virtually non-existent, as they do not use the South Delta as habitat during these months (Sommer et al. 2011).

Juvenile Delta Smelt during the summer period typically reside in the LSZ around X2, with a substantial portion of the population remaining in the North Delta (Sommer and Mejia 2013). The CDFW Summer Townet Survey (TNS) samples the distribution of Delta Smelt throughout the summer and early fall period, and in the summer of 2014 consistently detected Delta Smelt in both of these areas. It is thought that Delta Smelt in the Cache Slough Complex use deep water areas of Cache Slough and the Sacramento Deep Water Ship Channel as thermal refuges during high summer temperatures. Delta Smelt continue to feed and grow throughout summer months and begin to move upstream in early winter periods of increased outflow and high turbidities, which typically do not commence until December. There is no evidence that substantial upstream movement relative to the salt field occurs prior to this period (Sommer et al. 2011).

Juvenile Delta Smelt have the potential to be substantially affected by the proposed actions. The effects of changes in water quality in areas such as Liberty Island, Sacramento Deep Water Ship Channel, Lindsey and Cache Sloughs, are uncertain because the hydrology of this region is strongly driven by tidal effects during the months of the proposed action. However it is relatively likely that reduced inflow will result in a more upstream distribution of Delta Smelt, increasing the risk that they will be exposed to relatively high water temperatures (e.g., >25C). In laboratory temperature tolerance studies (Komoroske et al. 2014) juvenile Delta Smelt tolerated waters several degrees warmer than adults and post-spawn adults, and thus may be more resilient to temperatures between 25-28C than previously thought. Further, it is thought the Deep Water Ship Channel and Cache Slough may provide key thermal refuges that allow Delta Smelt to persist in the North Delta. Nonetheless, it is not known how long these refuges will persist under conditions of a sustained heat wave.

Delta Smelt have a strong positive association with the position of X2, with more downstream positions providing higher quality habitat (Feyrer et al. 2011). Under the proposed action, it is likely that summer Delta Smelt distributions will not be in areas optimal for growth and survival (Nobriga et al. 2008). In previous low-flow years, when water quality conditions became less tolerable for Delta Smelt in the Cache Slough Complex, the North Delta population appeared to have the capability to move downstream quickly towards the LSZ. It is likely, given the strongly tidal nature of the Cache Slough Complex, that Delta Smelt are able to ride these tidal flows and are capable of quickly escaping unfavorable habitat conditions in the North Delta. Under the current proposal, X2 would move further upstream, limiting potential downstream movement, although conditions without the modifications would also limit potential downstream movement. The proportion of the total population of Delta Smelt in the

North Delta in summer appears to be highly variable (James Hobbs, UC Davis, unpublished data), but it can be substantial. There is a moderate level of uncertainty about the expected effects in the North Delta.

Steelhead: Based on daily monitoring data through May 5, 2015 the DOSS workteam believes that a minority (10-15%) of San Joaquin River juvenile steelhead remain the Delta and the majority (80-85%) have migrated out of the Delta4. Due to limited catch data, DOSS did not estimate the current distribution of Sacramento River steelhead. Wild juvenile Central Valley Steelhead were salvaged in November, February, and mid to late April.

Modification of Rio Vista Flow Requirement
Based on the spatio-temporal distribution of steelhead during July, there should not be an effect of the Project Description's modification of the Net Delta Outflow Index standard.
Modification of Western Delta Salinity Compliance Point
Based on the spatio-temporal distribution of steelhead during September, there should not be an effect of the Project Description's modification of the Rio Vista Flow Requirement.
Modification of Western Delta Salinity Compliance Point
Based on the spatio-temporal distribution of steelhead between July 1 and August 15, 2015 there should not be an effect of the Project Description's modification of Western Delta Salinity Compliance Point.

Green Sturgeon:
Modification of Rio Vista Flow Requirement
Based on the spatio-temporal distribution of green sturgeon during July, there should not be an effect of the Project Description's modification of the Net Delta Outflow Index standard.
Modification of Western Delta Salinity Compliance Point
Based on the spatio-temporal distribution of green sturgeon during September, there should not be an effect of the Project Description's modification of the Rio Vista Flow Requirement.
Modification of Western Delta Salinity Compliance Point
Based on the spatio-temporal distribution of green sturgeon between July 1 and August 15, 2015 there should not be an effect of the Project Description's modification of Western Delta Salinity Compliance Point.

Consultation with California Department of Fish and Wildlife

DWR and Reclamation have met numerous times during the past few months with representatives of the DFW, as well as with NMFS and FWS, to discuss the hydrologic situation and potential measures to address it. 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 health and safety 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, modifying the Delta outflow as proposed in this petition will increase the probability that the Projects will be able to prevent the uncontrolled intrusion of salinity into the Delta this summer. If by meeting unmodified D-1641 outflow objectives early in the year the Projects have insufficient storage to control seawater intrusion, problematic water quality 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.

III. Due Diligence has been Exercised

DWR has exercised due diligence to avoid this circumstances necessitating this request by reducing allocations to its water supply contractors in 2013, 2014 and 2015, when the current severe dry pattern began to emerge. As discussed earlier SWP 2015 water supply contractor allocation is currently set at 20%, which is the second lowest allocation for users south of the Delta.

Prior to this petition, DWR and Reclamation pursued internally and through RTDOT all avenues to conserve water in upstream storage while continuing to meet regulatory requirements, critical needs and contractual obligations. DWR and Reclamation have met with State Water Board staff and with representatives of DFW, NMFS and FWS, to discuss the elements of this petition, and to seek their input on how best to manage multiple needs for water supply.

Compliance with D-1641 Salinity Objectives at Emmaton Compared to Complying with the Objective Moved to Threemile Slough

The proposed change of the salinity compliance location from Emmaton to Threemile Slough has similar effects in the 2015 analysis as compared to the 2014 analysis. This is because the DSM2 modeling that occurred in 2014 used similar Net Delta Outflow Index (NDOI) assumptions through the compliance season as in 2015.

Modeling Assumptions

To model the Delta flows, water levels and salinity, Delta Models such as DSM2 need boundary inflows, exports and diversions, water levels and salinity. Up to the point where the forecast begins, DSM2 uses observed historical data. For inflows to and exports from the Delta, DSM2 starts with the forecasted flows from the Delta Coordinated Operations (DCO) model that determine allocations to water contractors. Information that is fed into DCO includes hydrology data, contractor delivery requests, and regulatory and court restrictions on exports. The DCO allocation forecasts that were used for this analysis utilized an April Forecast with a 90% hydrology. This represents a forecast for a very dry year. Based on historical data, a 90% hydrology assumes that only one in ten years would be drier than this forecast.

When running the DCO forecasts this year, tradeoffs between upstream water needs and Delta water needs were made. This April forecast gives priority to Delta needs, by releasing enough water necessary to meet the requests in the temporary urgency change petition, while reducing or adjusting upstream demands.

In order to better understand the potential water quality impacts of complying with the modifications to the D-1641 objectives put forward in the Temporary Urgency Change Petition (TUCP) as compared to water quality that would occur when in compliance with D-1641, Sacramento flows were adjusted, using the Minimum Water Quality Cost Compliance Tool (available at the follow link-http://modeling.water.ca.gov/delta/reports/annrpt/2002/2002Ch10.pdf), so that DSM2 would comply with the water quality objectives in D-1641.

Figure 1 shows the locations for EC results. Figures 2, 4-8 below show EC results for the following scenarios for each location:

- Meeting D-1641 without a Barrier. These results show what could be expected for water quality if the D-1641 objectives are met.
- Meeting the modified objectives described in the TUCP without the Barrier. These results show relative impacts of modifying the D-1641 objectives without the False River Barrier.
- Meeting the modified objectives described in the TUCP with the False River Barrier. These results show the relative impacts of the full proposed project as compared to D-1641.

Figure 3 shows the additional volume of water needed to meet D-1641 objectives.

Without the additional flow required to meet the D-1641 objectives, there is greater salinity intrusion with the TUCP results. The TUCP with Barrier EC results show that salinity in the areas along Old River where Contra Costa Water District diversions and State Water Project and Central Valley Project exports occur, the Barrier provides salinity at levels closer to what would have occurred if D-1641 was in place. (Additionally, when comparing the TUCP with and without barrier simulations, the greatest benefits occur in the Central and South Delta with only a slightly higher salinity impact in northern Delta locations such as Rio Vista).

