Don Pedro Project Relicensing

W&AR-06 - Chinook Population Model and W&AR-10 – O. *mykiss* Population Model

Consultation Workshop Log

Workshop Description	No.	Meeting Date
Chinook & O.mykiss Population Models	1	11/15-16/2012
Chinook Population Model	2	08/06/2013
O.mykiss Population Model	2	11/05/2013

COMBINED W&AR-06 AND W&AR-10

November 15-16, 2012 Workshop No. 1 Documents:

DATE	FROM	ТО	SUBJECT
02/07/2012	Rose Staples,	Relicensing	Proposed Workshops/Meetings Schedule for 2012
	HDR	Participants	
03/05/2012	Rose Staples,	Relicensing	Confirmation of Workshop Dates/Consultation
	HDR	Participants	Workshop Process Draft
11/01/2012	Rose Staples,	Relicensing	Meeting Reminder
	HDR	Participants	
11/05/2012	Rose Staples,	Relicensing	Agenda and Logistics
	HDR	Participants	
11/15/2012	Rose Staples,	Relicensing	Advance Materials
	HDR	Participants	
12/13/2012	Rose Staples,	Relicensing	Draft Meeting Notes for 30-Day Review and
	HDR	Participants	Comment (copy attached to Final Meeting Notes
			filed with FERC on 03/18/2013)
01/14/2013	Jeffrey Single,	FERC/Districts	Comments on Draft Meeting Notes (copy attached
	USFWS		to Final Meeting Notes filed with FERC on
			03/18/2013)
03/18/2013	John Devine,	FERC	Final Meeting Notes filed with FERC, including
	HDR		Comments received from Relicensing Participant
			and Districts' Response to Comments

W&AR-06 Chinook Population Model August 6, 2013 Workshop No. 2 Documents: (Previously Announced Dates: Mar 27 / Apr 18 / Jun 6, 2013)

DATE	FROM	ТО	SUBJECT
03/20/2013	Rose Staples,	Relicensing	Announcement postponing 03/27/2013 workshop
	HDR	Participants	
04/11/2013	Rose Staples,	Relicensing	Notice that 04/18/2013 Workshop is being
	HDR	Participants	Rescheduled
04/26/2013	Rose Staples,	Relicensing	Notice Rescheduling Workshop for 06/06/2013
	HDR	Participants	
05/29/2013	Rose Staples,	Relicensing	Notice Cancelling 06/06/2013 Workshop
	HDR	Participants	
07/02/2013	Rose Staples,	Relicensing	Announcement of 08/06/2013 Workshop
	HDR	Participants	
07/26/2013	Rose Staples,	Relicensing	Agenda and Advance Materials
	HDR	Participants	
08/05/2013	Rose Staples,	Relicensing	Meeting Reminder/Additional Advance Materials
	HDR	Participants	
08/21/2013	Rose Staples,	Relicensing	Draft Meeting Notes for 30-Day Review and
	HDR	Participants	Comment
09/17/2013	Jeffrey	FERC	Comments on Draft Meeting Notes (copy attached to
	Single,		Final Meeting Notes filed with FERC on
	CDFW		10/31/2013)
09/20/2013	Daniel Welsh,	FERC	Comments on Draft Meeting Notes (copy attached to
	USFWS		Final Meeting Notes filed with FERC on
			10/31/2013)
09/20/2013	Patrick	Districts	Comments on Draft Meeting Notes (copy attached to
	Koepele, TRT		Final Meeting Notes filed with FERC on
	and Chris		10/31/2013)
	Shutes, CSPA		
09/23/2013	Peter Barnes,	FERC	Comments on Draft Meeting Notes (copy attached to
	SWRCB		Final Meeting Notes filed with FERC on
	~		10/31/2013)
10/31/2013	Stillwater	FERC	Final Meeting Notes filed with FERC, including
	Science		Comments received from Relicensing Participants
			and Districts' Response to the Comments

W&AR-10 O.mykiss Population Model

November 5, 2013 Workshop No. 2 Documents: (Previously Announced Date of Oct 8, 2013 postponed due to federal government shutdown)