Figure 1: Location Map of DSM2 EC Results

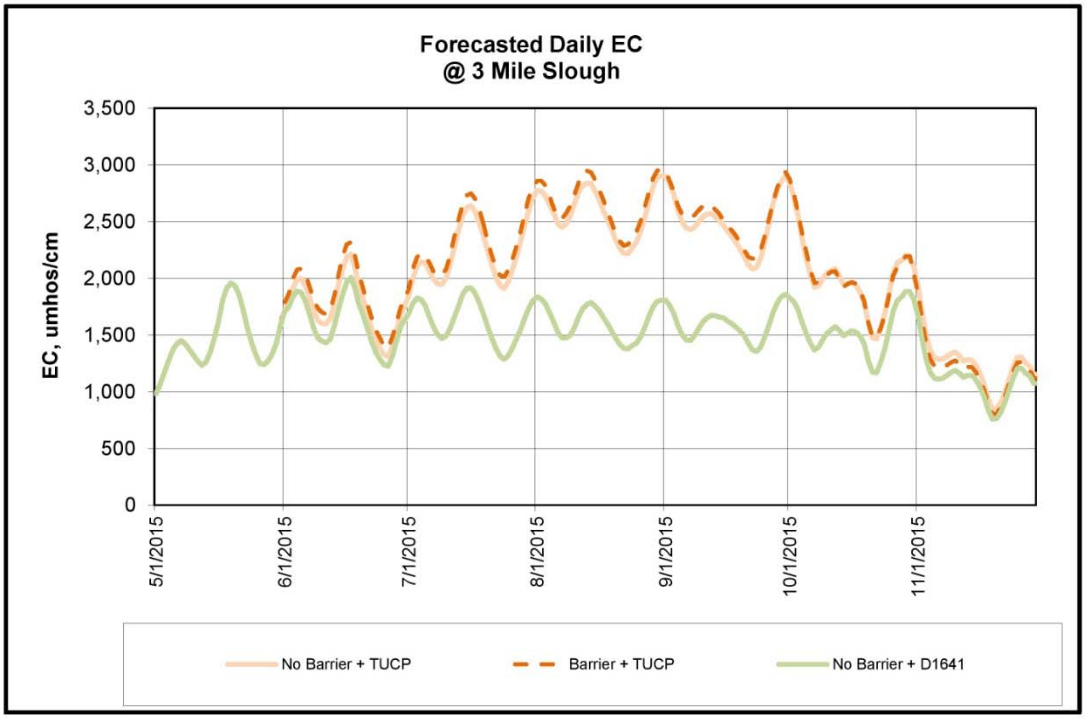


Figure 2: DSM2 EC Results at 3 Mile Slough

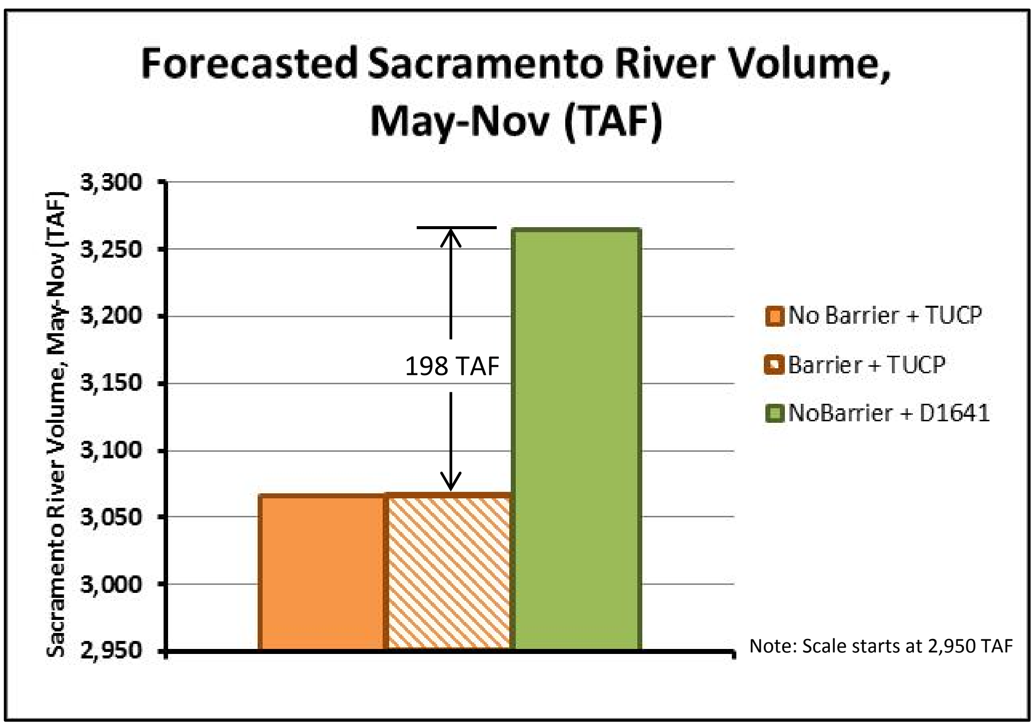


Figure 3: Sacramento River Volume for DSM2 Simulations

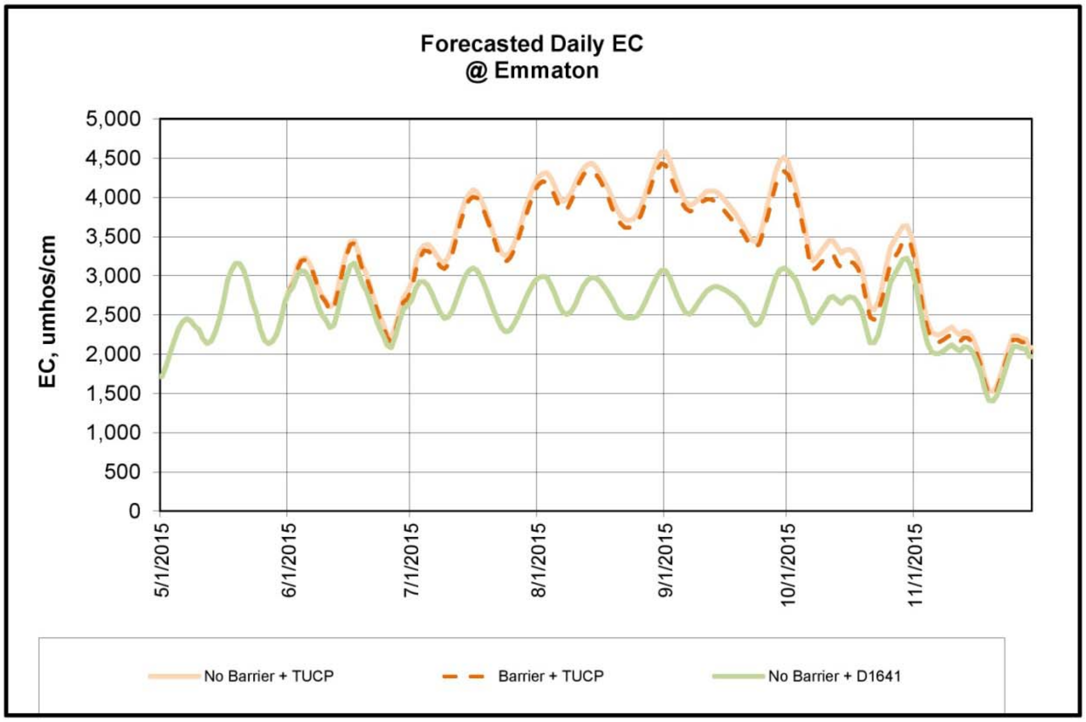


Figure 4: DSM2 EC Results at Emmaton

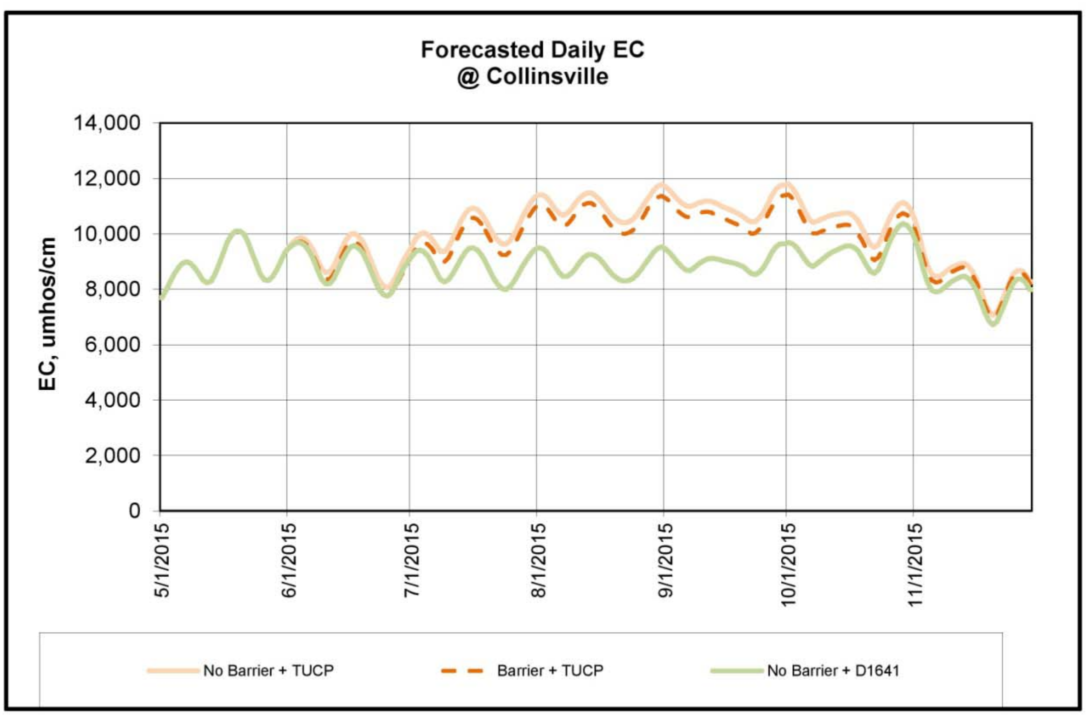


Figure 5: DSM2 EC Results at Collinsville

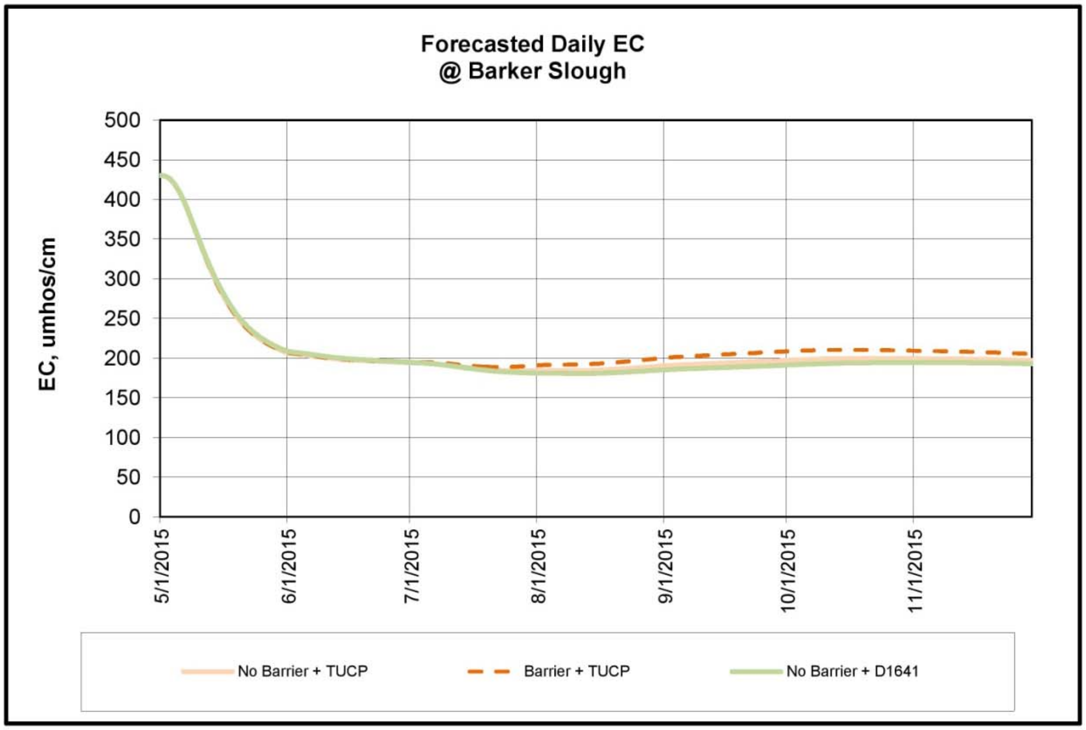


Figure 6: DSM2 EC Results at Barker Slough

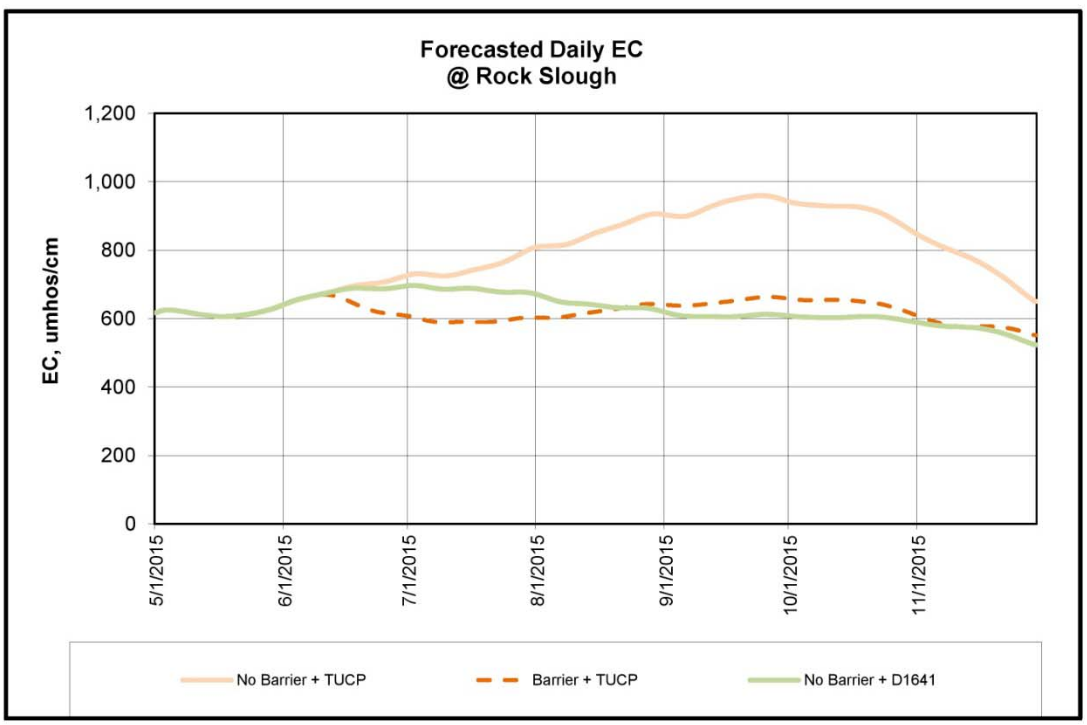


Figure 7: DSM2 EC Results at Rock Slough

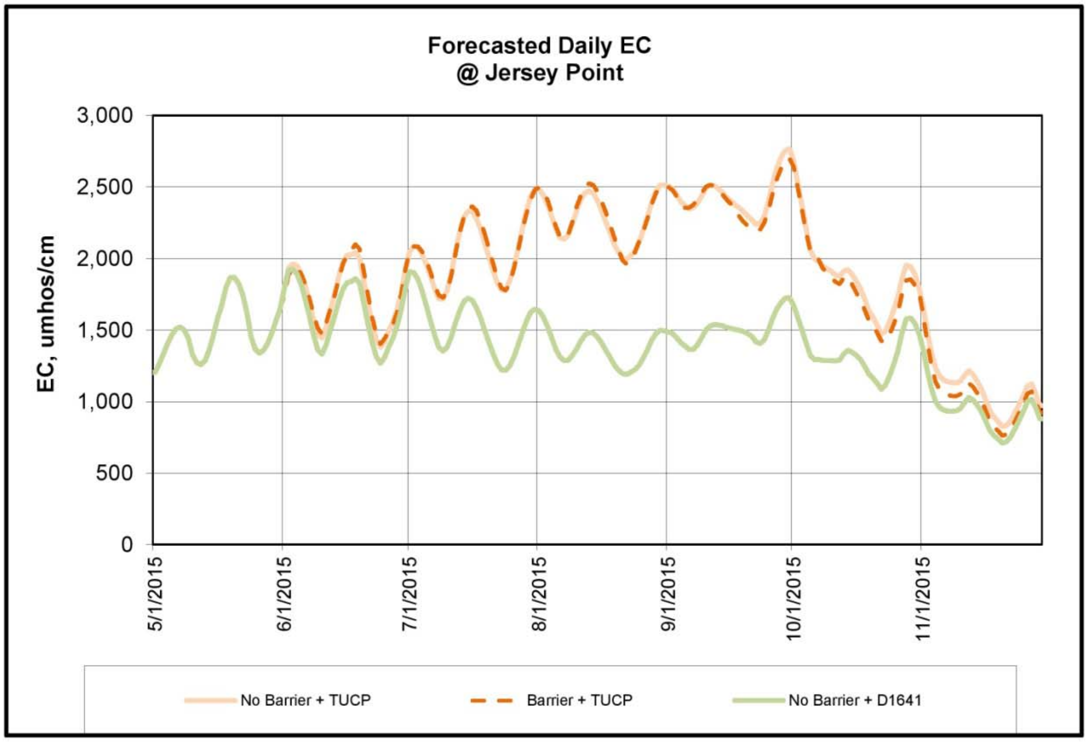


Figure 8: DSM2 EC Results at Jersey Point

Below (Figure 9 on the next page) is a spatial plot showing DSM2 results occurring on August 1, 2015. The plot shows a snapshot of the distribution of the difference in EC between the TUCP with Barrier DSM2 simulation and the D-1641 DSM2 simulation. The color in each region shows ranges of the differences in salinities that occur in the channels in that region. Blues indicate that the TUCP with Barrier simulation has better salinity water quality than the D-1641 simulation. The light green indicates a region that results in similar water quality between the two simulations. The yellows, oranges and reds indicate areas where the salinity in the channels for the TUCP with barrier are higher than the D-1641 simulation results.

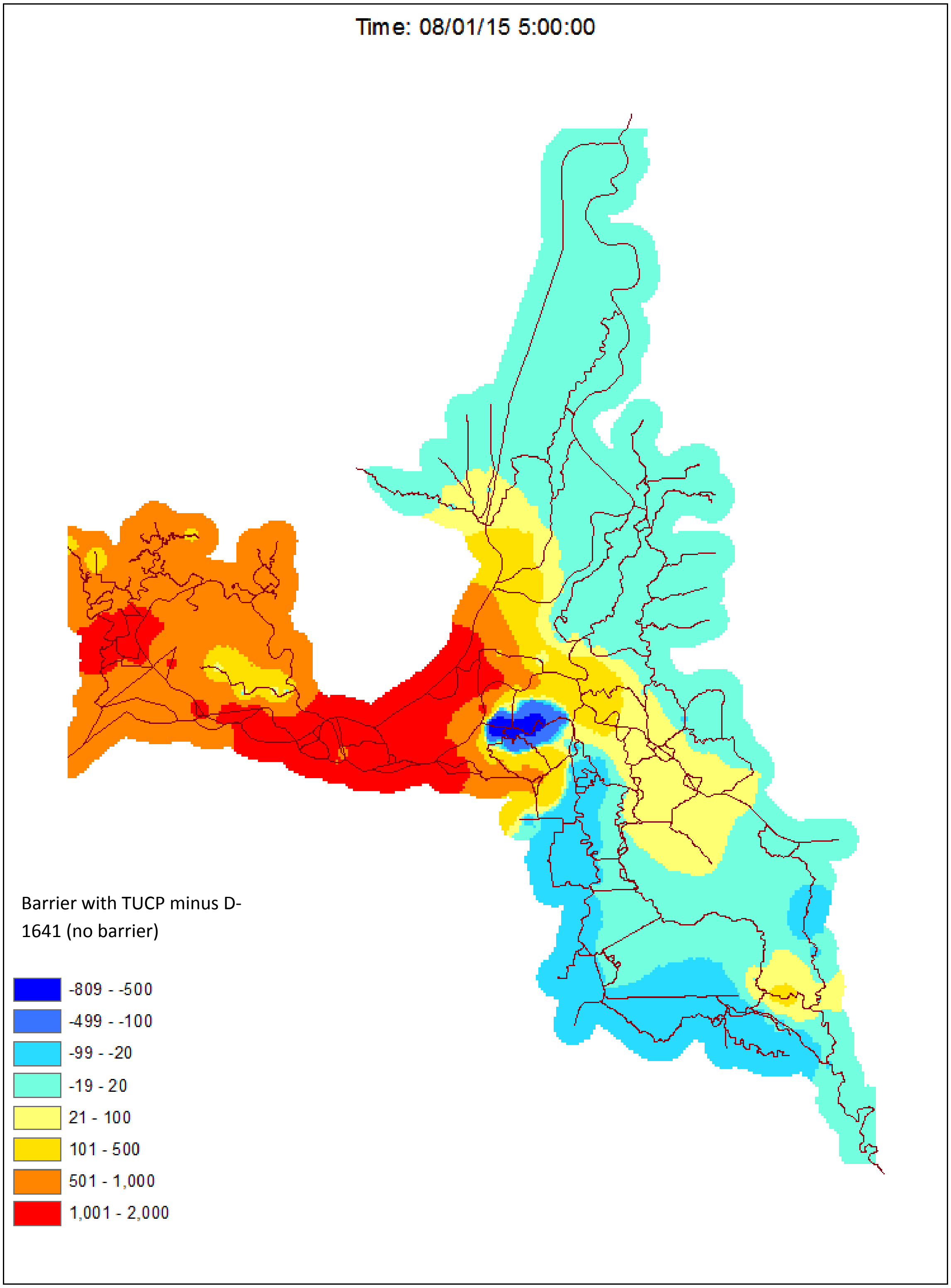


Figure 9: Difference in Salinity - Barrier with TUCP Minus D-1641 (no barrier)

Methods and Modeling

Conceptual Model

Four Chinook salmon runs, which are differentiated by the timing of the adult spawning migration (fall-run, late-fall-run, winter-run, and spring-run) are found in the Central Valley. NMFS (64 FR 50394) determined the four Central Valley Chinook salmon races comprise three distinct Evolutionarily Significant Units (ESUs): the fall/late fall-run, the spring-run, and the winter-run. The Sacramento River winter-run Chinook Salmon ESU is restricted to a single population. The Central Valley spring-run Chinook Salmon ESU is comprised of multiple self-sustaining wild populations (Mill, Deer and Butte Creek), although additional spring-run Chinook salmon populations exist in the mainstem Sacramento River, Feather River and Clear Creek. All these species share similar life stages, biological responses to habitat attributes, and exposure to environmental and management drivers (Figure 1).

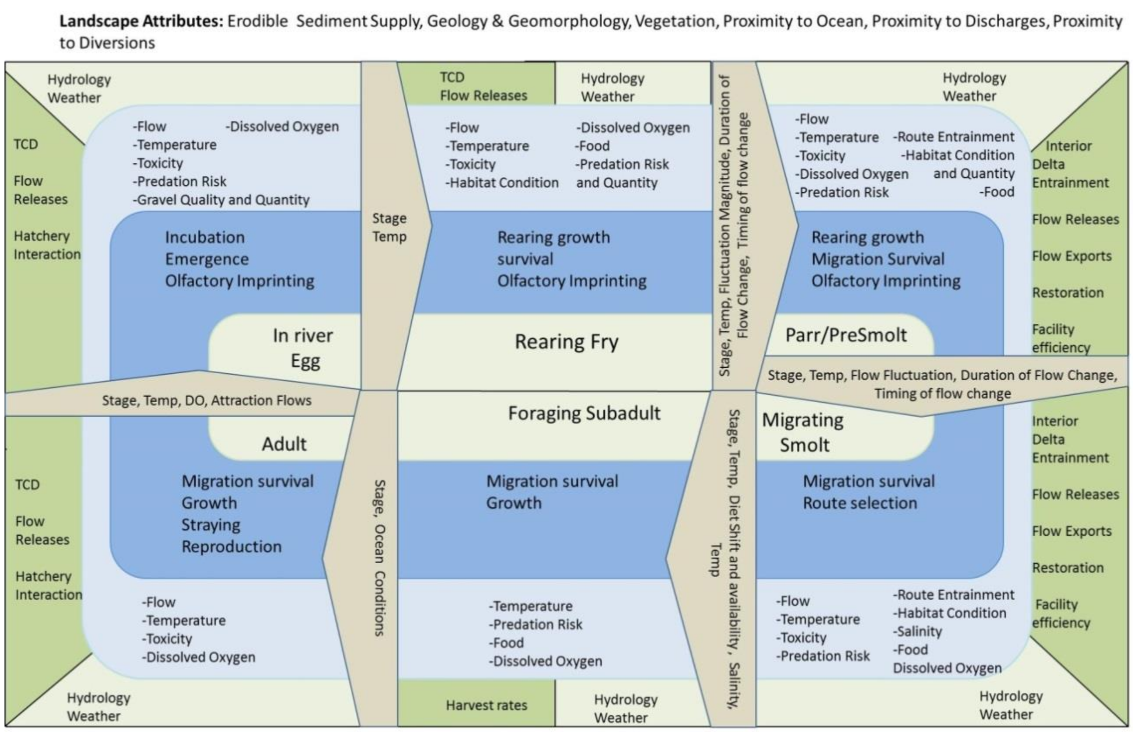


Figure 1. Conceptual Model for Central Valley Salmonids. The center are life stages nested in tiers representing biological responses, habitat attributes, and environmental and management drivers. Landscape attributes are representative of spatially diverse characteristics that can modify habitat attributes regionally. The grey arrows across tiers linking life stages represent transitional habitat attributes.

Egg Mortality Model

Egg and juvenile mortality can be estimated using a dynamic simulation framework developed by Cramer Fish Science (CFS 2010) to estimate juvenile WRCS production. Relationships for daily mortality of incubating eggs and rearing juveniles (Bartholow and Heasley 2006) are parameterized with results from temperature mortality studies undertaken by USFWS (1999). Carcass data from 2007-2013 were used to model average spawning time, in which the date of egg deposition was shifted 14 days before a carcass was observed (K. Niemela, pers comm in CFS 2010). Thus, daily cohorts of incubating eggs experience the observed temperature and flow conditions. The model used observed daily flows measured at Freeport during WY 2014 and temperatures from the May 2015 temperature management plan (USBR 2015a) to estimate egg survival and egg to fry survival. The model runs on a daily time step, and a mean proportional mortality of the incubating eggs is estimated from the daily water temperature using a polynomial daily mortality relationship. A mean mortality of rearing juveniles is predicted from the daily water temperature using an exponential relationship. The model was run for 1000 iterations and the predicted mean survivals are reported for egg and fry life stages. This prediction is compared to predictions from the WY 2014 temperature management plan (USBR 2014).

There remains uncertainty with the results from this model of egg and egg-to-fry mortality. In 2014, the observed temperature difference between Keswick and Clear Creek was 1.3°F, which is not observed in the modeled results of Clear Creek and Keswick temperatures. Additionally, modeled egg and egg-to-fry mortality has never been as high as estimates of mortality based on observed juvenile production at Red Bluff Diversion Dam. It is not assumed that all mortality of these life stages is directly linked to temperature mortality, and Reclamation (2105b) suggested that the monitoring strategy consider indirect effects, potentially linked to temperature (such as increased predation mortality, increase disease mortality, and increased stranding mortality) to understand multiple stressors of the drought mediated by temperature. Additionally, there is uncertainty due to the potential for actual operations during late summer deviating from the temperature management plan if actual storage and temperature conditions in Trinity and Shasta reservoirs are different from the modeled conditions.

DSM2 Model

To model the Delta flows, water levels, and salinity, Delta models such as DSM2 need boundary inflows, exports, diversions, consumptive use diversions and returns, water levels, and salinity. For inflows to and exports from the Delta, the models use forecasted flows extracted from the Delta Coordinated Operations (DCO) studies that DWR's Division of Operation and Maintenance (O&M) and USBR conducts to determine State Water Project and Central Valley Project allocations. DCO studies incorporate hydrology data, contractor delivery requests, and regulatory and court restrictions on exports[1]. The DCO allocation forecasts that were used for this analysis assumed a 90% hydrology. This forecast, which included the West False River Barrier, was compared to scenarios of meeting D1641 without modifications after the expiration of the current order and augmented Sacramento River flow as-needed at the expense of upstream storage, cold water pool and contract quantities (Table 1, Table 2). Scenarios of the 90% forecast with and without the West False River Emergency Drought Barrier (EBD) were also conducted for EC and flow at compliance points throughout the Delta (Table 1, Table 3). Projected salinity and flow patterns should be considered to reflect the relative influence of the proposed modifications, rather than as accurate predictions. A 90% hydrology is one that assumes, based on historical statistics, only one in ten years would be drier than this forecast. The models also use observed historical data up until the forecast period begins.

Table 1. Modeled conditions for DSM2 modeling. Red numbers in parentheses represent negative values.

April 90% D1641								
	Sacramento River (cfs)	San Joaquin River (cfs)	East Side Flow (cfs)	DCU (cfs)	CVP (cfs)	CCFB(cfs)	CCWD (cfs)	North Bay (cfs)
May-15	6,584	309	179	2,163	537	211	65	96
Jun-15	8,315	319	185	3,682	555	202	67	25
Jul-15	8,822	260	179	4,341	537	65	65	55
Aug-15	8,023	309	179	3,772	537	65	65	16
Sep-15	8,219	387	185	2,471	2,403	50	67	8
Oct-15	6,582	244	210	1,447	748	374	65	7
Nov-15	7,533	957	260	756	1,091	755	67	2

April 90% with TUCP with 1 EDB								
	Sacramento River (cfs)	San Joaquin River (cfs)	East Side Flow (cfs)	DCU (cfs)	CVP (cfs)	CCFB (cfs)	CCWD (cfs)	North Bay (cfs)
May-15	6,586	309	179	2,163	537	211	65	96
Jun-15	8,029	319	185	3,682	555	202	67	25
Jul-15	7,626	260	179	4,341	537	65	65	55
Aug-15	6,970	309	179	3,772	537	65	65	16
Sep-15	7,429	387	185	2,471	2,403	50	67	8
Oct-15	6,620	244	210	1,447	748	374	65	7
Nov-15	7,533	957	260	756	1,091	755	67	2

Comparison of "April 90% with TUCP + D1641" and "April 90% with TUCP" (the later minus former)								
	Sacramento River (cfs)	San Joaquin River (cfs)	East Side Flow (cfs)	DCU (cfs)	CVP (cfs)	CCFB(cfs)	CCWD (cfs)	North Bay (cfs)
May-15	2	0	0	0	0	0	0	0
Jun-15	(286)	0	0	0	0	0	0	0
Jul-15	(1,196)	0	0	0	0	0	0	0
Aug-15	(1,053)	0	0	0	0	0	0	0
Sep-15	(791)	0	0	0	0	0	0	0
Oct-15	37	0	0	0	0	0	0	0
Nov-15	0	0	0	0	0	0	0	0

[1] [1] As noted in the Project Description, Reclamation is not requesting a modification to the October Vernalis flow requirement per D-1641 at this time, so that action is not being evaluated in this document. A October fall pulse flow was not included in the modeling (both baseline and proposed action scenarios). A baseline flow of 1,000 cfs will be used to evaluate any modification to the October Vernalis flow requirement, if that modification is deemed necessary based on late-summer New Melones storage.

Table 2. Daily average flow and EC at compliance locations throughout the Delta for D-1641 and with 1 barrier DSM2 and DSM2-QUAL modeling.

Location	Daily Average flow D-1641 v. 1 Barrier	Daily average EC D-1641 v. 1 Barrier
Jersey Point	1 barrier has smaller max and min daily flows (few 100 cfs difference)	1 barrier has greater EC (>500 umhos/cm difference)
Antioch	1 barrier has smaller max and min daily flows (few 100 cfs difference)	1 barrier has greater EC (>500 umhos/cm difference)
Rio Vista	1 barrier has smaller max flow and greater min flow (few to many 100 cfs difference)	1 barrier has greater EC (few 100 umhos/cm difference)
Old and Middle River	1 barrier has smaller max and min daily flows (~100 cfs difference)	1 barrier has greater EC (>500 umhos/cm difference)
Emmaton	1 barrier has smaller max flow and greater min flow (few to many 100 cfs difference)	1 barrier has greater EC (>500 umhos/cm difference)
Collinsville	1 barrier has smaller max flow and greater min flow (few to many 100 cfs difference)	1 barrier has greater EC (~1,000 umhos/cm difference)
Cache Slough near Ryer Island	1 barrier does not change max flow and greater min flow (few 100 cfs difference)	1 barrier has greater EC (<100 umhos/cm difference)
Vernalis	1 barrier does not change max and min flow	1 barrier does not change EC
Barker Slough (NBA Pumping)	N/A	1 barrier has greater EC (<50 umhos/cm difference)
Three Mile Slough	N/A	1 barrier has greater EC (>500 umhos/cm difference)
Rock Slough (CCWD Pumping)	N/A	1 barrier has lower EC for half of operational period, then higher EC for second half (<100umhos/cm difference)
Prisoners Point	N/A	1 barrier has greater EC (~100 umhos/cm difference)

Table 3. Daily average flow and EC at compliance locations throughout the Delta for the with and without 1 barrier DSM2 and DSM2 QUAL modeling.

Location	Daily Average flow	Daily average EC
	No barrier v. 1 barrier	No barrier v. 1 barrier
Jersey Point	1 barrier has smaller max and min daily flows (few 100 cfs difference)	1 barrier does not change EC consistently
Antioch	1 barrier has smaller max and min daily flows (few 100 cfs difference)	1 barrier consistently lower EC (~100 umhos/cm)
Rio Vista	1 barrier has smaller max flow and greater min flow (~100 cfs difference)	1 barrier consistently greater EC (~100 umhos/cm)
Old and Middle River	1 barrier has smaller max and min daily flows (<100 cfs difference)	Not completed
Emmaton	1 barrier does not change max flow and smaller min flow (~100cfs difference)	1 barrier consistently lower EC (~100 umhos/cm)
Collinsville	1barrier has smaller max flow and greater min flow (~100 cfs difference)	1 barrier consistently lower EC (~100 umhos/cm)
Cache Slough near Ryer Island	1 barrier has greater max flow and min flow (~100cfs difference)	1 barrier consistently greater EC (<50 umhos/cm)
Vernalis	1 barrier does not change max and min flow	1 barrier does not change EC
Barker Slough (NBA Pumping)	N/A	1 barrier consistently lower EC (~200 umhos/cm)
Three Mile Slough	N/A	1 barrier consistently greater EC (<100 umhos/cm)
Rock Slough (CCWD Pumping)	N/A	1 barrier consistently lower EC (>200 umhos/cm)
Prisoners Point	N/A	1 barrier consistently lower EC (<100 umhos/cm)

Biological Review of Winter-run Chinook Salmon

Updated Status of Winter-run Chinook Salmon

An updated status of Winter-run Chinook Salmon through April 21 is well-described in the Emergency Drought Barrier Aquatic Biological Assessment (DWR 2015, Environmental Baseline section). Based on daily monitoring data through May 5, 2015 the Delta Operation for Salmonids and Sturgeon (DOSS) work team believes that few (<1%) juvenile Brood Year 2014 Winter-run Chinook salmon remain upstream of or in the Delta and the majority (>99%) have migrated out of the Delta[2]. No salvage of juvenile Winter-run Chinook Salmon has occurred since March 31, 2015. The Sacramento River Temperature Task Group is monitoring the results of California Department of Fish and Wildlife winter-run Chinook carcass surveys. Historic information suggests less that 10% of carcasses are observed by the end of May based on data collected between 2003-2014, with a substantial increase in carcasses during the first three weeks of June (Figure 2). Spawning has started later during the last four years compared to previous survey years.

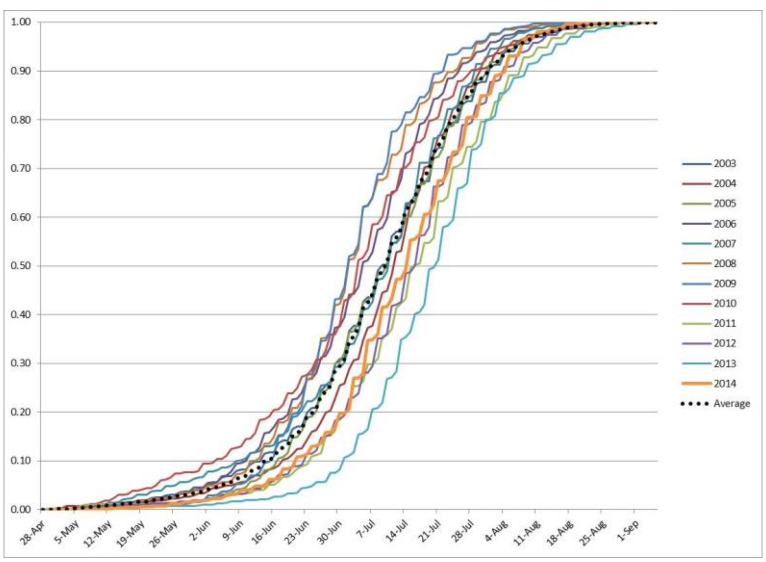


Figure 2. Temporal distribution of Winter run Chinook Salmon carcass survey between 2003 and 2014. Carcass recovery may be assumer to occur 2 weeks following spawning (K. Niemala in CFS 2009)

[2] [2] May 5, 2015 DOSS notes available at: http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocapwy2015.html

Effects of Project Description on Winter-run Chinook Salmon

Table 4: Presence of Winter run Chinook Salmon During the Project Description Period and Exposure to Potential Effects

Winter-run Chinook Salmon Life Stage	Life Stage Present	Tributary Habitat Effect	Delta Habitat Effect	Facility Loss Effect
Egg/Alevin	This life stage will be present in the Sacramento River May through September for BY 15.			
Sacramento R	Yes	Yes	N/A	N/A
Juvenile	This life stage will be present in the Sacramento during August to November for BY 15, and potentially present in the Delta in October and November			
Sacramento R	Yes	Yes	N/A	N/A
Delta	Potentially	N/A	No	No
Adults	This life stage will be present in the Sacramento River through July			
Sacramento R	Yes	Yes	N/A	N/A

Proposed Upstream Tributary Operations- July Through November

Winter-run Chinook salmon adults, eggs, and juveniles will be affected by the proposed operations (Table 4). CDFW and USFWS will conduct regular carcass surveys and aerial redd surveys during the summer 2015. Surveys will be conducted in close proximity to spawning areas and will enable an assessment of egg and alevin survival. CDFW and NMFS have monitoring and research studies planned to document and describe water quality around redds more accurately. A recent review of WY 2014 drought monitoring suggested monitoring of disease and pathogen during period of suboptimal water quality (Reclamation 2015c) would provide additional information to managers about undocumented sources of mortality, which are not accounted for in the mortality modeling. These undocumented sources of mortality may be the mechanisms influencing negative bias in models used for evaluating egg and egg to fry mortality in Winter-run Chinook Salmon.

Discussions on fish distribution and temperature management will occur throughout the year in the Sacramento River Temperature Task Group to iteratively inform and update temperature control operations. Based on the April 2015 Preliminary Temperature Analysis, the Project Description's model run met a temperature target of 56°F, with a few exceedances, at the Sacramento River above Clear Creek location through October. Based on the uncertainty of observations of Sacramento River temperature at the Clear Creek location (in WY2014, observed temperature differences between Keswick and Clear Creek were 1.3°F greater than the model difference), more numerous exceedances of

56°F are predicted to be observed. This model run estimated the end of September lake volume below 56°F to be approximately 340 TAF. For comparison , the 2014 April 90% operational forecast's temperature model run predicted end of September to be approximately 150 TAF, suggesting this year's plan may result in later operation of the temperature control device's (TCD's) side gate, which decreases the risk associated with temperature control through the TCD (USBR 2015a). As mentioned in the Method section, the temperature mortality model appears to underpredict mortality of egg and fry. There is uncertainty if this is related to sources of mortality not directly estimated by the model, actual operations during late summer deviating from the temperature management plan, and actual storage and temperature conditions in Trinity and Shasta reservoirs deviating from the temperature management plan modeling, or some combination of these factors.

Proposed temperature and flow operations as part of NMFS RPA Action I.2.3.C were developed to achieve maximum use of the limited cold water reserves in Shasta, Whiskeytown, and Trinity reservoirs. The highest priority for cold water management will be to improve and maintain cold water temperatures in the upper Sacramento River for protection of early life stages of Winter-run Chinook Salmon. To evaluate the potential impact of this plan, the daily temperature data from the April 90% operational forecast temperature model run were used with a dynamic simulation model using observed spawn timing, temperature, and flow data to estimate temperature-related egg and juvenile mortality during incubation and rearing. Egg mortality was estimated to be 1%, which was the same as the WY 2014's prediction in the WY 2014 TUCP (USBR 2014). Egg to fry mortality was estimated to be 22%, which was 75% of the WY 2014 prediction in the WY 2014 TUCP (USBR 2014). There is uncertainty if this is related to sources of mortality not directly estimated by the model, actual operations during late summer deviating from the temperature management plan, actual storage and temperature conditions in Trinity and Shasta reservoirs deviating from conditions assumed in the temperature management plan, or some combination of these factors.

Proposed Delta Operations- July Through November

Modification of Net Delta Outflow Index

Based on the spatio-temporal distribution of Winter-run Chinook Salmon during July, there should not be an effect of the Project Description's modification of the Net Delta Outflow Index standard.

Modification of Rio Vista Flow Requirement

Based on the spatio-temporal distribution of Winter-run Chinook Salmon during September, there should not be an effect of the Project Description's modification of the Rio Vista Flow Requirement.

Modification of Western Delta Salinity Compliance Point

Based on the spatio-temporal distribution of Winter-run Chinook Salmon between July 1 and August 15, 2015 there should not be an effect of the Project Description's modification of Western Delta Salinity Compliance Point.

Modification of the Ripon Dissolved Oxygen Requirement

Based on the spatio-temporal distribution of Winter-run Chinook Salmon between July 1 and November 15, 2015 there should not be an effect of the Project Description's modification of Ripon Dissolved Oxygen Requirement.

Extension of Water Transfer Window

Juvenile Winter-run Chinook Salmon will be present in the Sacramento River and may be present in the Delta during October and November 2015 (Table 4). Juvenile Winter-run Chinook Salmon first migrate into the Delta during the Fall when river flows or turbidity increase rapidly. These physical stimuli lead to Winter-run Chinook Salmon abandoning rearing below natal areas and increase migrating until turbidity or flows decrease. The volume and rate of releases as part of the Water Transfer are not expected to result in flow or turbidity signals that will stimulate migration.. However, the extension of the water transfer window is proposed into the Fall period when the likelihood of these physical stimuli occurring increases. The Project Description will utilize existing monitoring alerts and triggers identified in NMFS BiOp Actions IV.1.1, IV.1.2 and IV.3 (NMFS 2009) to reduce or suspend conveyance of transfer water while juvenile Winter-run Chinook Salmon are migrating to maintain protection of fish from potential effects of Interior Delta entrainment. Thus, the proposed activity is predicted not to measurably change the exposure of the population or likelihood of fish protection actions during the Project Description's period.

West False River Emergency Drought Barrier Operation

Based on the spatial distribution of adult, egg, and juvenile Winter- run Chinook Salmon, the presence of the West False River Emergency Drought Barrier operation should not have impacts on the species between July 1 and October 1, 2015. Critical habitat for Sacramento River winter-run Chinook Salmon in the Delta is limited to the Sacramento River and therefore does not include the EDB site footprint.

Biological Review of Spring-run Chinook Salmon

Updated Status of Spring-run Chinook Salmon

An updated status of Spring-run Chinook Salmon through April 21 is well-described in the Emergency Drought Barrier Aquatic Biological Assessment (DWR 2015, Environmental Baseline section). Based on daily monitoring data through May 5, 2015 the DOSS work team believes that a minority (20%) of young-of-year Brood Year 2014 Spring-run Chinook Salmon remain upstream of or in the Delta and the majority (80%) have migrated out of the Delta[3]. DOSS believes that more than 99% of BY 2013 yearling Spring-run Chinook Salmon have migrated out of the Delta. Spring-run sized juvenile Chinook have been salvaged every week since the week of March 30, 2015.

Effects of Project Description on Spring-run Chinook Salmon

Table 5: Presence of Spring run Chinook Salmon During the Project Description Period and Exposure to Potential Effects

Spring-run Chinook Salmon Life Stage	Life Stage Present	Tributary Habitat Effect	Delta Region Effect	Facility Loss Effect
Egg	This life stage will be present in the Sacramento River in September and October			
Sacramento R	Yes	Yes	N/A	N/A
Clear Creek	Yes	Yes	N/A	N/A
Juvenile	This life stage will be present in the Sacramento River and Clear Creek during late October and November			
Sacramento R	Yes	Yes	No	N/A
Clear Creek	Yes	Yes	No	N/A
Adults	This life stage will be present in the Sacramento River between July and September			
Sacramento R	Yes	No	N/A	N/A
Clear C	Yes	Yes	N/A	N/A
Stanislaus R	Yes	No	N/A	N/A

[3] [3] May 5, 2015 DOSS notes available at: http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocapwy2015.html

Proposed Upstream Tributary Operations- July Through November

Sacramento River

Spring-run Chinook salmon adults, eggs, and juveniles will be affected by the proposed operations on the Sacramento River (Table 5). CDFW and USFWS will conduct regular carcass surveys and aerial redd surveys during the summer 2015. Surveys will be conducted in close proximity to Spring-run spawning areas and will enable an assessment of adult prespawn, egg and alevin survival in the expected stressful water temperatures. CDFW and NMFS have monitoring and research studies planned to document and describe these effects more accurately on Winter run Chinook, which may be insightful regarding potential impacts to Spring-run Chinook Salmon in WY 2015.

Discussions on fish distribution and temperature management will occur throughout the year in the Sacramento River Temperature Task Group to iteratively inform and update temperature control operations. Temperature plan submittals to NMFS will be made according to what is laid out in RPA Action I.2.4- May 14 Through October Keswick Release Schedule (Summer Action). Based on the April 2015 Preliminary Temperature Analysis, the Project Description's model run met a temperature target of 56ºF, with a few exceedances, at the Sacramento River above Clear Creek location through October. This model run estimated the end of September lake volume below 56ºF to be approximately 340 TAF. For comparison , the 2014 April 90% operational forecast's temperature model run predicted end of September to be approximately 150 TAF, suggesting this year's plan may result in later operation of the temperature control device's side gate, which decreases the risk associated with temperature control through the TCD (USBR 2015c). As mentioned in the Method section, the temperature mortality model appears to underpredict mortality of egg and fry. There is uncertainty if this is related to sources of mortality not directly estimated by the model, actual operations during late summer deviating from the temperature management plan, actual storage and temperature conditions in Trinity and Shasta reservoirs deviating from conditions assumed in the temperature management plan, or some combination of these factors.

Proposed temperature and flow operations as part of NMFS RPA Action I.2.3.C were developed to achieve maximum use of the limited cold water reserves in Shasta, Whiskeytown, and Trinity reservoirs. Forecasted releases during July through November 2015 have been proposed that considers operating for necessary cold water temperature in the Sacramento River for Spring-run Chinook egg and fry survival. In support of these cold water needs into the Fall, the Project Description includes Reclamation bypassing power penstocks at times this year if such operation will help access remaining cold water pool or would help preserve cold water if blending with warmer water early in the season is appropriate to meet overall CVP obligations.

Clear Creek
Spring-run Chinook salmon adults, eggs, and juveniles will be affected by the proposed operations on the Sacramento River (Table 5). USFWS will conduct Spring-run Chinook Salmon adult spawner surveys during the summer 2015. Surveys will be conducted and potentially enable an assessment of adult prespawn mortality in the expected stressful water temperatures. CDFW and NMFS have monitoring and research studies planned to document and describe these effects more accurately. A recent review of WY 2014 drought monitoring suggested monitoring of disease and pathogen during period of suboptimal water quality (Reclamation 2015c) would provide additional information to managers about temperature’s effect on early life stages of Spring-run Chinook Salmon.

Based on the April 2015 Preliminary Temperature Analysis, the Project Description’s model run does not meet an Igo temperature compliance location or temperature target for the duration described in NMFS RPA Action I.1.4. In this temperature model run, the 60ºF at Igo target between July 1 and September 15 is exceeded on 20% of these days in comparison to 18% of these modeled data in the WY 2014 April 90% operational forecast’s temperature model run. Between September 16 and October 31, the 56ºF at Igo is exceeded 100% of these days in comparison to 76% of these modeled data in the WY 2014 April 90% operational forecast’s temperature model run. These results suggest substantial egg and egg-to fry mortality for Spring-run Chinook Salmon in Clear Creek due to an inability to maintain fall coldwater temperatures in Clear Creek.

Proposed Delta Operations- July Through November

Modification of Rio Vista Flow Requirement
Based on the spatio-temporal distribution of adult Spring-run Chinook Salmon during July, there should not be an effect of the Project Description’s modification of the Net Delta Outflow Index standard.

Modification of Western Delta Salinity Compliance Point
Based on the spatio-temporal distribution of Spring-run Chinook Salmon adults and eggs during September, there should not be an effect of the Project Description’s modification of the Rio Vista Flow Requirement.

Modification of Western Delta Salinity Compliance Point
Based on the spatio-temporal distribution of adult Winter- run Chinook Salmon between July 1 and August 15, 2015 there should not be an effect of the Project Description’s modification of Western Delta Salinity Compliance Point.

Modification of the Ripon Dissolved Oxygen Requirement

Spring-running Chinook Salmon adults have been observed at the weir on the Stanislaus River, and in deep pools upstream of Knights Ferry (RM 55) in spring and summer. The Project Description's modification of the Ripon dissolved oxygen (DO) requirement from 7.0 mg/L to 5.0 mg/L is expected to reduce the extent of the river in which dissolved oxygen is at or above 7.0 mg/L. No DO gage data is available upstream of Ripon (RM 9), so it is not known how a 5 mg/L target at Ripon translates to the downstream extent of DO of 7.0 mg/L or greater. Temperatures are expected to be unsuitable for any holding adult spring-running Chinook Salmon downstream of Orange Blossom (RM 46) during the summer of WY 2015, so a contraction of suitable DO conditions upstream of Ripon (RM 9) may not impact spring-running Chinook adults in holding habitats further upstream where temperatures are cooler and dissolved oxygen levels are expected to remain at suitable levels.

Extension of Water Transfer Window

Juvenile Spring-run Chinook Salmon may be present in the Sacramento River during late October and November 2015. Young of the Year Brood Year 2015 and yearling Brood Year 2014 Spring-run Chinook will migrate into the Delta during Fall 2015 when river flows or turbidity increase rapidly and/or temperatures decrease. These physical stimuli lead to Spring-run Chinook Salmon abandoning rearing in natal areas and increasing migratory behavior until turbidity or flows decrease. The volume and rate of releases as part of the water transfer proposed action will not change the likelihood of these physical stimuli being exceeded. The extension of the water transfer window is proposed into the Fall period when the likelihood of these physical stimuli occurring increases. Thus, the Project Description will utilize existing monitoring alerts and triggers for Spring-run Chinook Salmon identified in NMFS BiOp Action IV.1.1, IV.1.2 and IV.3 (NMFS 2009). Use of these monitoring alerts and triggers to reduce or suspend conveyance of transfer water while juvenile Spring-run Chinook Salmon are migrating will maintain protection of fish from potential effects of Interior Delta entrainment. Thus, the proposed activity is predicted not to change the exposure of the population or likelihood of fish protection actions during the Project Description's period.

West False River Emergency Drought Barrier Operation

Based on the spatio-temporal distribution of adult, egg, and juvenile Spring-run Chinook Salmon, the presence of the West False River Emergency Drought Barrier should not have impacts on the species between approximately July 1 and October 1 2015. Impacts to critical habitat after May 1 as part of construction and as late as November 15 as part of deconstruction of the EDB are described in DWR (2015), and are being concurrently evaluated through a separate consultation process. Critical habitat for Spring-run Chinook Salmon in the Delta includes estuarine areas free of migratory obstructions, and the EDB is an obstruction. These areas support juvenile and adult physiological transitions with suitable water quality, quantity and salinity. The EDB will modify salinity conditions while it is present, but salinity conditions will return to baseline conditions prior to a spatio-temporal overlap of adult and juvenile spring-run Chinook Salmon with the Barrier's action area of the Delta. Thus, operation of the EDB will not measurably effect juvenile or adult Spring-run Chinook Salmon physiological transitions.

Biological Review of Green Sturgeon

Updated Status of Green Sturgeon

An updated status of green sturgeon through April 21 is well-described in the Emergency Drought Barrier Aquatic Biological Assessment (DWR 2015, Environmental Baseline section).

Effects of Project Description on Green Sturgeon

Table 6: Presence of Green Sturgeon During the Project Description Period and Exposure to Potential Effects

Green Sturgeon Life Stage	Life Stage Present	Tributary Habitat Effect	Delta Region Effect	Facility Loss Effect
Egg	This life stage will be present in the Sacramento River in early July.			
Sacramento R	Yes	Yes	N/A	N/A
Juvenile	This life stage will be present in the Sacramento River and Delta in July through November.			
Sacramento R	Yes	Yes	N/A	N/A
Delta	Yes	N/A	No	No
Subadults	This life stage will be present in the Bay, not in the Delta.			
Delta	No	N/A	No	No
Adults	This life stage will be present in the Sacramento River and Delta July through November.			
River	Yes	No	N/A	N/A
Delta	Yes	N/A	No	No

Proposed Upstream Tributary Operations- July Through November

Sacramento River

Green sturgeon eggs, juveniles, and adults will be in Sacramento River during the project description's period (Table 6). Proposed temperature and flow operations as part of NMFS RPA Action I.2.3.C were developed to achieve maximum use of the limited cold water reserves in Shasta, Whiskeytown, and Trinity reservoirs during the remainder of WY 2015 and early WY 2016. Forecasted releases during July through November 2015 have been proposed to prioritize use of the cold water reserve for protection of early life stages of Winter run Chinook Salmon. These cold water temperatures are likely supportive of a greater length of river for green sturgeon spawning, egg incubation, and juvenile rearing between July 1 and November 30.