DATE	FROM	ТО	SUBJECT
09/03/2013	Rose Staples,	Relicensing	Announcement of 10/08/2013 Workshop
	HDR	Participants	
10/01/2013	John Devine,	Relicensing	Agenda and Advance Materials
	HDR	Participants	
10/02/2013	Rose Staples,	Relicensing	Postponement of 10/08/2013 Workshop
	HDR	Participants	
10/15/2013	Rose Staples,	Relicensing	Tentative New Date Set for 11/05/2013
	HDR	Participants	
10/25/2013	Rose Staples,	Relicensing	Confirmation of 11/05/2013 Date for Rescheduled
	HDR	Participants	Workshop
11/01/2013	Rose Staples,	Relicensing	Revised Agenda, with Logistics
	HDR	Participants	
11/23/2013	Rose Staples,	Relicensing	Draft Meeting Notes for 30-Day Review and Comment
	HDR	Participants	

Consultation Workshop No. 1 November 15, 2012

From: Sent: To:

Staples, Rose

Tuesday, February 07, 2012 8:15 PM

Alves, Jim - City of Modesto; Anderson, Craig - USFWS; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Barnes, Peter - SWRCB; Beuttler, John - CSPA; Blake, Martin; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave -Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brenneman, Beth - BLM; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Brochini, Tony - NPS; Buckley, John - CSERC; Buckley, Mark; Burley, Silvia-CVMT; Burt, Charles - CalPoly; Cadagan, Jerry; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cismowski, Gail - SWRCB; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI; Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, Kevin - TBMI; Day, P - MF; Denean - BVR; Derwin, Maryann Moise; Devine, John; Donaldson, Milford Wayne -OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau -CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Gorman, Elaine - YSC; Grader, Zeke; Gutierrez, Monica - NOAA-NMFS; Hackamack, Robert; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hayden, Ann; Hellam, Anita - HH; Heyne, Tim -CDFG; Holden, James ; Holm, Lisa; Horn, Jeff - BLM; Horn, Tini; Hudelson, Bill -StanislausFoodProducts; Hughes, Noah; Hughes, Robert - CDFG; Hume, Noah -Stillwater; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Justin; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick -TRT; Kordella, Lesley - FERC; Lein, Joseph; Levin, Ellen - SFPUC; Lewis-Reggie-PRCI; Linkard, David - TRT /RH; Looker, Mark - LCC; Loy, Carin; Lwenya, Roselynn, BVR; Lyons, Bill - MR; Madden, Dan; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Martin, Ramon - USFWS; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - PRCI; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Paul, Duane - Cardno; Pavich, Steve-Cardno; Pinhey, Nick - City of Modesto; Pool, Richard; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Ridenour, Jim; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sander, Max - TNC; Sandkulla, Nicole -BAWSCA; Saunders, Jenan; Schutte, Allison - HB; Sears, William - SFPUC; Shakal, Sarah - Humboldt State; Shipley, Robert; Shumway, Vern - SNF; Shutes, Chris - CSPA; Sill, Todd; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Steiner, Dan; Stone, Vicki -TBMI; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; Terpstra, Thomas; TeVelde, George A; Thompson, Larry - NOAA-MNFS; Vasquez, Sandy ; Verkuil, Colette - TRT/MF; Vierra, Chris; Villalabos, Ruben; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Wilcox, Scott -Stillwater; Williamson, Harry (NPS); Willy, Alison - FWS; Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB

Subject:

Don Pedro Project Relicensing Water & Aquatic Study Plans Workshop/Meeting Schedule for 2012

In accordance with FERC's Study Plan Determination and the Districts' Water & Aquatic (W&AR) study plans to be underway in 2012, we have developed schedule dates for the various workshops contained within the study plans. Please make note of these below:

April 2012

Apr 09 1:00 pm - 5:00 pm PT Don Pedro Project Relicensing - Hydrology Workshop (W&AR-2) (Modesto Irrigation District Offices, Modesto {MID})

Apr 10 8:00 am – 10:00 am PT Don Pedro Project Relicensing - Reservoir Temperature Modeling Data and Methods (MID)

Apr 10 10:15 am - 5:00 pm PT Don Pedro Project Relicensing - Salmonid Population Information Workshop (W&AR-5) (MID)

June 2012

Jun 26 9:00 am – 4:00 pm PT Don Pedro Project Relicensing - Salmonid Population Information Workshop (W&AR-5) (MID)

September 2012

Sep 18 9:00 am - 4:00 pm PT Don Pedro Project Relicensing - Temperature Model Verification/Calibration Meeting (MID)

November 2012

Nov 15 9:00 am - 4:00 pm PT Don Pedro Project Relicensing - Chinook Population (W&AR-6) and O.mykiss Population

(W&AR-10) Modeling Workshop (MID)

In addition, in accordance with FERC's direction regarding the development and implementation of a more explicit consultation program for those studies with workshops, we are proposing to hold a meeting on March 20th at MID (from 1:30 to 4:30 p.m.) to discuss and finalize such a Workshop Consultation Program. An initial proposal will be forwarded by March 5 to all participants.

March 2012

Mar 20 1:30 pm – 4:30 pm PT Don Pedro Project Relicensing - Workshop on Consultation Process (as per Appendix B of FERC's Study Plan Determination) (MID)

We look forward to continuing to work with all relicensing participants in 2012.

ROSE STAPLES CAP-OM

HDR Engineering, Inc. Executive Assistant, Hydropower Services

970 Baxter Boulevard, Suite 301 | Portland, ME 04103 207.239.3857 2 | f: 207.775.1742 2 rose.staples@hdrinc.com | hdrinc.com From: Sent: To: Staples, Rose Monday, March 05, 2012 3:38 PM

Alves, Jim - City of Modesto; Anderson, Craig - USFWS; Asay, Lynette - N-R; Aud, John - SCERD; Barnes, James - BLM; Barnes, Peter - SWRCB; Beuttler, John - CSPA; Blake, Martin; Bond, Jack - City of Modesto; Boucher, Allison - TRC; Boucher, Dave -Allison - TRC; Bowes, Stephen - NPS; Bowman, Art - CWRMP; Brenneman, Beth - BLM; Brewer, Doug - TetraTech; Brochini, Anthony - SSMN; Brochini, Tony - NPS; Buckley, John - CSERC; Buckley, Mark; Burley, Silvia-CVMT; Burt, Charles - CalPoly; Cadagan, Jerry; Carlin, Michael - SFPUC; Catlett, Kelly - FOR; Charles, Cindy - GWWF; Cismowski, Gail - SWRCB; Costa, Jan - Chicken Ranch; Cowan, Jeffrey; Cox, Stanley Rob - TBMWI: Cranston, Peggy - BLM; Cremeen, Rebecca - CSERC; Day, Kevin - TBMI; Day, P - MF: Denean - BVR; Derwin, Maryann Moise; Devine, John; Donaldson, Milford Wayne -OHP; Dowd, Maggie-SNF; Drekmeier, Peter - TRT; Edmondson, Steve - NOAA; Eicher, James - BLM; Fety, Lauren - BLM; Findley, Timothy - Hanson Bridgett; Freeman, Beau -CalPoly; Fuller, Reba - TMTC; Furman, Donn W - SFPUC; Ganteinbein, Julie - Water-Power Law Grp; Giglio, Deborah - USFWS; Gorman, Elaine - YSC; Grader, Zeke; Gutierrez, Monica - NOAA-NMFS; Hackamack, Robert; Hastreiter, James L - FERC; Hatch, Jenny - CT; Hayat, Zahra - MF; Hayden, Ann; Hellam, Anita - HH; Heyne, Tim -CDFG; Holden, James ; Holm, Lisa; Horn, Jeff - BLM; Horn, Tini; Hudelson, Bill -StanislausFoodProducts; Hughes, Noah; Hughes, Robert - CDFG; Hume, Noah -Stillwater; Jackman, Jerry ; Jackson, Zac - USFWS; Jennings, William - CSPA; Jensen, Art - BAWSCA; Jensen, Laura - TNC; Johannis, Mary; Johnson, Brian - CalTrout; Justin; Keating, Janice; Kempton, Kathryn - NOAA-MNFS; Kinney, Teresa; Koepele, Patrick -TRT; Kordella, Lesley - FERC; Lein, Joseph; Levin, Ellen - SFPUC; Lewis-Reggie-PRCI; Linkard, David - TRT /RH; Looker, Mark - LCC; Loy, Carin; Lwenya, Roselynn, BVR; Lyons, Bill - MR; Madden, Dan; Manji, Annie; Marko, Paul ; Marshall, Mike - RHH; Martin, Michael - MFFC; Martin, Ramon - USFWS; Mathiesen, Lloyd - CRRMW; McDaniel, Dan -CDWA; McDevitt, Ray - BAWSCA; McDonnell, Marty - SMRT; McLain, Jeffrey - NOAA-NMFS; Means, Julie - CDFG; Mills, John - TUD; Morningstar Pope, Rhonda - BVR; Motola, Mary - PRCI; O'Brien, Jennifer - CDFG; Orvis, Tom - SCFB; Ott, Bob; Ott, Chris; Paul, Duane - Cardno; Pavich, Steve-Cardno; Pinhey, Nick - City of Modesto; Pool, Richard; Porter, Ruth - RHH; Powell, Melissa - CRRMW; Puccini, Stephen - CDFG; Raeder, Jessie - TRT; Ramirez, Tim - SFPUC; Rea, Maria - NOAA-NMFS; Reed, Rhonda - NOAA-NMFS; Richardson, Kevin - USACE; Ridenour, Jim; Robbins, Royal; Romano, David O - N-R; Roos-Collins, Richard - Water-Power Law Grp for NHI; Roseman, Jesse; Rothert, Steve - AR; Sander, Max - TNC; Sandkulla, Nicole -BAWSCA; Saunders, Jenan; Schutte, Allison - HB; Sears, William - SFPUC; Shakal, Sarah - Humboldt State; Shipley, Robert; Shumway, Vern - SNF; Shutes, Chris - CSPA; Sill, Todd; Slay, Ronn - CNRF/AIC; Smith, Jim - MPM; Staples, Rose; Steindorf, Dave - AW; Steiner, Dan; Stone, Vicki -TBMI; Stork, Ron - FOR; Stratton, Susan - CA SHPO; Taylor, Mary Jane - CDFG; Terpstra, Thomas; TeVelde, George A ; Thompson, Larry - NOAA-MNFS; Vasquez, Sandy; Verkuil, Colette - TRT/MF; Vierra, Chris; Villalabos, Ruben; Walters, Eric - MF; Wantuck, Rick - NOAA-NMFS; Welch, Steve - ARTA; Wesselman, Eric - TRT; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas - RHH; Wilcox, Scott -Stillwater; Williamson, Harry (NPS); Willy, Alison - FWS; Wilson, Bryan - MF; Winchell, Frank - FERC; Wood, Dave - FR; Wooster, John -NOAA; Workman, Michelle - USFWS; Yoshiyama, Ron; Zipser, Wayne - SCFB