Proposed Delta Operations- July Through November

Modification of Rio Vista Flow Requirement

Based on the spatio-temporal distribution of green sturgeon during July, there should not be an effect of the Project Description's modification of the Net Delta Outflow Index standard.

Modification of Western Delta Salinity Compliance Point

Based on the spatio-temporal distribution of green sturgeon during September, there should not be an effect of the Project Description's modification of the Rio Vista Flow Requirement.

Modification of Western Delta Salinity Compliance Point

Based on the spatio-temporal distribution of green sturgeon between July 1 and August 15, 2015 there should not be an effect of the Project Description's modification of Western Delta Salinity Compliance Point.

Modification of the Ripon Dissolved Oxygen Requirement

Because green sturgeon are not expected to be present in the Stanislaus River, there should not be an effect of the Project Description's modification of the Ripon Dissolved Oxygen Requirement.

West False River Emergency Drought Barrier Operation

Based on the spatio-temporal distribution of juvenile and adult green sturgeon, these lifestages may be in the Emergency Drought Barrier action area (DWR 2015) during its presence between approximately July 1 and October 1 2015. Impacts to critical habitat after May 1 as part of construction and as late as November 15 as part of deconstruction of the EDB are described in DWR (2015), and are being concurrently evaluated through a separate consultation process. Juvenile green sturgeon live in the freshwater Bay-Delta during the summer and fall, and adult green sturgeon may outmigrate during the summer back to San Francisco Bay. Critical habitat for the Southern DPS of North American green sturgeon includes the estuarine waters of the Delta, which contain the following PCEs: food resources, water flow, water quality, migratory corridors, water depth, and sediment quality.

The EDB will reduce the connectivity of green sturgeon freshwater habitats, but should not limit the foraging or rearing of juvenile or adult green sturgeon in the Delta. Little is known about the rearing habitats of green sturgeon in the Delta, but historic data found these juvenile green sturgeon along the San Joaquin River (Ratdke 1966). The extent to which habitat in the Barrier action area is a migratory corridor is unknown, but the main migratory corridor for adult green sturgeon appears to be between the Sacramento River spawning area and western Delta adult rearing/foraging habitats (Israel et al. 2010). If green sturgeon utilize

West False River for migration during the summer, it may cause delay in passage into or out of the South Delta.

Biological Review of Central Valley Steelhead

Updated Status of Central Valley Steelhead

An updated status of steelhead through April 21 is well-described in the Emergency Drought Barrier Aquatic Biological Assessment (DWR 2015, Environmental Baseline section). Based on daily monitoring data through May 5, 2015 the DOSS workteam believes that a minority (10-15%) of San Joaquin River juvenile steelhead remain the Delta and the majority (80-85%) have migrated out of the Delta[4]. Due to limited catch data, DOSS did not estimate the current distribution of Sacramento River steelhead. Wild juvenile Central Valley Steelhead were salvaged in November, February, and mid to late April.

Effects of Project Description on Central Valley Steelhead

Table 7: Presence of Central Valley Steelhead During the Project Description Period and Exposure to Potential Effects

Steelhead Life Stage	Life Stage Present	Tributary Habitat Effect	Delta Region Effect	Facility Loss Effect
Egg	This life stage is not present in the Sacramento River and San Joaquin River during July through November.			
Sacramento R and tributaries	No	N/A	N/A	N/A
San Joaquin R and Stanislaus R	No	N/A	N/A	N/A
Juvenile	This life stage will be present in the Sacramento River and San Joaquin River during July through November. Juveniles may be exiting the Delta in July and November			
Sacramento R and tributaries	Yes	No Change	N/A	N/A
San Joaquin R and Stanislaus R	Yes	No	N/A	N/A
Delta	Yes	N/A	No	No
Adults	This life stage will be present in the Sacramento and San Joaquin Rivers and			

[4] [4] May 5, 2015 DOSS notes available at: http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/ocapwy2015.html

	Delta during July through November			
Sacramento R and tributaries	Yes	No	N/A	N/A
San Joaquin R and Stanislaus R	Yes	No	N/A	N/A

Proposed Upstream Tributary Operations- July Through November

American River

Juvenile and adult steelhead may be in the American River between July and November (Table 7). Based on the April 2015 Preliminary Temperature Analysis on the American River, the Project Description's iCPMM model run could maintain temperatures targeting 72ºF upstream of Watt Avenue. This temperature is likely to make meeting 68ºF at Watt Avenue unattainable for a portion of the period between May 15 and October 1 per NMFS RPA Action II.2. Juvenile steelhead are present in the American River year round. Over-summer rearing habitat for these fish may be reduced due to temperatures greater than 68ºF in a portion of the rearing habitat. Adult steelhead enter the river in November. Key biological responses during the adult life stage such as survival and egg maturation are not predicted to be affected by the Project Description's temperature operation.

Proposed Delta Operations- July Through November

Modification of Rio Vista Flow Requirement

Based on the spatio-temporal distribution of steelhead during July, there should not be an effect of the Project Description's modification of the Net Delta Outflow Index standard.

Modification of Western Delta Salinity Compliance Point

Based on the spatio-temporal distribution of steelhead during September, there should not be an effect of the Project Description's modification of the Rio Vista Flow Requirement.

Modification of Western Delta Salinity Compliance Point

Based on the spatio-temporal distribution of steelhead between July 1 and August 15, 2015 there should not be an effect of the Project Description's modification of Western Delta Salinity Compliance Point.

Modification of the Ripon Dissolved Oxygen Requirement

During the summer, *O. mykiss* juvenile and adults are likely to be present primarily above Orange Blossom (RM 46). Based on Caswell Trap (RM 9) monitoring. *O. mykiss* have been observed in the lower Stanislaus River as late as the end of June (USBR 2015d). The Project Description's modification of the Ripon dissolved oxygen requirement from 7.0 mg/L to 5.0 mg/L is expected to reduce the extent of the river in which dissolved oxygen is at or above 7.0 mg/L.

Oxygen distress can occur in salmonids at DO concentrations less than 6.5 mg/L causing reduced swimming ability and growth (Carter 2005). No DO gage data is available upstream of Ripon, so it is not known how a 5 mg/L target at Ripon translates to the downstream extent of DO of 7.0 mg/L or higher. Temperatures at Ripon (RM 9) are expected to be unsuitable for rearing steelhead juveniles and adult steelhead during the summer of WY 2015, so contraction of suitable DO conditions may not impact juvenile or adult steelhead if they are holding farther upstream where temperatures are cooler and dissolved oxygen is expected to be higher.

West False River Emergency Drought Barrier Operation

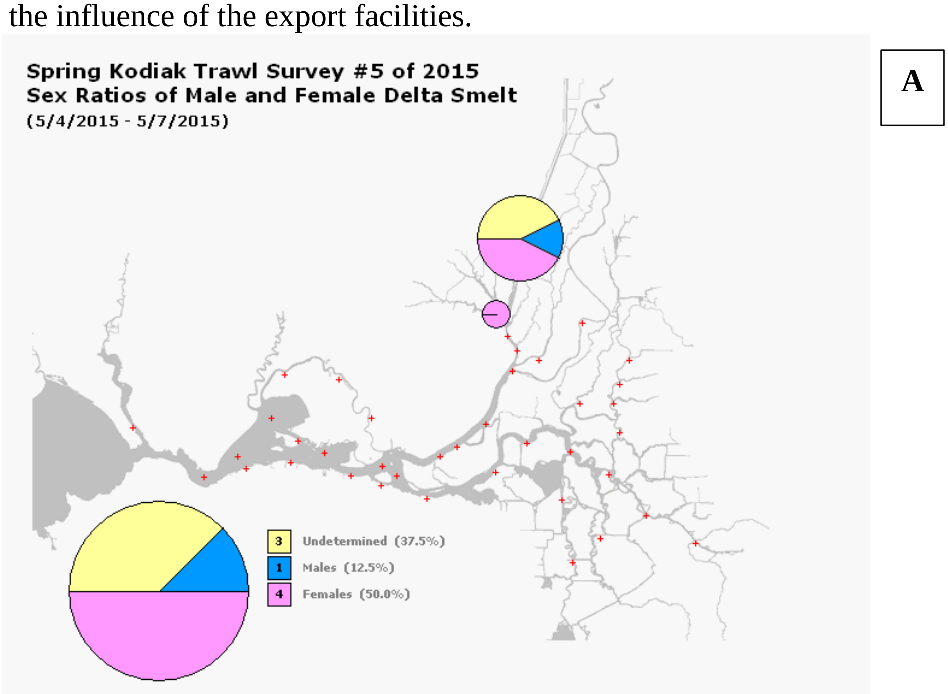
Based on the historical spatio-temporal distribution of adult Central Valley steelhead, adult lifestage may be in the EDB action area during its presence between approximately July 1 and October 1 2015. Impacts to critical habitat after May 1 as part of construction and as late as November 15 as part of deconstruction of the EDB are described in DWR (2015), and are being concurrently evaluated through a separate consultation process. Historically, adult steelhead migrated up the Sacramento River from July through October, and thus a significant proportion of upstream migrants could enter the Delta during the presence of the EDB. Historical information on upstream migration timing of San Joaquin River steelhead is lacking. Furthermore, contemporary timing and movement information for Sacramento and San Joaquin river adult steelhead upstream migrants is lacking.

Critical habitat for Central Valley steelhead in the Delta includes estuarine areas free of migratory obstructions. The EDB will reduce the connectivity of Central Valley steelhead migratory corridor habitat, however the EDB will be removed by mid-November before the majority (more than 90%) of juvenile Sacramento origin steelhead are expected to pass Knights Landing and migrate into the Delta (NMFS 2009). Less information is known about San Joaquin River steelhead, but juveniles appear to migrate between December and June, which is outside the time when the EDB will be present.

Effects of Project Description on Delta Smelt

Current Delta Smelt Distribution

SKT #5 was in the field the week of May 4, 2015 and yielded presence of 4 adults in the Deep water shipping channel, three of which were females, and 3 juveniles (Figure 3A). One more pre-spawned female was caught in Cache Slough. One of the three females was reported to have reabsorbed her eggs, which is an indicator of spawning failure[3]. SKT #4 was in the field the week of April 6, 2015. A single ripe adult male was caught at station 719 (Figure 3B). A preliminary review (SWG notes 4/13/2015) of historical SKT data indicated that this is a record low catch for SKT #4. In the final week (March 30, 2015) of supplemental U.S. Fish and Wildlife Service sampling in the lower San Joaquin River (Jersey Point, Figure 4), which consisted of 15 trawls per day and concluded on March 31, 2015, catch of adult Delta Smelt declined precipitously to zero in the final month of sampling. This evidence suggests the majority of the adult population is outside the influence of the export facilities.



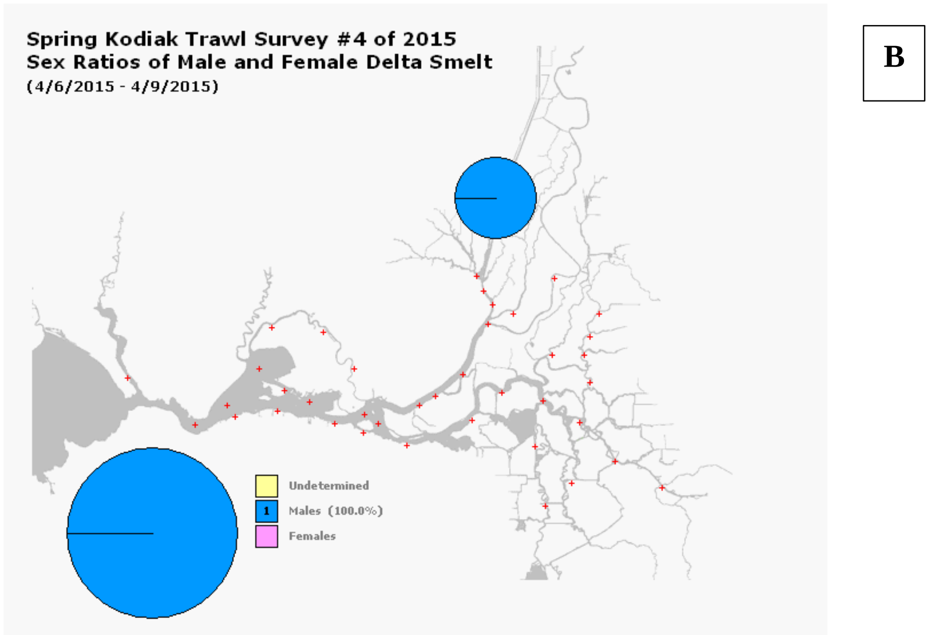


Figure 3. 2015 Spring Kodiak Trawl #5 (A) and #4 (B) Delta Smelt Catch[5]. Red crosses indicate surveyed stations with zero catch.

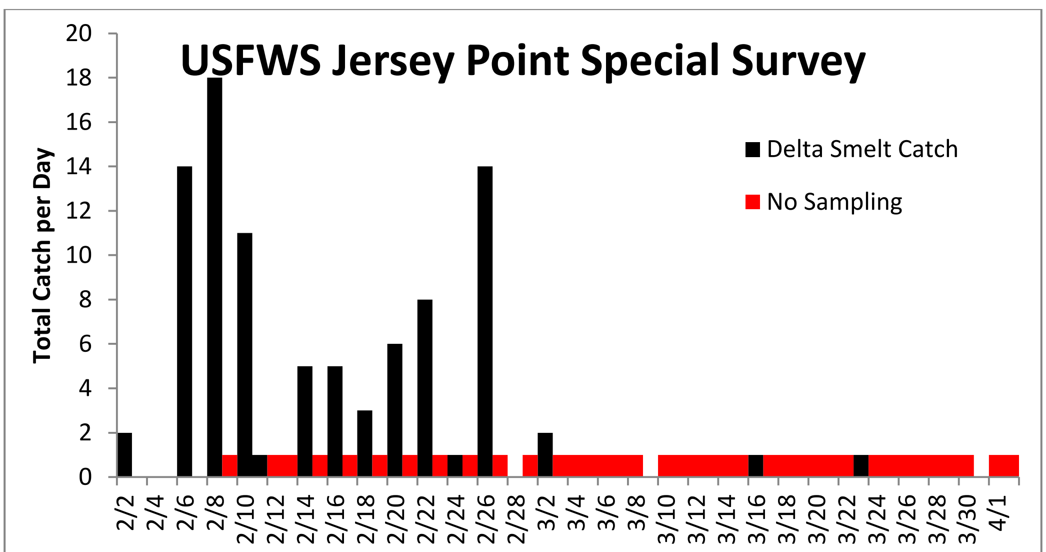


Figure 4. USFWS Jersey Point Special Sampling of adult Delta Smelt.[6]

No adult Delta Smelt have been observed in salvage since February 21, 2015, at the South Delta fish facilities, and low (n=1 at the SWP, n=3 at the CVP) levels of salvage of young-of-year Delta Smelt were reported on May 4, the first of the season. However, pre-screen loss and entrainment effects (e.g., predation) can occur despite lack of observed salvage at the facilities, and these effects are

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[5] Retrieved from <http://www.dfg.ca.gov/delta/projects.asp?ProjectID=SKT> on 4/22/15.
[6] Data provided to Smelt Working Group.

difficult to detect and quantify. In addition, salvage operations at the CVP were sporadically impacted by high levels of debris and outages.

Delta Smelt spawning is likely to have peaked in March or April, with larvae detected in the Sacramento River system as of March 2-4 (Figure 5), and larvae detected in the lower San Joaquin River as of March 24-26 during the Smelt Larval Survey (Figure 6). A 20 mm survey, conducted March 30 – April 8, 2015, detected juvenile Delta Smelt in the San Joaquin River at Jersey Point (Figure 7), but subsequent two surveys reflected presence only in the deep water shipping channel in the vicinity of station 719 (Figure 8). Larvae and juveniles in the lower San Joaquin River are potentially susceptible to the effects of South Delta exports. Hatching may continue over the next couple of weeks, although the peak of the spawning season has likely passed. As water temperatures rise, larvae will start to recruit to juvenile size and may begin to disperse further throughout the system. The majority of members of the Smelt Working Group expect that larval and juvenile Delta Smelt may not be detected in salvage because numbers are so low as to be at detection levels of the larval surveys (Smelt Working Group-notes from 4/13/2015)[7]. A temperature off-ramp occurs when water temperatures at Clifton Court reach 25°C for three consecutive days (FWS BO 2008). This off-ramp typically occurs in late June, but given unseasonably warm April temperatures due to the ongoing drought, it is likely that this threshold will be met earlier in 2015 (an alternate, calendar based off ramp is June 30).

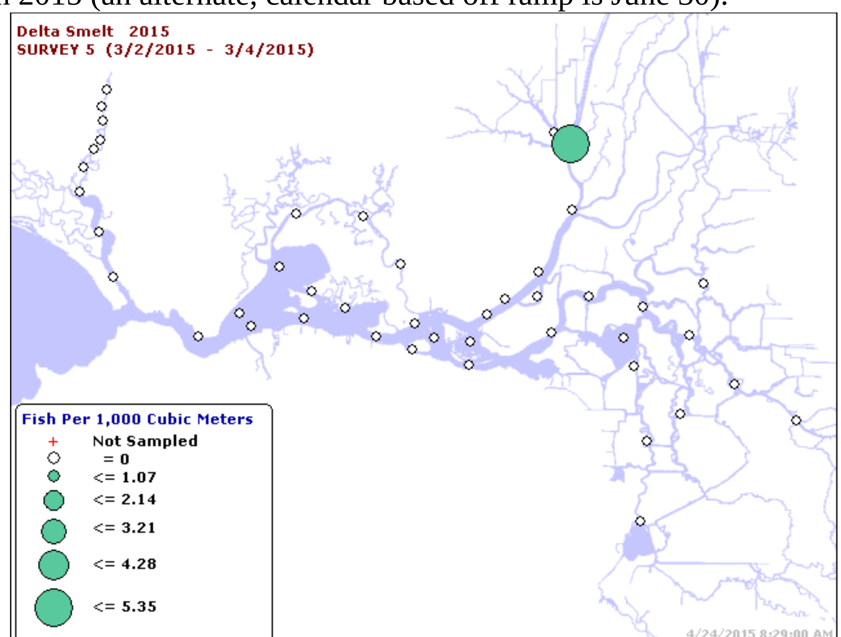


Figure 5. Smelt Larval Survey #5 larval Delta Smelt catch[8].

[7] Smelt Working Group notes, available on the internet at <http://www.fws.gov/sfbaydelta/documents/smelt_working_group/swg_notes_4_13_2015.pdf>

[8] Retrieved from <http://www.dfg.ca.gov/delta/projects.asp?ProjectID=SLS> on 4/22/15.

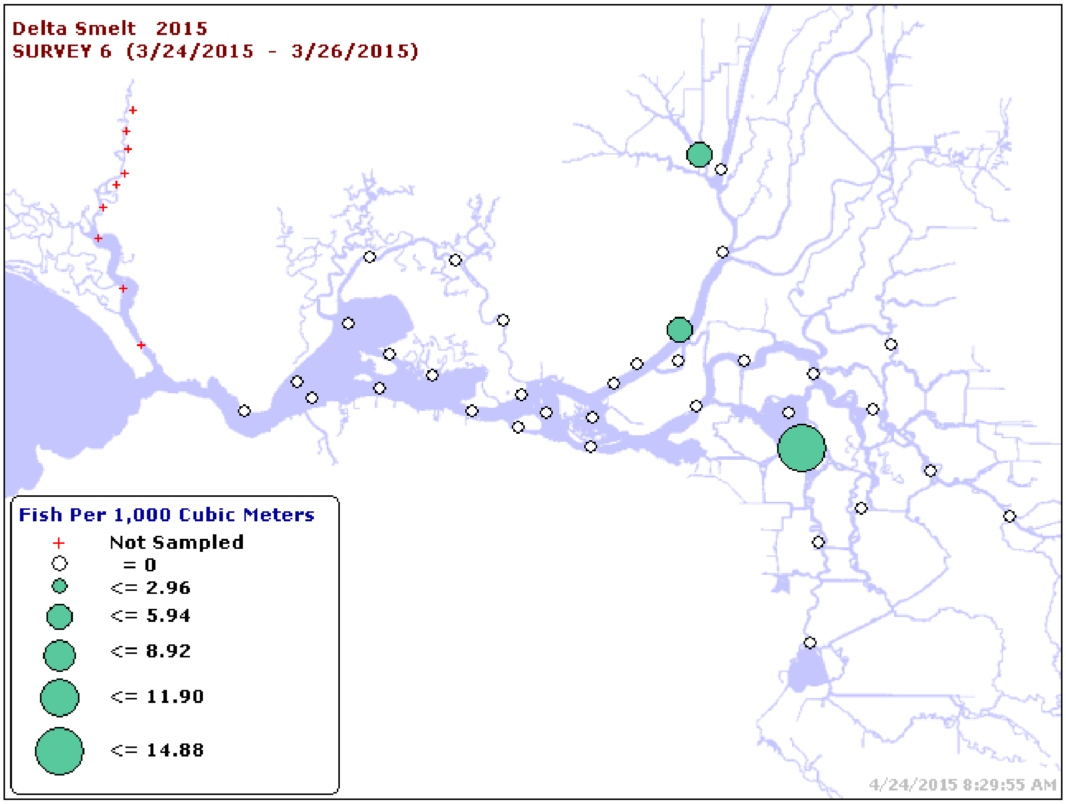


Figure 6. Smelt Larval Survey #6 larval Delta Smelt catch.