Reminder Don Pedro March 20 Meeting; Draft Workshop Consultation Process; 2012 Workshop Schedule

Attachments:

Subject:

Don Pedro Draft Workshop Consultation Process_120305.pdf

Reminder of March 2012 Meeting

Mar 20 - 1:30 pm - 4:30 pm - MID Offices

Don Pedro Project Relicensing - Workshop on Consultation Process (as per Appendix B of FERC's Study Plan Determination)

Draft Workshop Consultation Process

Please find attached the Draft Workshop Consultation Process document.

2012 Workshop Schedule

Included in the attached Draft Workshop Consultation Process document.

 ROSE STAPLES CAP-OM
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DRAFT

WORKSHOP CONSULTATION PROCESS ON INTERIM STUDY PLAN DECISIONS

As part of certain studies to be undertaken in the Don Pedro Project relicensing, the Districts had proposed a series of workshops to share and discuss relevant data with Relicensing Participants (RPs). FERC has recommended that the Workshop Consultation process be formalized. In accordance with Appendix B of FERC's December 22, 2011 Study Plan Determination, the draft workshop consultation process outlined below has been developed to provide guidance for the decision-making process involved within the following study plans:

- W&AR-2 (Project Operations Model): <u>Hydrology Workshop</u>
- W&AR-5 (Salmonid Population Information Synthesis): <u>Literature/Data Review Workshop</u> and <u>Conceptual Model Review Workshop</u>
- W&AR-6 (Chinook Population Model): <u>Conceptual Model Review Workshop</u> and <u>Modeling</u> <u>Approach Workshop</u>
- W&AR-10 (*O.Mykiss* Population Model): <u>Conceptual Model Review Workshop</u> and <u>Modeling Approach Workshop</u>
- W&AR-14 (Temperature Criteria Assessment): <u>Water Temperature Evaluation Criteria</u> <u>Workshop</u>

The purpose of the eight workshops is to provide opportunity for RPs and the Districts to discuss relevant data sources, methods of data use and development, and modeling parameters at key points in the execution of these study plans. The goal of the workshops is for RPs and the Districts to reach agreement where possible after thorough discussion of data, methods and parameters. Consensus on decisions dealing with data acceptability, or study approaches or methods can only be achieved by the active and consistent in-person attendance and participation of interested Relicensing Participants. Additional workshops beyond those already specified above may be held as agreed to between the RPs and the Districts.