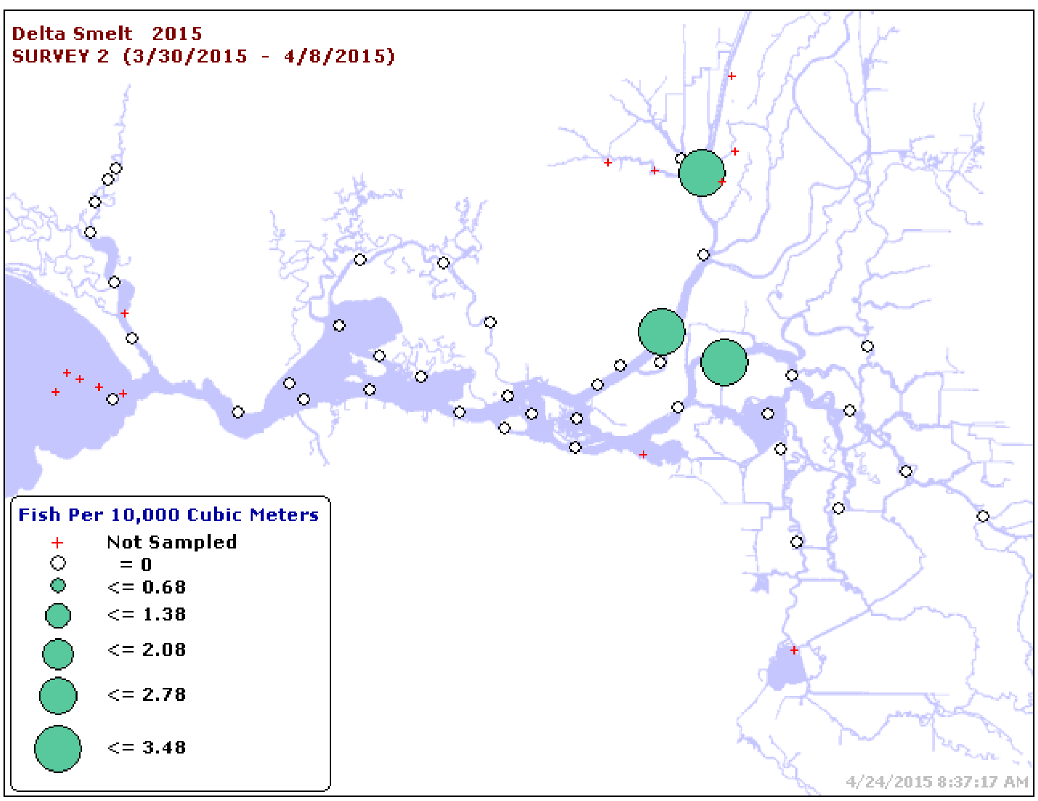


Figure 7. 20mm survey #2 catch of juvenile Delta Smelt.

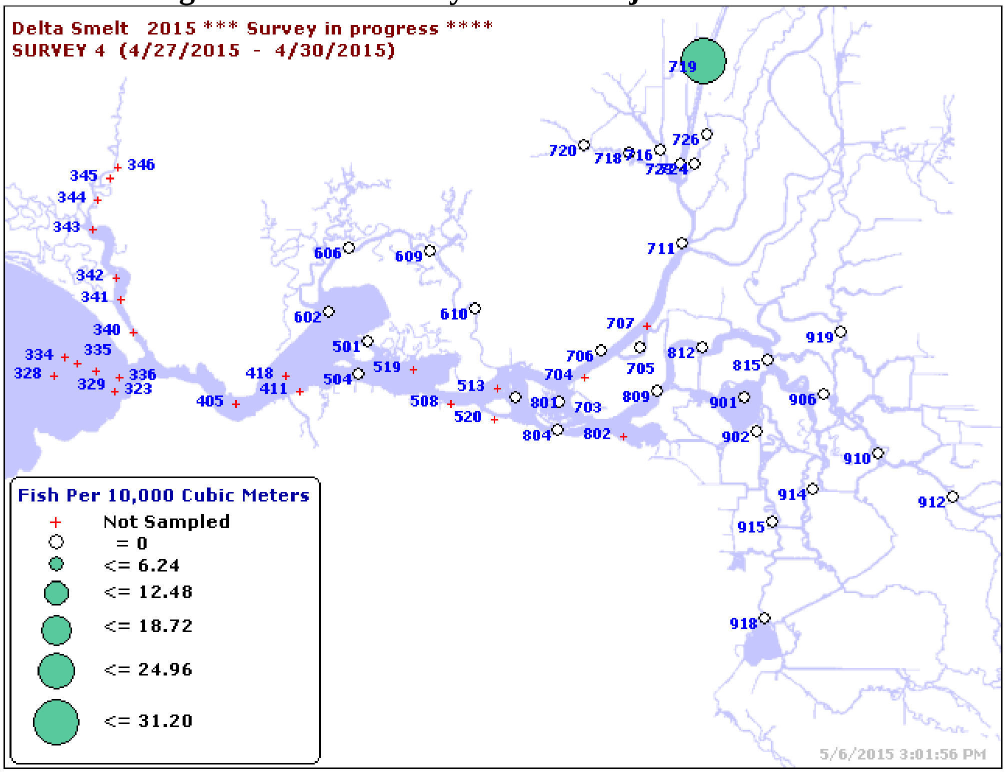


Figure 8. 20mm survey #4 catch of juvenile Delta Smelt reflected a nearly identical distribution as 20mm survey #3 (not shown).

Effects of Proposed Action Specific to Delta Smelt Designated Critical Habitat

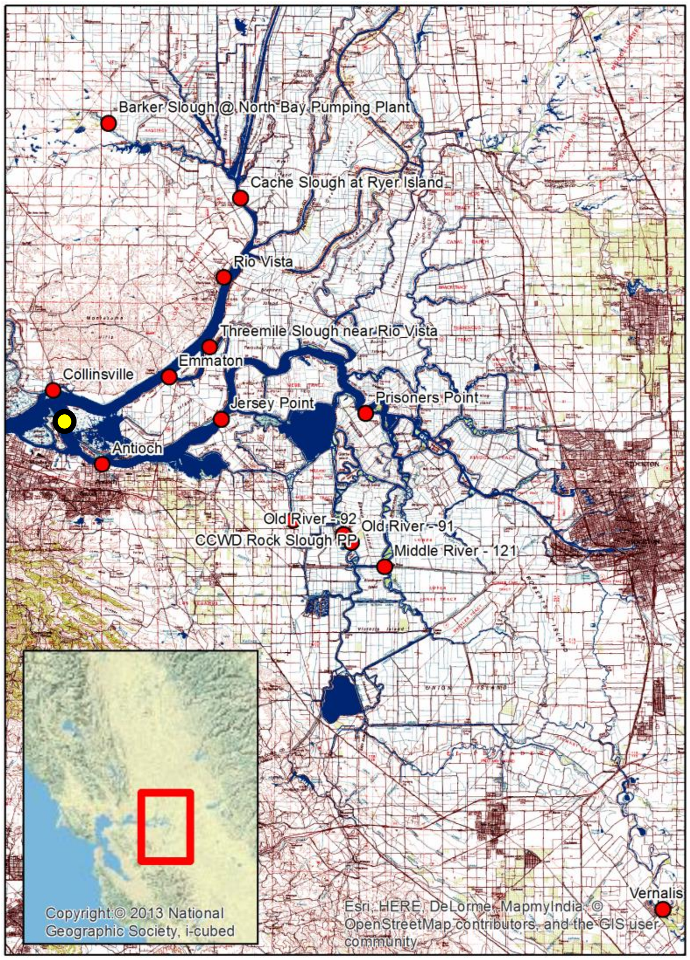


Figure 9. Modeled locations in the Delta (red) and the West False River Barrier (yellow).

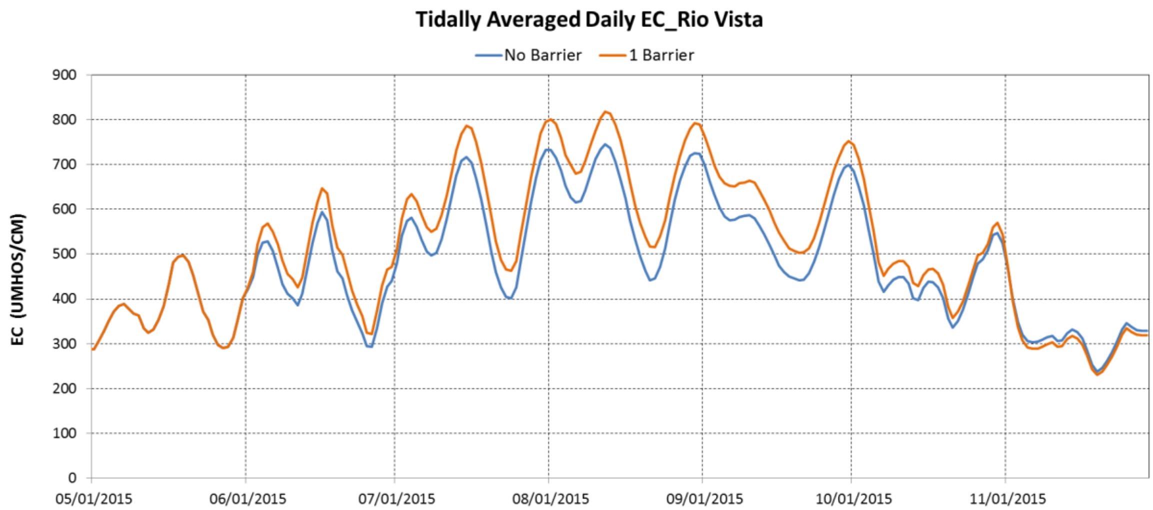


Figure 10. Forecasted tidally averaged Electrical Conductivity at Rio Vista, based on April 90% forecast from DSM2 models with and without the West False River Emergency Drought Barrier.

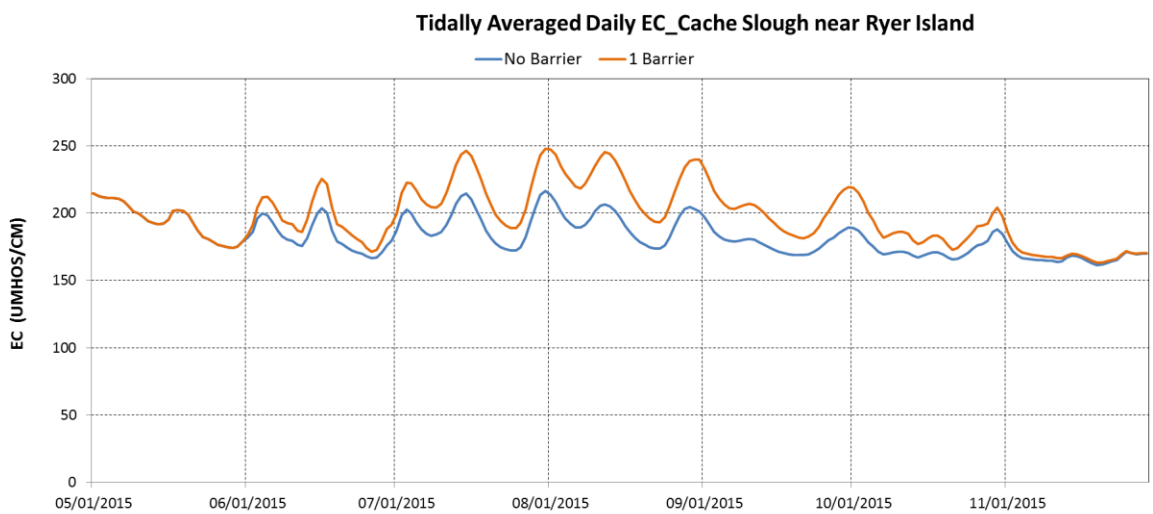


Figure 11. Forecasted tidally averaged Electrical Conductivity in Cache Slough near Ryer Island, based on April 90% forecast from DSM2 models with and without the West False River Emergency Drought Barrier.

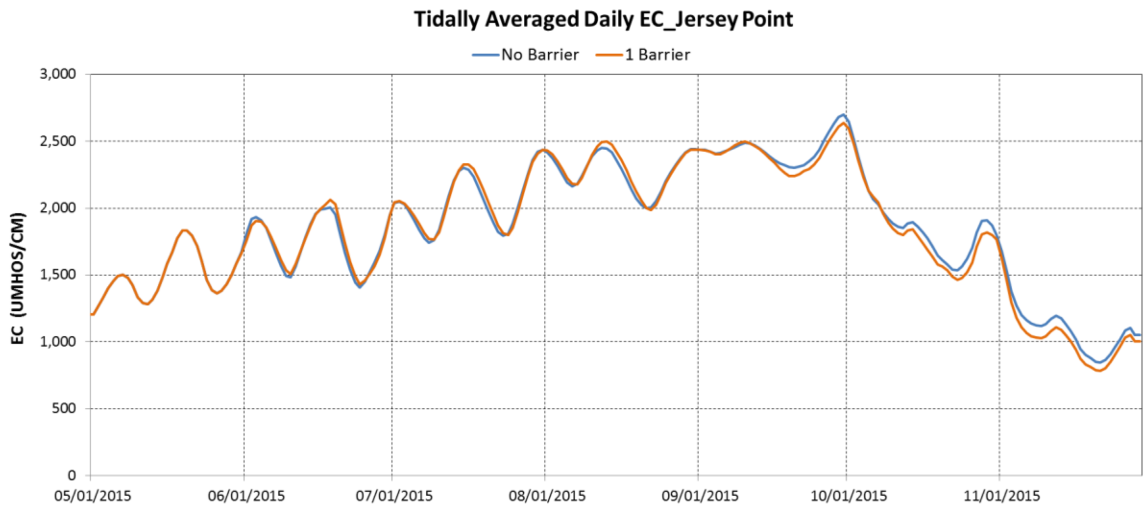


Figure 12. Forecasted tidally averaged Electrical Conductivity at Jersey Point, based on April 90% forecast from DSM2 models with and without the West False River Emergency Drought Barrier.

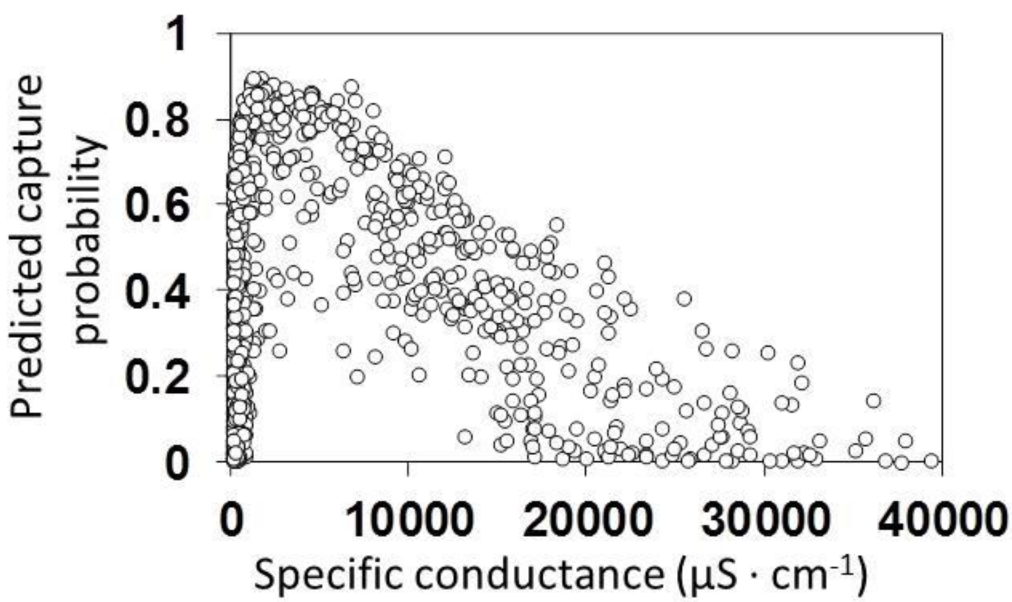


Figure 13. Predicted capture probability of Delta Smelt juveniles in 1974-2004 July Summer Townet Surveys from generalized additive modeling in relation to specific conductance (microSiemens cm^{-1} [= micromhos cm^{-1}]) with scatter depicting variation caused by secchi depth and water temperature.[9]

[9] Source: Nobriga et al. 2008.

DSM2 models indicate that installation of a barrier across West False River will result in elevated salinities up to approximately 100 micromhos per centimeter (µmhos cm^{-1}) in the Sacramento River at Rio Vista (Figure 10) and to a lesser degree (~50 µmhos cm^{-1}) in the Cache Slough Complex (Figure 11). This effect was not evident in the lower San Joaquin River at Jersey Point (Figure 12) and appears to mainly be a result of increased tidal excursion. These differences are marginal in the context of the range of salinity in which Delta Smelt have been caught in the past (Nobriga et al, 2008; Figure 13). Similarly, the effects of a barrier on flows in the lower Sacramento River at Jersey Point (Figure 14) and Rio Vista (Figure 15) are minor relative to the tidal influence in those areas.

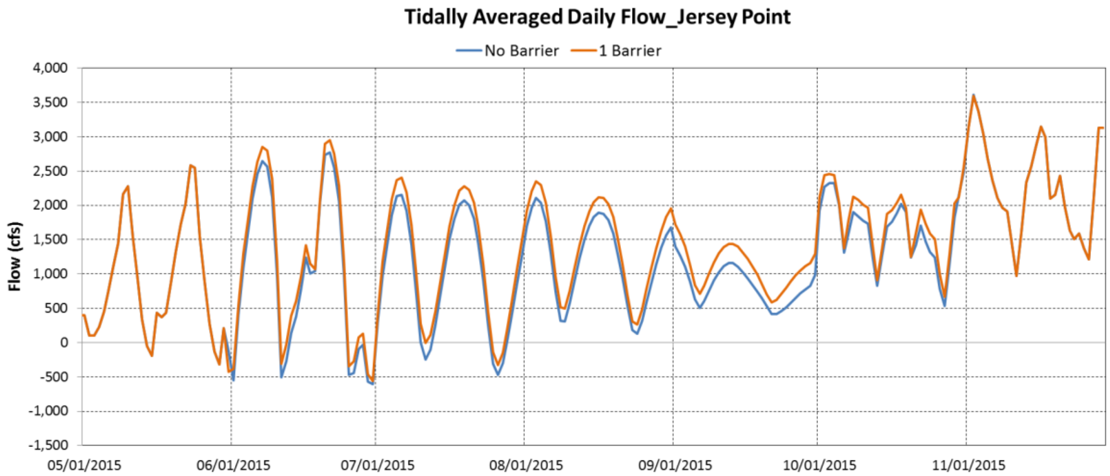


Figure 14. Forecasted tidally averaged flow at Jersey Point, based on April 90% forecast from DSM2 models with and without the West False River Emergency Drought Barrier.

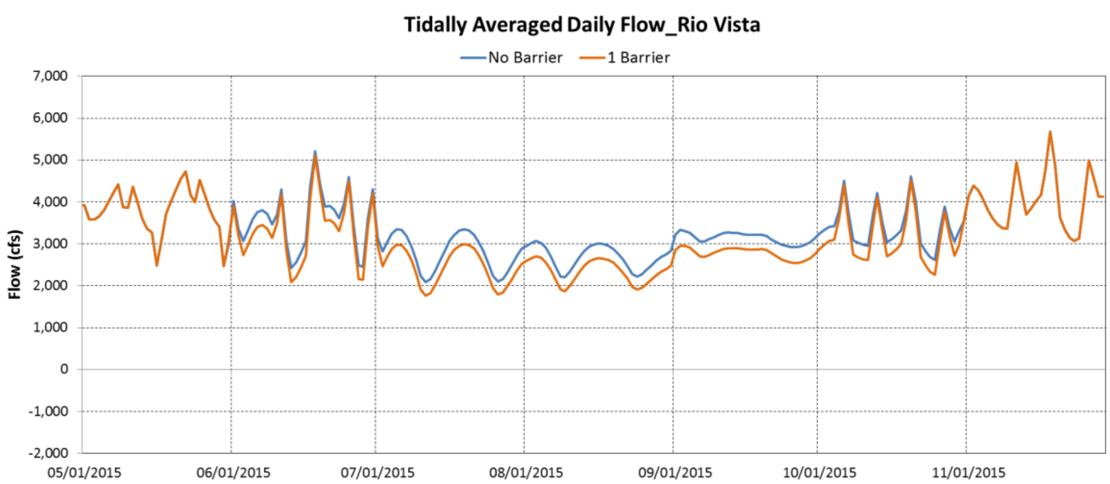


Figure 15. Forecasted tidally averaged flow at Rio Vista, based on April 90% forecast from DSM2 models with and without the West False River Emergency Drought Barrier.

Physical habitat and water quality would be affected by the proposed modifications. The upstream relocation of the Western Delta Salinity Standard from Emmaton to Three Mile Slough and reduction in outflows will result in salinity moving further upstream on the lower Sacramento and San Joaquin Rivers (Figures 16-21). Due to the potential for Sacramento River origin water to be transported through the Delta Cross Channel to the San Joaquin River, the upstream tidal excursion of higher salinity water is expected to be more pronounced on the Sacramento River than the San Joaquin River. For example, DSM2 modeling estimated that change in conductivity at Emmaton would be elevated by approximately 1000 micromhos per centimeter (µmhos cm^{-1}) from July-November (Figure 21) whereas the difference at Prisoners Point in the lower San Joaquin is 100 µmhos cm^{-1} over the same time period.

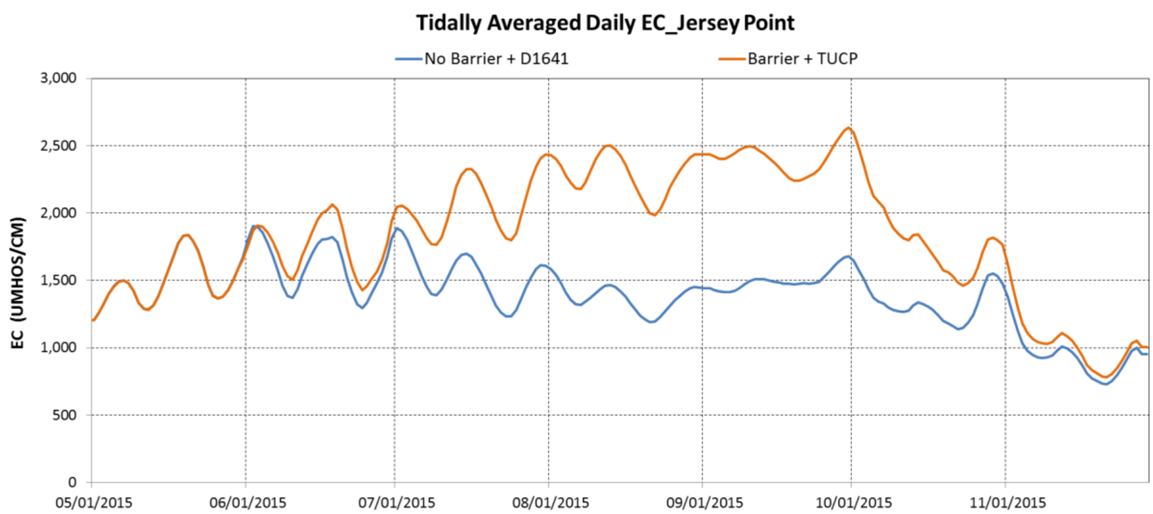


Figure 16. Forecasted tidally averaged Electrical Conductivity at Jersey Point, based on April 90% forecast from DSM2 models under TUCP conditions with the West False River Emergency Drought Barrier and without the barrier under D1641 compliance.

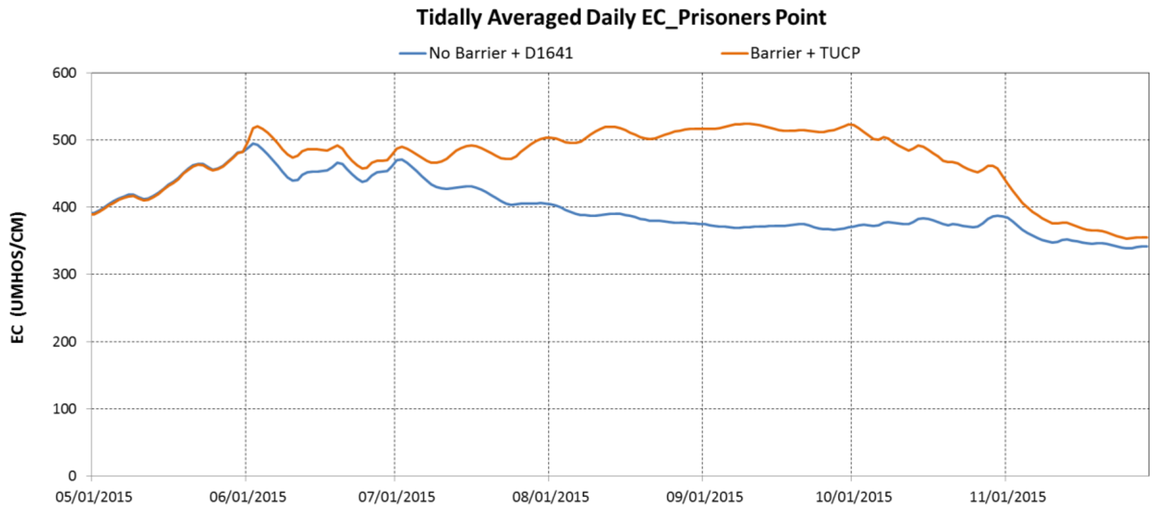


Figure 17. Forecasted tidally averaged Electrical Conductivity at Prisoners Point, based on April 90% forecast from DSM2 models under TUCP conditions with the West False River Emergency Drought Barrier and without the barrier under D1641 compliance.

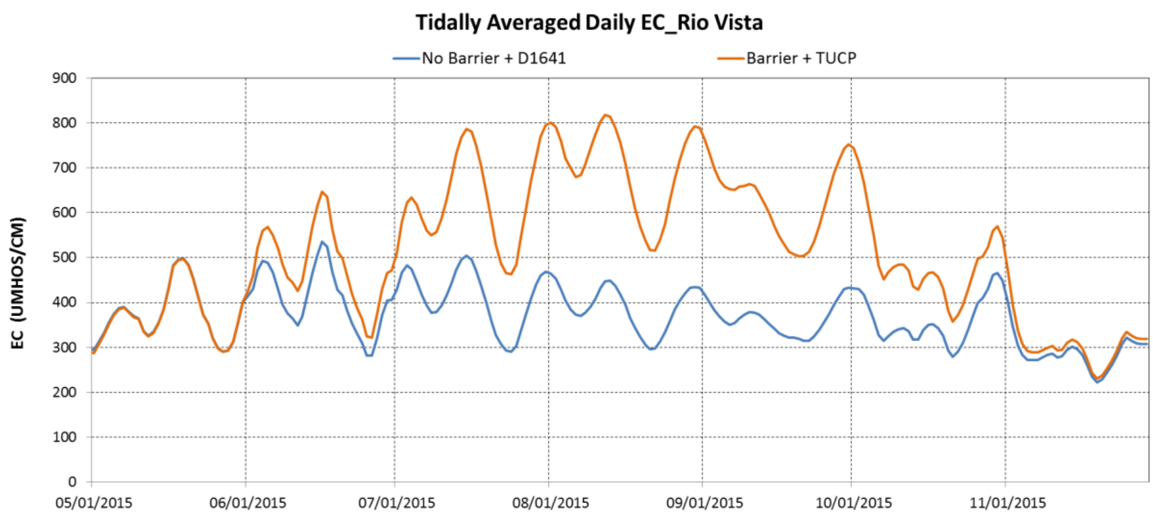


Figure 18. Forecasted tidally averaged Electrical Conductivity at Rio Vista, based on April 90% forecast from DSM2 models under TUCP conditions with the West False River Emergency Drought Barrier and without the barrier under D1641 compliance.

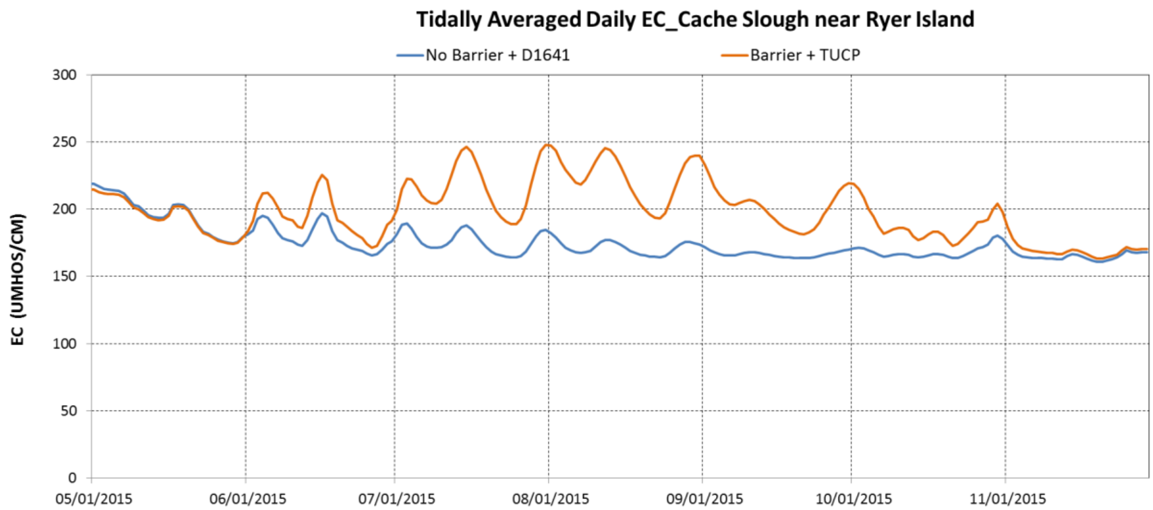


Figure 19. Forecasted tidally averaged Electrical Conductivity at Cache Slough, based on April 90% forecast from DSM2 models under TUCP conditions with the West False River Emergency Drought Barrier and without the barrier under D1641 compliance.

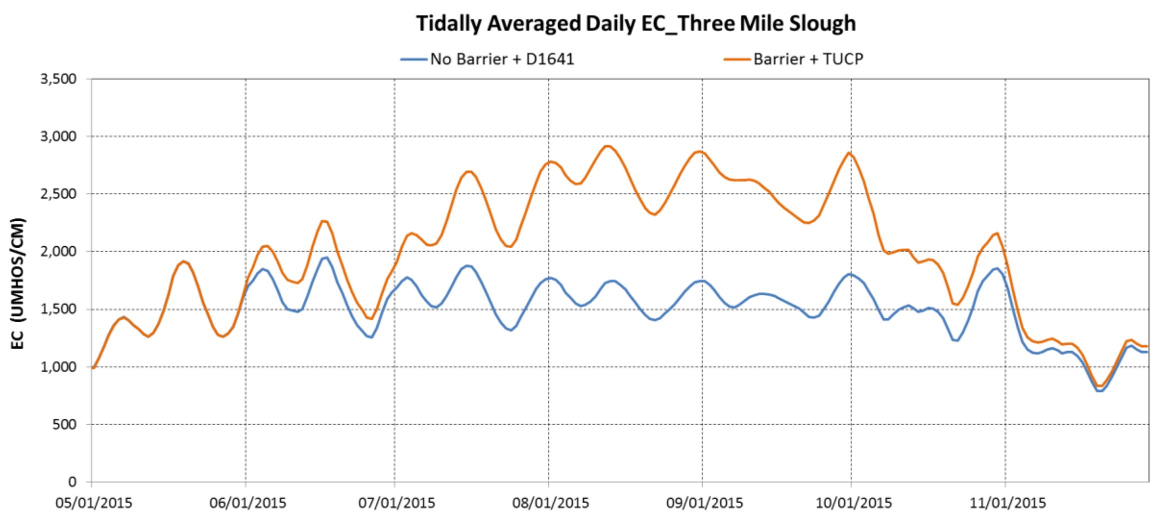


Figure 20. Forecasted tidally averaged Electrical Conductivity at Three Mile Slough, based on April 90% forecast from DSM2 models under TUCP conditions with the West False River Emergency Drought Barrier and without the barrier under D1641 compliance.

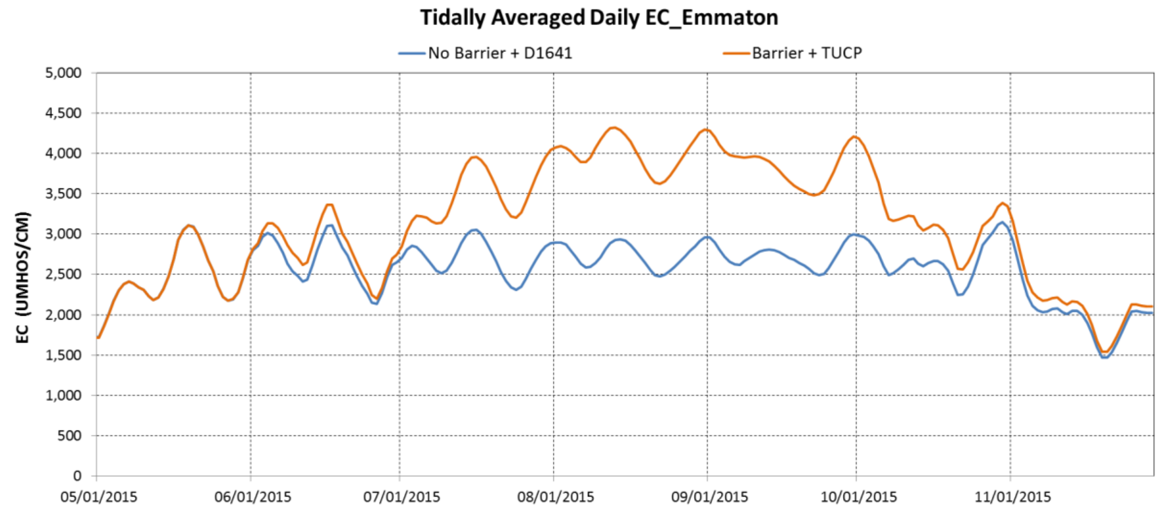


Figure 21. Forecasted tidally averaged Electrical Conductivity at Emmaton, based on April 90% forecast from DSM2 models under TUCP conditions with the West False River Emergency Drought Barrier and without the barrier under D1641 compliance.

This would cause an upstream relocation of X2, which is a specific point within the low salinity zone (LSZ) where the average daily salinity at the bottom of the water column is 2 psu (Jassby et al. 1995). By local convention X2 is described in terms of distance from the 2 psu isohaline to the Golden Gate Bridge. Ecologically, X2 serves as an indicator of habitat suitability for many San Francisco Estuary organisms and is associated with variance in abundance of diverse components of the ecosystem (Jassby et al. 1995). The LSZ expands and moves downstream when river flows into the estuary are high. Similarly, it contracts and moves upstream when river flows are low. During the past 40 years, monthly average X2 has varied from as far downstream as San Pablo Bay (45 km) to as far upstream as Rio Vista on the Sacramento River (95 km). At all times of year, the location of X2 influences both the area and quality of habitat available for Delta Smelt to successfully complete their life cycle. In general, Delta Smelt habitat quality and surface area are greater when X2 is located in Suisun Bay. Both habitat quality and quantity diminish the more frequently and further the LSZ moves upstream, toward the confluence of the Sacramento and San Joaquin rivers (Feyrer et al. 2007), thus further constraining the habitat for juvenile Delta Smelt closer to the upstream spawning areas in the lower Sacramento River, San Joaquin River, and the Cache Slough Complex/Sacramento Deep Water Ship Channel. DSM2 forecasts X2 towards the upstream end of the range in the Sacramento River between June and November, with greater differences between the D1641 baseline and the proposed action occurring between July and September (Figure 22).

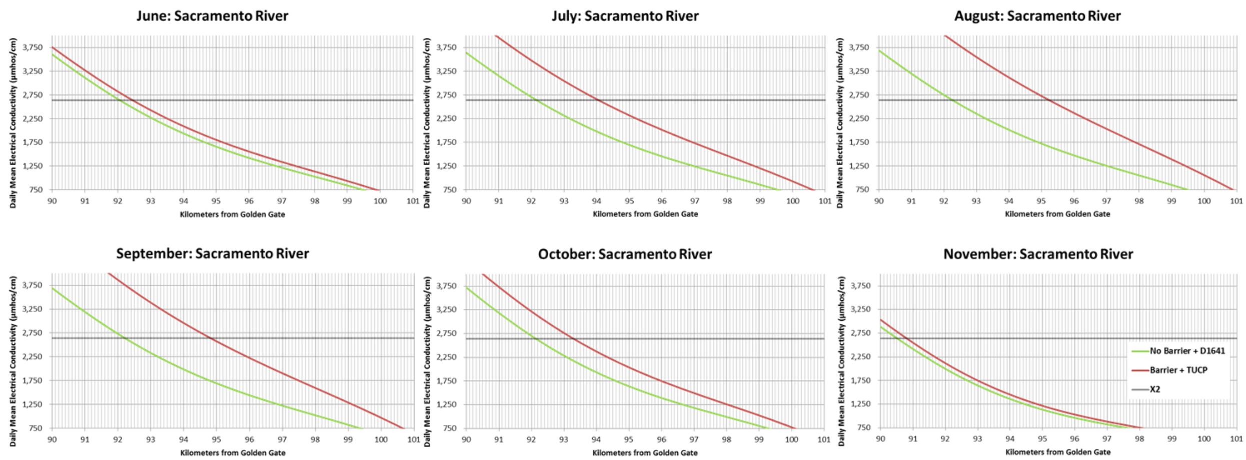


Figure 12. Forecasted position of X2 (dark grey line = 2 psu isohaline), based on April 90% forecast from DSM2 models of electrical conductivity under TUCP conditions with the West False River Emergency Drought Barrier (red line) and without the barrier under D1641 compliance (green line).

Although these changes will reduce the quantity of available habitat, conductivity within this habitat will be within the range of salinity generally occupied by Delta Smelt during the summer and fall. Also as Sommer and Mejia (2013) noted, Delta Smelt are not confined to a narrow salinity range and occur from fresh water to relatively high salinity, even though the center of distribution is consistently associated with X2 (Sommer et al. 2011). Conductivity forecasts for Three Mile Slough (Figure 20) and locations upstream are within the range in which they have been encountered during the period modeled. Therefore we conclude that while changes in salinity in the lower Sacramento River are within the physiological tolerances of Delta Smelt, the proposed modifications may shift the Delta Smelt population upstream.

An upstream shift of Delta Smelt distribution on the Sacramento River will increase the potential for stochastic events to exacerbate mortality on the population (Feyrer et al. 2011). For example, water temperature increases during prolonged heat waves could pose risks to persistence of local populations. In general, summer temperatures are higher in landward channels (Wagner 2012), so reduced outflow associated with the proposed action (Figures 23-24) is expected to shift the distribution of Delta Smelt into these warmer regions.

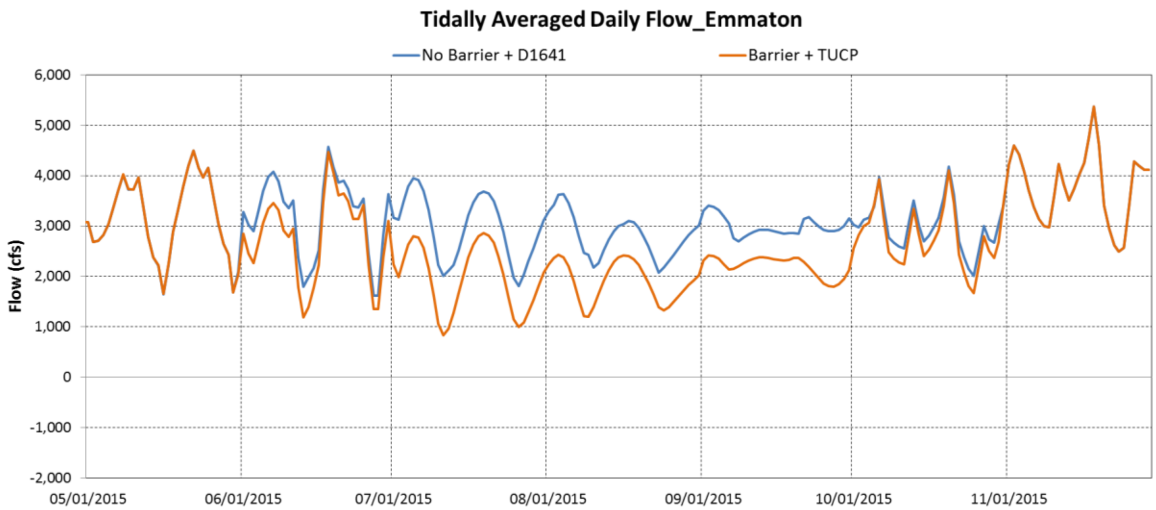


Figure 23. Forecasted flow at Emmaton, based on April 90% forecast from DSM2 models under TUCP conditions with the West False River Emergency Drought Barrier (red line) and without the barrier under D1641 compliance (blue line).