FERC has also directed the Districts to formalize the workshop process to define how interim decisions on model inputs and parameters will be made. To promote clear communication and informed participation, the Districts will make a good-faith effort to provide two (2) weeks before each workshop, in electronic format, information and presentation materials to be discussed at the workshops. For studies that involve resource modeling, presentation materials will be tailored to the audience at a level that assumes familiarity with the resource issues being addressed. To promote a common understanding of terms, a glossary of definitions will be prepared prior to each initial workshop, updated and expanded upon periodically, and included in the final study report. Prior to the initial workshops, the Districts will also prepare a logic diagram of the study steps from data selection through model development and numerical procedures to model scenario evaluation. This study "process diagram" will aid in promoting a common understanding of the step-wise approach being used in model development.

Following each workshop, draft meeting notes of the consultation workshop will be distributed to participants within approximately eight (8) working days. The notes will identify areas where participants reached agreement on data, methods and/or parameters, areas where there is disagreement among participants, and action items for any future meetings. Following a 30-day

Don Pedro Project

Consultation Approach for Studies W&AR-2, 5, 6, and 10

comment period, the Districts will file with FERC a revised version of the consultation workshop notes describing areas of agreement, areas where agreement was not reached, copies of comments received, a discussion of how the Relicensing Participant comments and recommendations have been considered by the Districts, as well as the rationale for the Districts not adopting any Relicensing Participants recommendations.

The proposed schedule for workshops is included below. All meetings will be held at MID offices in Modesto.

March 2012

Mar 20 - 1:30 pm – 4:30 pm Don Pedro Project Relicensing - Workshop on Consultation Process (as per Appendix B of FERC's Study Plan Determination)

<u>April 2012</u>

Apr 09 - 1:00 pm - 5:00 pm Don Pedro Project Relicensing - Hydrology Workshop (W&AR-2)

Apr 10* - 10:30 am - 5:00 pm Don Pedro Project Relicensing - Salmonid Population Information Workshop (W&AR-5)

Apr 11 - 9 am – 12:00 pm Don Pedro Project Relicensing – Temperature Criteria Workshop (W&AR-14)

June 2012

Jun 26 - 9:00 am - 4:00 pm Don Pedro Project Relicensing - Salmonid Population Information Workshop (W&AR-5)

November 2012

Nov 15 - 9:00 am - 4:00 pm Don Pedro Project Relicensing - Chinook Population (W&AR-6) and O.mykiss Population (W&AR-10) Modeling Workshop

2013 (Dates to be determined)

March 2013 (preliminary) - 9 am to 4 pm Don Pedro Project Relicensing - 2nd Workshop Chinook Population (W&AR-6) and O.mykiss Population (W&AR-10) Modeling

***NOTE:** From 8:30 am to 10:15 am, the Districts will conduct an introduction to the MIKE3 reservoir temperature model for use in W&AR-3. The goal is to introduce the model platform, computation methods, model development, and data sources. This is not considered a formal workshop. The Districts are also planning to conduct a discussion and presentation of the reservoir temperature model validation results at a Relicensing Participant Meeting on September 18, 2012 from 9 am to 4 pm at MID. Please add this meeting to your calendars.