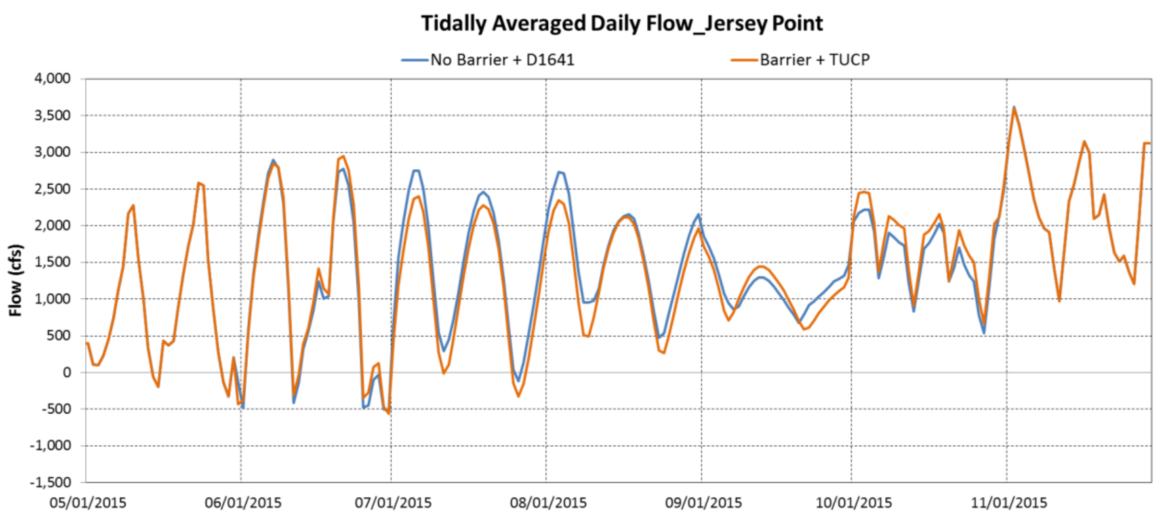


Figure 24. Forecasted flow at Jersey Point, based on April 90% forecast from DSM2 models under TUCP conditions with the West False River Emergency Drought Barrier (red line) and without the barrier under D1641 compliance (blue line).

Under these conditions, effects on Delta Smelt from changes in conductivity in the lower San Joaquin River are anticipated to be minor because they are within physiological tolerance ranges for salinity in which Delta Smelt are captured (Nobriga et al. 2008; Figure 13). With X2 positioned above the Sacramento-San

Joaquin confluence, it is possible that salinities downstream may reach levels that are less suitable for juvenile Delta Smelt and prevent substantial seaward movement to areas where the marine influence and larger water bodies maintain cooler water temperatures, although EC values at Collinsville (Figure 25) are projected to remain below levels at which 100% survival occurred in laboratory salinity tolerance studies (Komoroske et al. 2014).

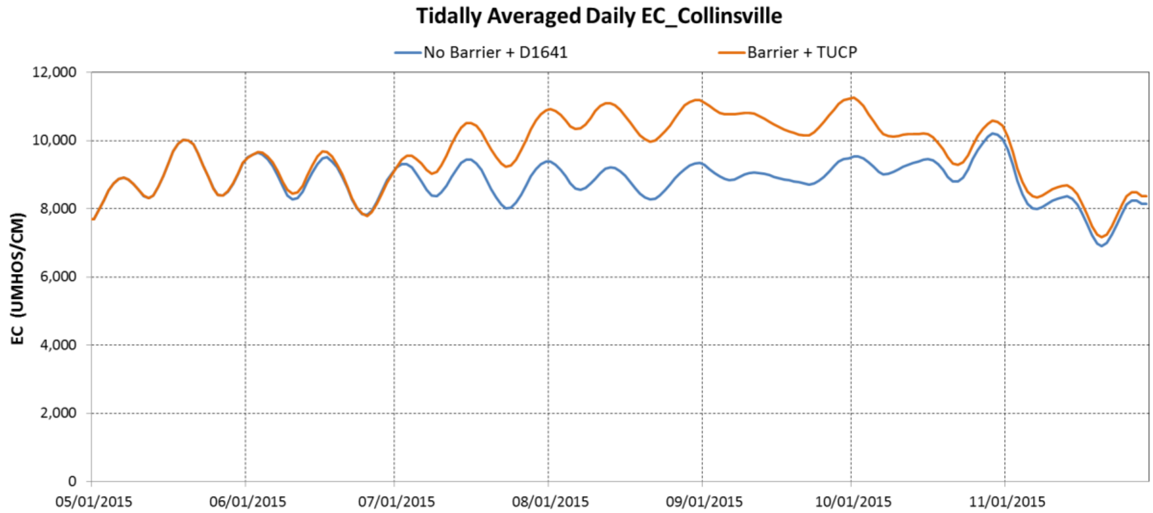


Figure 25. Forecasted flow at Collinsville, based on April 90% forecast from DSM2 models under TUCP conditions with the West False River Emergency Drought Barrier (red line) and without the barrier under D1641 compliance (blue line).

Hydrodynamic Effects on Entrainment

The proposed modifications will result in lower outflows that may reduce survival of out-migrating juvenile Delta Smelt that are currently in the interior Delta. For example, lower flows increase migration time and increase exposure to degraded habitats and predators. However, the projected OMR flows are at minimum levels and therefore are not likely to directly result in substantial additional impacts over unmodified conditions. For smelt residing in the North Delta, reduced outflow, while limiting the available habitat and its quality, is not expected to result in increased risk of entrainment. There is a low level of uncertainty in this conclusion.

Food Availability

Prey availability is constrained by habitat use, which in turn affects what types of prey are encountered. Delta Smelt are visual feeders. They find and select individual prey organisms and their ability to see prey in the water is enhanced by turbidity (Baskerville-Bridges et al. 2004). Thus, Delta Smelt diets are largely comprised of small invertebrates (i.e., zooplankton) that inhabit the estuary's turbid, low-salinity, open-water habitats. Larval Delta Smelt have particularly restricted diets (Nobriga 2002). They do not feed on the full array of zooplankton with which they co-occur and primarily consume three copepods: *Eurytemora affinis*, *Pseudodiaptomus forbesi*, and freshwater species of the family Cyclopidae, which inhabit the North Delta region. Further, the diets of Delta Smelt larvae are largely restricted to the larval stages of these copepods. As Delta Smelt grow larger their mouth gape increases and their swimming ability strengthens, enabling them to target larger copepods.

In the laboratory, a turbid environment (>25 Nephelometric Turbidity Units [NTU]) was necessary to elicit a first-feeding response in larval Delta Smelt (Baskerville-Bridges et al. 2000; Baskerville-Bridges 2004). Successful feeding seems to depend on a high density of food organisms and turbidity, and success increases with stronger light conditions (Baskerville-Bridges et al. 2000; Mager et al. 2004; Baskerville-Bridges et al. 2004). Variability of shallow and deep water habitat and resuspension of sediment due to wind and tidal action in the North Delta may buffer effects of the proposed modifications because much of the habitat in this region would remain suitable. Expectations for the North Delta contrast with the lower San Joaquin River where the upstream relocation of X2 may result in a greater proportion of the available habitat encompassing areas of high semi-aquatic vegetation and associated low turbidities. This could result in lower prey availability and higher predation rates on juvenile Delta Smelt. There is moderate level of uncertainty in this conclusion.

In addition to turbidity, changes in flow may affect residence time, which in turn may influence planktonic production. Lower flows are expected to increase hydraulic residence times, potentially resulting in improved planktonic production (Lucas et al. 2009). However, a specific effect is difficult to predict because benthic grazing can offset these benefits and hence the response of the food web to changes in flow is unclear. There is a high level of uncertainty about this conclusion.

Summary of Delta Smelt Effects

Adult Delta Smelt

If the recent SKT survey results reasonably reflect the current distribution of Delta Smelt, there is an absence of adult Delta Smelt in the central and south Delta (SKT #4). Entrainment of adults is unlikely to be a management issue for the rest of this year. Published analyses of a 13-year dataset of salvage records at the CVP/SWP fish collection facilities indicate that increased salvage of adult Delta Smelt at the CVP/SWP occurs when turbidities increase in the South Delta and Old and Middle River flows are highly negative (Grimaldo et al. 2009). Given the present low level of pumping and low turbidity in the South Delta, movement of remaining adults into areas of elevated entrainment risk is not expected. The salvage of adult Delta Smelt typically ends by May (Figure 26). After the onset of spawning, salvage of adults diminishes, with the regulatory focus shifting to protection of larvae/juveniles by the end of March (as determined by water temperatures or biological triggers; FWS BO 2008).

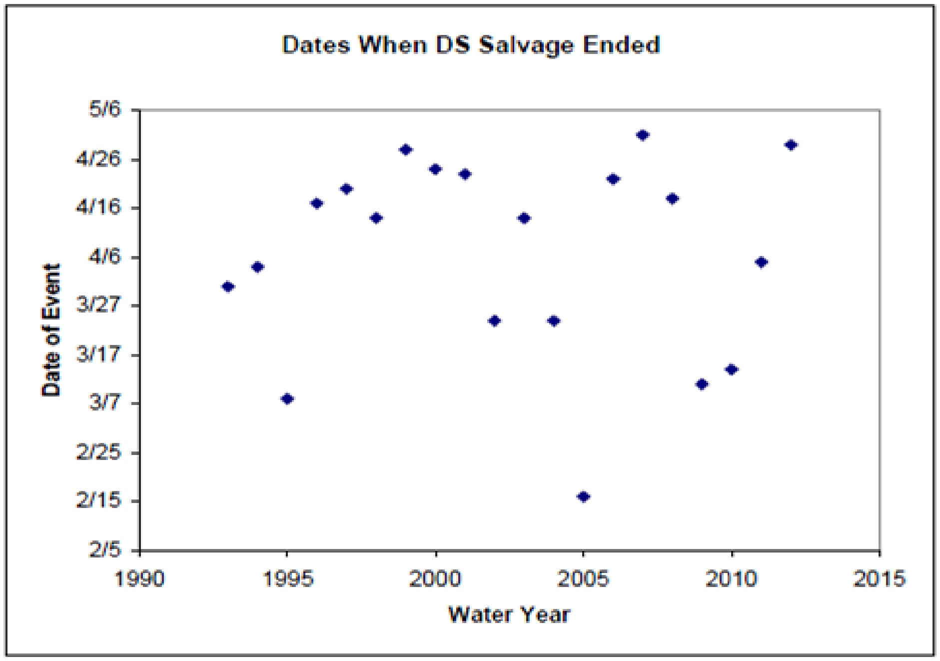


Figure 26. Dates of salvage for last adult Delta Smelt in water years (WY) 1993-2012[10]. Latest dates of adult Delta Smelt salvage in WY 2013-2015 were 3/25/13 in WY 2013, none salvaged in 2014, and 2/21/15 to date in WY 2015.

Some two-year-old fish survive through the summer to spawn the following year (Figure 27), but this is uncommon (2.3% to 9.3% of population in 2002 and 2003, respectively; Bennett 2005). Although the proportion of fish in this category is typically small, these age 1+ Delta Smelt produce more eggs than age 1 adults and have a disproportionate effect on the population (Bennett 2005). We hypothesize that these age 1+ fish will have a greater ability to move out of areas of poor habitat quality due to their size and broader salinity tolerance, and thus will be more likely to survive compared to juvenile Delta Smelt (discussed below). For these reasons the remainder of our discussion regarding Delta Smelt during the summer will focus on effects on larvae and juveniles.

[10] Graph provided by Robert Fujimura, CDFW, on 1/14/13.

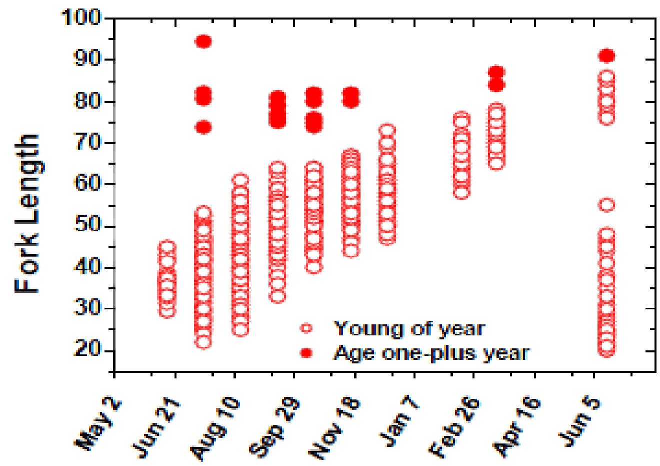


Figure 27. Length of young-of-year and 1+ adults determined from Otolith evaluations (n=876) in 1999-2000[11]

Larval-Juvenile Delta Smelt

San Joaquin River

The distribution of newly hatched larval Delta Smelt in the lower San Joaquin River is assumed to be similar to the distribution of adults, which are not currently present and therefore not at a high risk of entrainment. Recent larval survey results further support this assumption (see above). The entrainment risk of larval Delta Smelt produced in the lower San Joaquin River is expected to be moderated by the maintenance of Index OMR flows substantially less negative than -5000 cfs on a 14-day running average under the proposed action for the duration of the RPA action. There is potential that undetected larval Delta Smelt are located in the South Delta closer to the export facilities and these may be at a higher risk of entrainment. However, based on simulated fates of neutrally buoyant particles (Kimmerer and Nobriga 2008), any Delta Smelt southeast of Jersey Point in the Central/South Delta may be entrained at the south Delta export facilities even at minimum export levels. There is a low level of uncertainty about this conclusion.

Salvage of juvenile Delta Smelt during the summer and fall months is reported to be virtually non-existent (Table 8; CDFW Salvage data), as they do not use the South Delta as habitat during these months (Sommer et al. 2011).

[11] Bennett 2005.

Table 8. Date of last juvenile Delta Smelt salvaged for water year[12]

Facility	2008	2009	2010	2011	2012	2013	2014
CVP	6/20	6/23	5/21	N/A	6/23	6/8	5/13
SWP	7/5	6/30	6/8	N/A	6/28	6/17	5/3

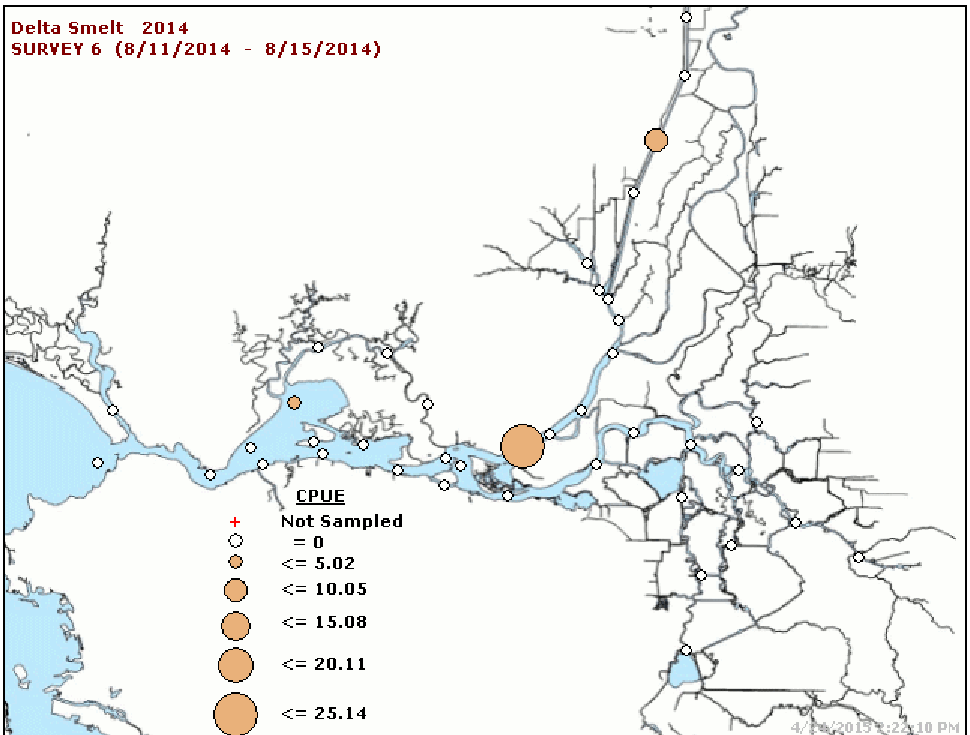


Figure 27. Townet Survey #6 Delta Smelt Distribution in mid-August[13] **Catch per unit effort (CPUE) was the number of fish caught per 10,000 cubic meters of water sampled.**

Sacramento River/North Delta

Juvenile Delta Smelt during the summer period typically reside in the LSZ around X2, with a substantial portion of the population remaining in the North Delta (Sommer and Mejia 2013). The CDFW Summer Townet Survey (TNS) samples the distribution of Delta Smelt throughout the summer and early fall period, and in the summer of 2014 consistently detected Delta Smelt in both of these areas (Figure 27). It is thought that Delta Smelt in the Cache Slough Complex use deep water areas of Cache Slough and the Sacramento Deep Water Ship Channel as thermal refuges during high summer temperatures. Delta Smelt continue to feed and grow throughout summer months and begin to move upstream in early winter

[12] Retrieved from <http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx> on 4/24/15.
[13] Retrieved from <http://www.dfg.ca.gov/delta/projects.asp?ProjectID=TOWNET> on 4/24/15.

during periods of increased outflow and high turbidities, which typically do not commence until December. There is no evidence that substantial upstream movement relative to the salt field occurs prior to this period (Sommer et al. 2011).

Juvenile Delta Smelt have the potential to be substantially affected by the proposed actions. The effects of changes in water quality in areas such as Liberty Island, Sacramento Deep Water Ship Channel, Lindsey and Cache Sloughs, are uncertain because the hydrology of this region is strongly driven by tidal effects during the months of the proposed action. However it is relatively likely that reduced inflow will result in a more upstream distribution of Delta Smelt, increasing the risk that they will be exposed to relatively high water temperatures (e.g., >25C). In laboratory temperature tolerance studies (Komoroske et al. 2014) juvenile Delta Smelt tolerated waters several degrees warmer than adults and post-spawn adults, and thus may be more resilient to temperatures between 25-28C than previously thought. Further, it is thought the Deep Water Ship Channel and Cache Slough may provide key thermal refuges that allow Delta Smelt to persist in the North Delta. Nonetheless, it is not known how long these refuges will persist under conditions of a sustained heat wave.

Delta Smelt have a strong positive association with the position of X2, with more downstream positions providing higher quality habitat (Feyrer et al. 2011). Under the proposed action, it is likely that summer Delta Smelt distributions will not be in areas optimal for growth and survival (Nobriga et al. 2008). In previous low-flow years, when water quality conditions became less tolerable for Delta Smelt in the Cache Slough Complex, the North Delta population appeared to have the capability to move downstream quickly towards the LSZ. It is likely, given the strongly tidal nature of the Cache Slough Complex, that Delta Smelt are able to ride these tidal flows and are capable of quickly escaping unfavorable habitat conditions in the North Delta. Under the current proposal, X2 would move further upstream, limiting potential downstream movement, although conditions without the modifications would also limit potential downstream movement. The proportion of the total population of Delta Smelt in the North Delta in summer appears to be highly variable (James Hobbs, UC Davis, unpublished data), but it can be substantial. There is a moderate level of uncertainty about the expected effects in the North Delta.

Biological Review of Longfin Smelt

Longfin Smelt Status and Distribution

In Bay Study trawls conducted during early January, 2015, the majority of adult Longfin Smelt were detected in Suisun Bay, the Confluence area, and the lower Sacramento River (Figure 28). By early April, the distribution was shifted westward, with catch occurring in San Pablo Bay and the Confluence area (Figure 29). No adult Longfin Smelt have been collected in salvage or in the Central or South Delta in the Bay Study sampling, from January-April 2015.

Fish surveys, including the Early Warning Monitoring that occurred at Jersey Point, and salvage suggest there were Longfin Smelt spawning in the West, North and South Delta this year (Figures 28 and 32). Based upon the most recent 20mm survey data the majority of juvenile Longfin Smelt appears to be distributed in the lower Sacramento near the confluence and in Montezuma Slough and with lower densities in near Franks Tract in the South Delta (Figures 30 and 31).

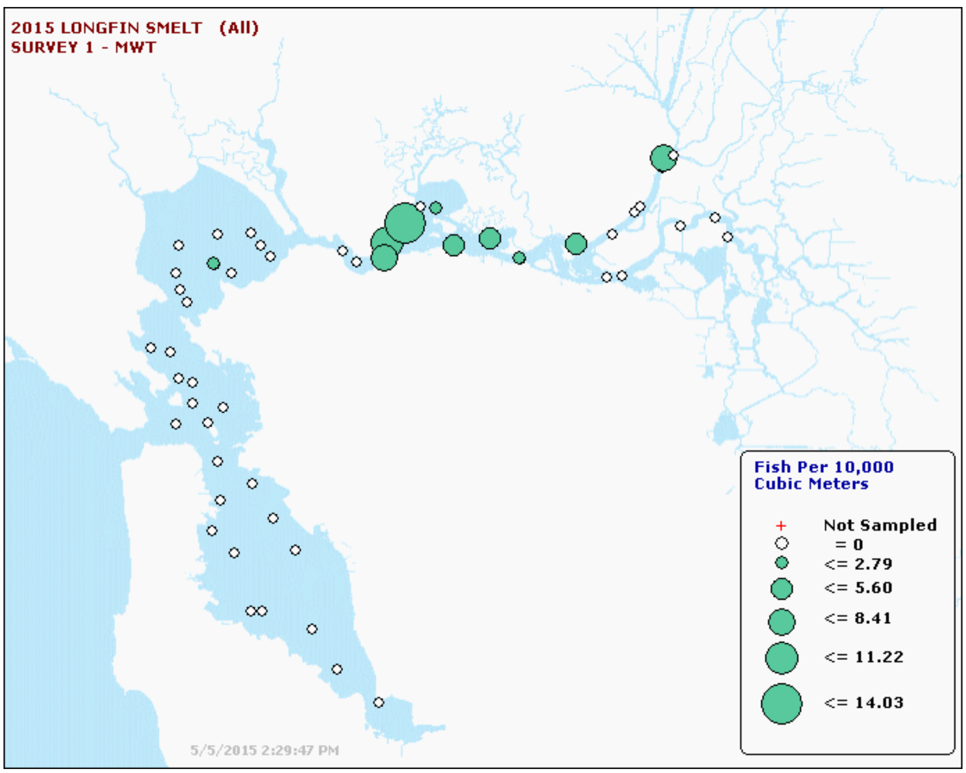


Figure 28. Distribution of adult Longfin Smelt in the Bay Study Midwater Trawl during January 2015.

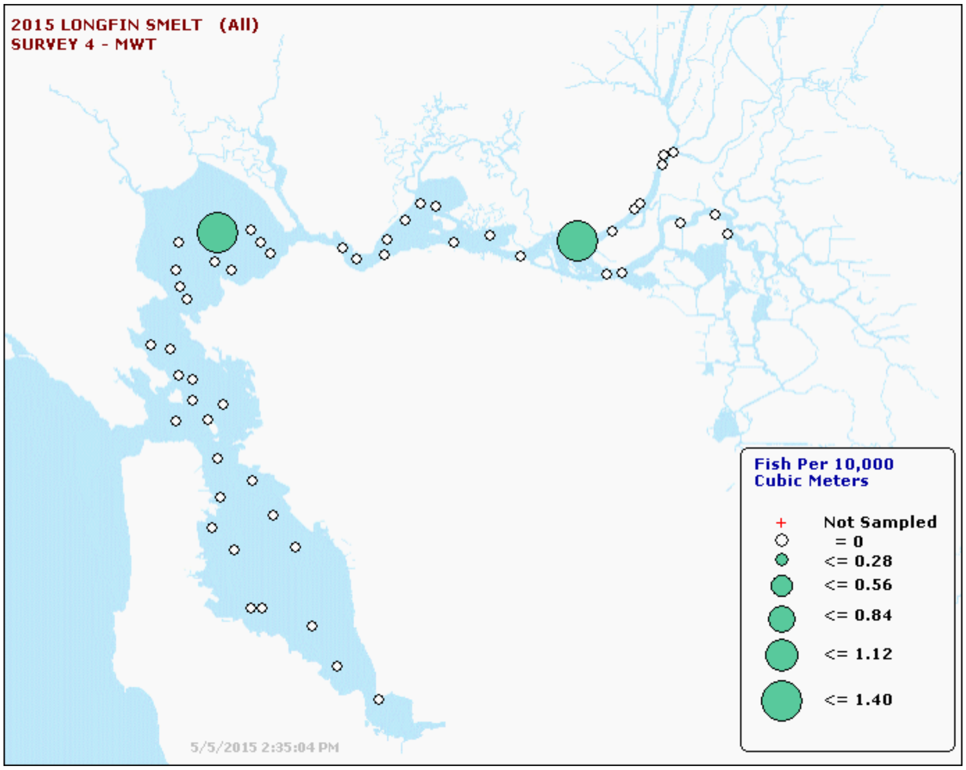


Figure 29. Distribution of adult Longfin Smelt in the Bay Study Midwater Trawl during April 2015.

Longfin Smelt larvae were detected at 4 of 12 Lower San Joaquin River (SJR) and South Delta sampling stations during Smelt Larva Survey #4, conducted February 17-19, 2015 (Figure 32). However, subsequent Smelt Larva Survey sampling indicated densities of Longfin Smelt larvae in the South Delta diminished in following weeks while densities increased in the lower SJR (Figure 33).

While larvae in these southern areas will be at risk of entrainment during operations due to their proximity to the export facilities, the minimal export levels should result in a low level of risk. In addition, larvae in the south Delta only represent approximately 3.5% of the total larval catch in SLS #6 east of Carquinez Straights based upon Catch Per Unit Effort (CPUE). Larvae were initially detected at the CVP and SWP salvage facilities, (on February 27 and March 3, respectively). Detection of age-0 Longfin Smelt in larval fish sampling at the facilities continued to be intermittent in March and increased to near daily detections during the latter half of April (Figure 34).

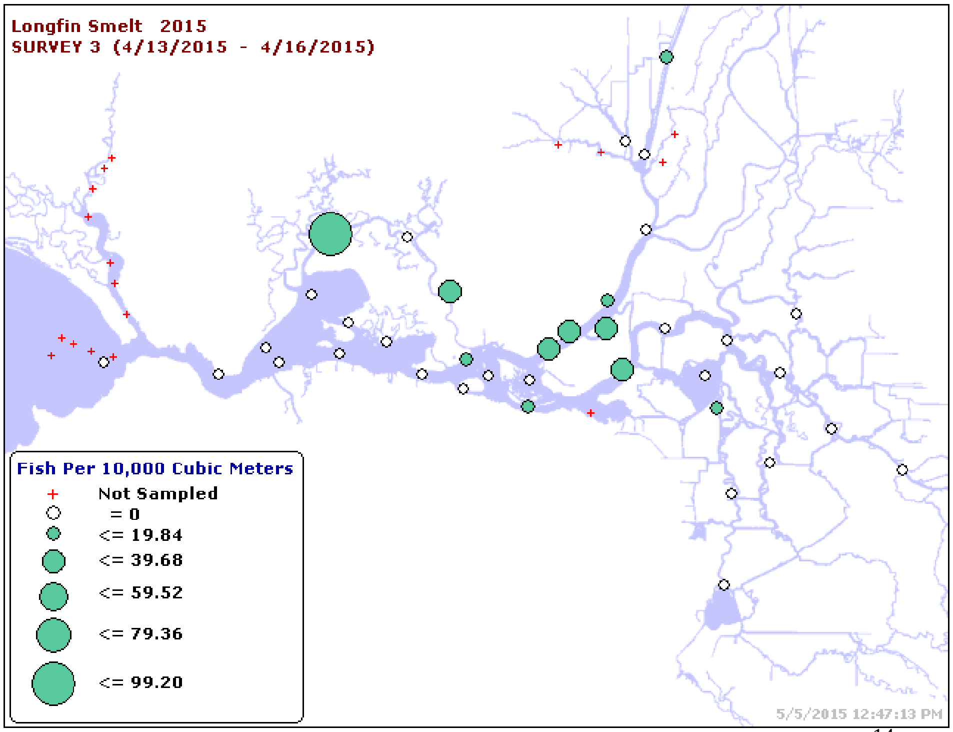


Figure 30. Longfin age-0 distribution from 20 mm survey #3[14].

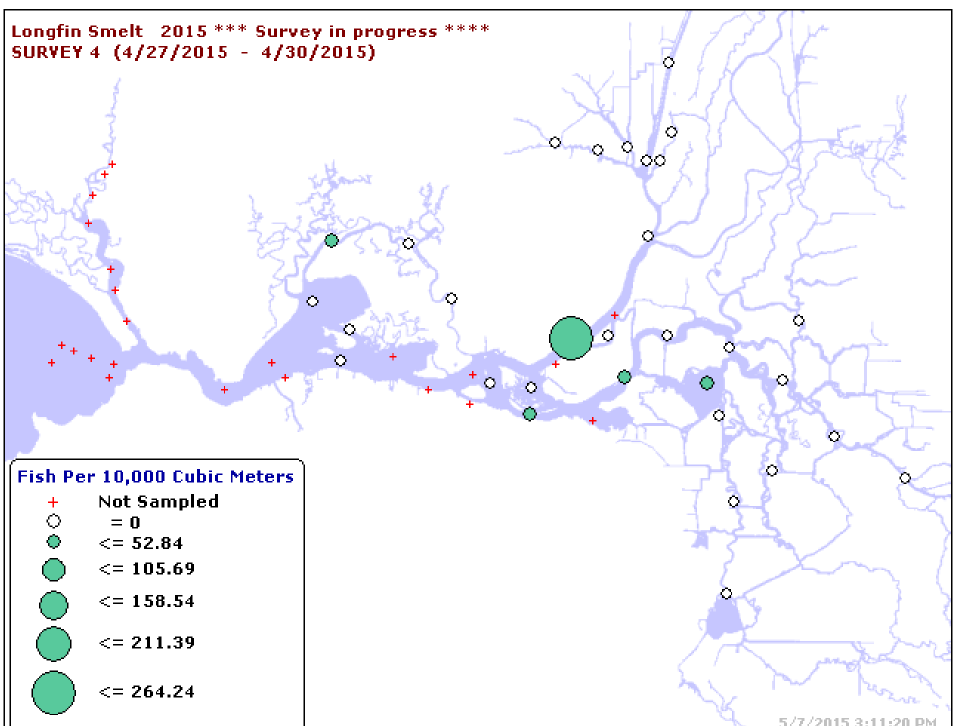


Figure 31. Longfin age-0 distribution from 20 mm survey #4[15].

[14] Retrieved from http://www.dfg.ca.gov/delta/data/ on 5/05/15
[15] Retrieved from http://www.dfg.ca.gov/delta/data/ on 5/07/15

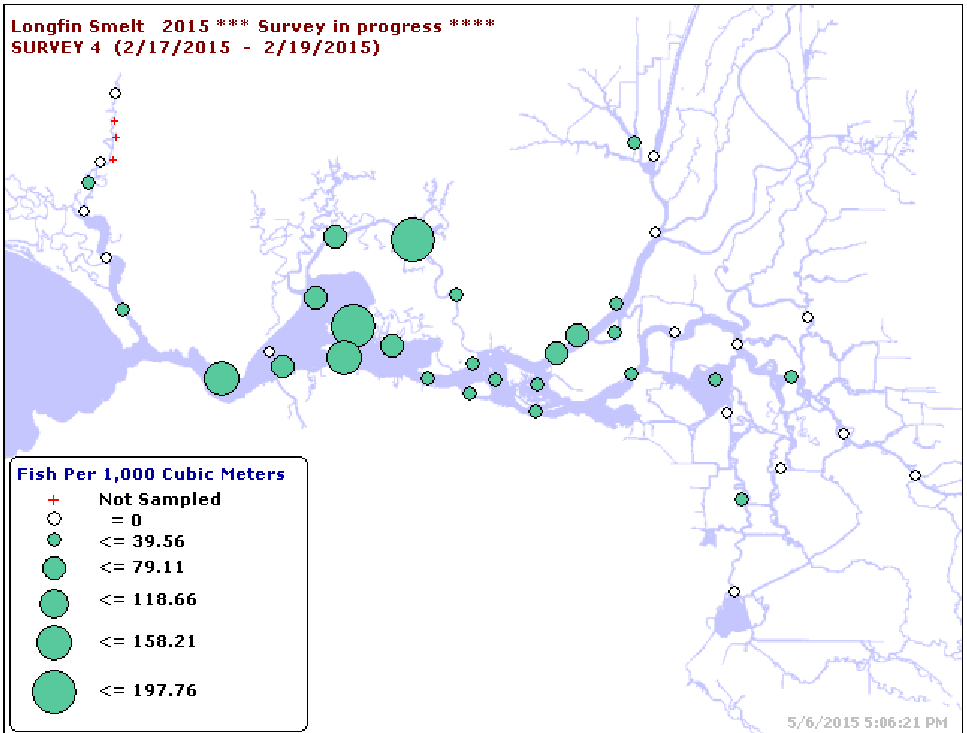
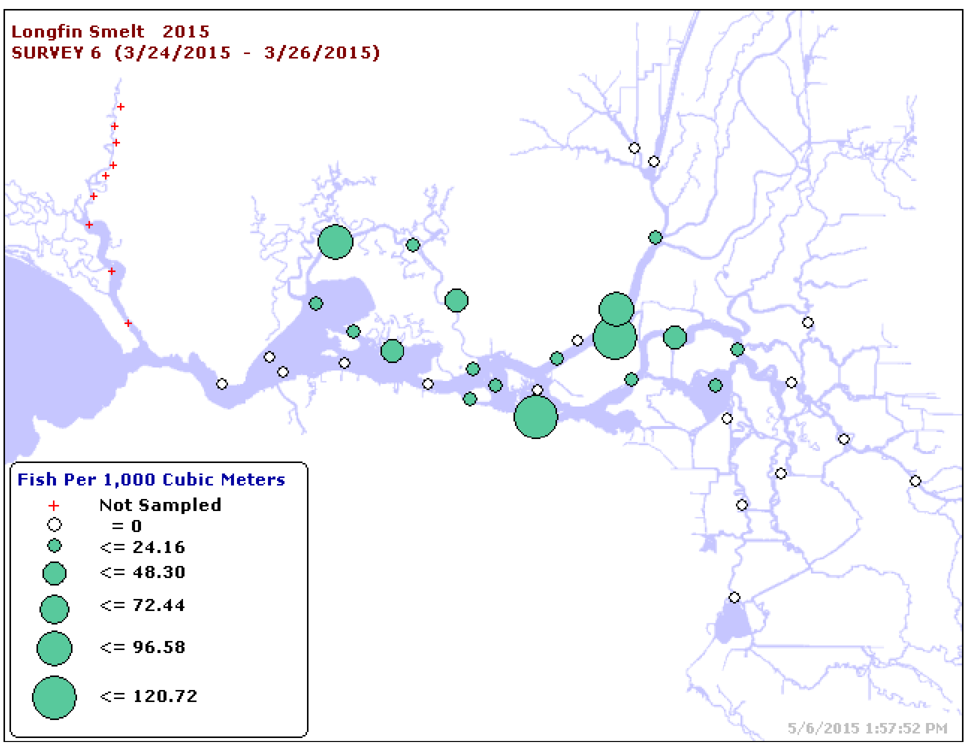


Figure 32. Longfin age-0 distribution from Smelt Larva survey #4[16].



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[16] Retrieved from http://www.dfg.ca.gov/delta/data/ on 5/05/15

Figure 33. Longfin age-0 distribution from Smelt Larva survey #6[17].

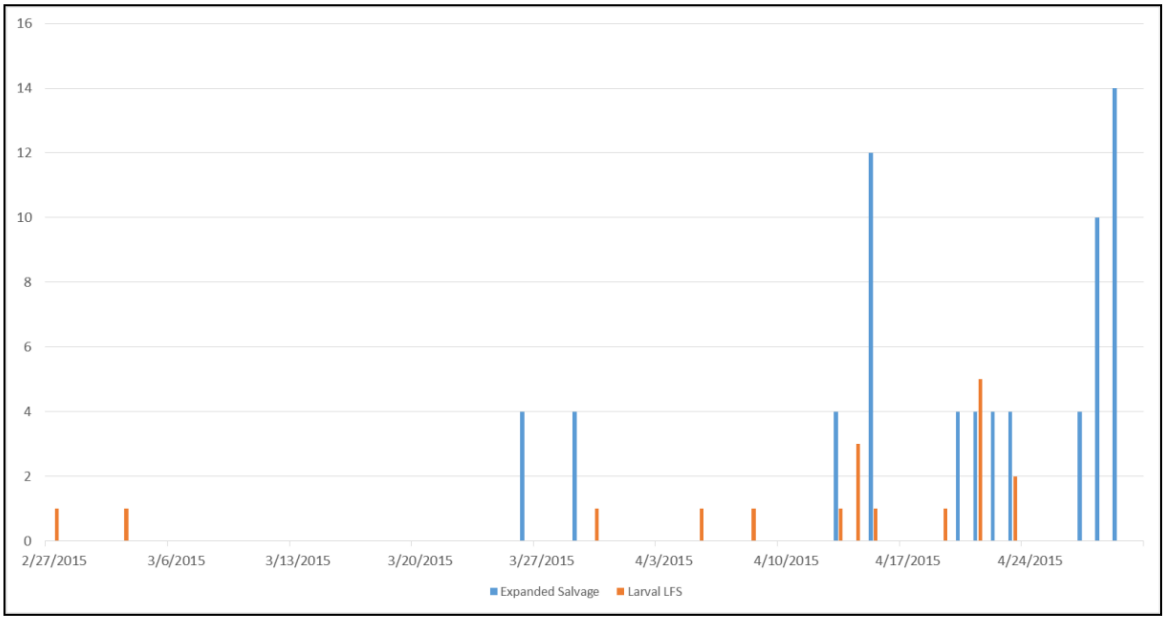

Figure 34. juvenile counts are expanded salvage, larval counts are raw sample numbers, water year 2015[18].

Longfin Smelt Effects

Adult Longfin Smelt

In WY2015 no adult Longfin smelt were observed at the salvage facilities. Based on salvage data from WY1994 through WY2015 the first 5% of total yearly salvage typically occurs in early February, and salvage of any Longfin smelt prior to December occurred in only one year during the past 21 years (WY2001). Longfin smelt migration does not appear to correlate with any single environmental variable, and the population may have a more generalized seasonal migration response. Therefore, there is potential for some migration to occur during the end of the currently proposed action with or without the occurrence of any change in predicted environmental conditions, such as a large precipitation or flow event although the probability of a large migration event during the period of the proposed actions is low. There is a moderate level of certainty in this conclusion.

Larval-Juvenile Longfin Smelt

Given the limited distribution of larvae and juveniles in the Central and South Delta, and the very low levels of projected exports, the proposed action will not substantially raise the entrainment risk of the Longfin Smelt population. The

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[17] Retrieved from http://www.dfg.ca.gov/delta/data/ on 5/05/15
[18] Retrieved from http://www.dfg.ca.gov/delta/apps/salvage/Default.aspx on 4/30/15

maximum change in daily tidal flow at Jersey Point resulting from the proposed actions is less than 500cfs, and for the majority of the period the change is less pronounced (Figure 17). Additionally, larval Longfin Smelt salvage has historically decreased as south Delta water temperatures rise in the spring months. Therefore salvage is likely to continue declining through the action period, and little increase in entrainment effects on BY2015 Longfin Smelt resulting from the proposed actions are expected. However, a demonstrated positive relationship between Longfin Smelt abundance and winter-spring Delta outflow (Kimmerer 2002; Rosenfeld and Baxter 2007) suggests reduced outflow in April under the proposed action will result in some reduction in overall abundance. Furthermore, the operation of West False River Emergency Drought Barrier has the potential to delay or inhibit westward migration of juvenile longfin that were in the Franks Tract area and regions further south. The modifications proposed are not likely to result in a substantial degradation of rearing habitat for Longfin Smelt over conditions that would be experienced in a dry year. There is a moderate level of certainty about this conclusion.

Summary of Effects on Longfin Smelt

Like other species, inhabiting the Delta, Longfin Smelt are likely to experience poor recruitment this year due to effects of the continuing drought. Low spawning and larval detection rates this year seem to support these predicted low survival rates. The reduction in outflow due to the proposed action may have some negative impact on Longfin spawning and recruitment, though this effect is hard to quantify given the already poor environmental conditions due to the drought.

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