From: Sent: To: Staples, Rose

Thursday, November 01, 2012 8:23 PM

Asay, Lynette; Barnes, James; Barnes, Peter; Beniamine Beronia; Blake, Martin; Bond, Jack; Borovansky, Jenna; Boucher, Allison; Bowes, Stephen; Bowman, Art; Brenneman, Beth; Brewer, Doug; Buckley, John; Buckley, Mark; Burt, Charles; Byrd, Tim; Cadagan, Jerry; Carlin, Michael; Charles, Cindy; Colvin, Tim; Costa, Jan; Cowan, Jeffrey; Cox, Stanley Rob; Cranston, Peggy; Cremeen, Rebecca; Damin Nicole; Day, Kevin; Day, P; Denean; Derwin, Maryann Moise; Devine, John; Donaldson, Milford Wayne; Dowd, Maggie; Drekmeier, Peter; Edmondson, Steve; Eicher, James; Fargo, James; Ferranti, Annee; Ferrari, Chandra; Fety, Lauren; Findley, Timothy; Fuller, Reba; Furman, Donn W; Ganteinbein, Julie; Giglio, Deborah; Gorman, Elaine; Grader, Zeke; Gutierrez, Monica; Hackamack, Robert; Hastreiter, James; Hatch, Jenny; Hayat, Zahra; Hayden, Ann; Hellam, Anita; Heyne, Tim; Holley, Thomas; Holm, Lisa; Horn, Jeff; Horn, Timi; Hudelson, Bill; Hughes, Noah; Hughes, Robert; Hume, Noah; Jackson, Zac; Jauregui, Julia; Jennings, William; Jensen, Art; Jensen, Laura; Johannis, Mary; Johnson, Brian; Justin; Keating, Janice; Kempton, Kathryn; Kinney, Teresa; Koepele, Patrick; Kordella, Lesley; Lein, Joseph; Levin, Ellen; Lewis, Reggie; Linkard, David; Loy, Carin; Lwenya, Roselynn; Lyons, Bill; Madden, Dan; Manji, Annie; Marko, Paul; Marshall, Mike; Martin, Michael; Martin, Ramon; Mathiesen, Lloyd; McDaniel, Dan; McDevitt, Ray; McDonnell, Marty; McLain, Jeffrey; Mein Janis; Mills, John; Minami Amber; Monheit, Susan; Morningstar Pope, Rhonda; Motola, Mary; Murphey, Gretchen; O'Brien, Jennifer; Orvis, Tom; Ott, Bob; Ott, Chris; Paul, Duane; Pavich, Steve; Pinhey, Nick; Pool, Richard; Porter, Ruth; Powell, Melissa; Puccini, Stephen; Raeder, Jessie; Ramirez, Tim; Rea, Maria; Reed, Rhonda; Richardson, Kevin; Ridenour, Jim; Robbins, Royal; Romano, David O; Roos-Collins, Richard; Roseman, Jesse; Rothert, Steve; Sandkulla, Nicole; Saunders, Jenan; Schutte, Allison; Sears, William; Shakal, Sarah; Shipley, Robert; Shumway, Vern; Shutes, Chris; Sill, Todd; Slay, Ron; Smith, Jim; Staples, Rose; Stapley, Garth; Steindorf, Dave; Steiner, Dan; Stender, John; Stone, Vicki; Stork, Ron; Stratton, Susan; Taylor, Mary Jane; Terpstra, Thomas; TeVelde, George; Thompson, Larry; Vasquez, Sandy; Verkuil, Colette; Vierra, Chris; Wantuck, Richard; Welch, Steve; Wesselman, Eric; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas; Wilcox, Scott; Williamson, Harry; Willy, Allison; Wilson, Bryan; Winchell, Frank; Wooster, John; Workman, Michelle; Yoshiyama, Ron; Zipser, Wayne Don Pedro Relicensing Studies WAR14 Meeting and WAR06-10 Workshop - November 15-16 2012

Subject: Attachments:

Don Pedro Relicensing Studies WAR14 Meeting and WAR06-10 Workshop - November 15-16 2 DP_TempCriteriaAssessmtMtg_Nov16_AGENDA_121101.doc

W&AR-06 Tuolumne River Chinook Salmon and W&AR-10 O. mykiss Population Model Workshops

November 15 (9:00 am – 4:30 pm) and November 16 (9 am – Noon): The agenda for these workshops will be forthcoming soon; please continue to hold these dates.

W&AR-14 Temperature Criteria Study Meeting

November 16 (1:00 pm – 4:00 pm): AGENDA attached. This Temperature Criteria Study Meeting is to update relicensing participants on the status of empirical studies proposed at the April 2012 meeting. Written background materials on proposed studies will be provided next week.

ROSE STAPLESHDR Engineering, Inc.CAP-OMExecutive Assistant, Hydropower Services

970 Baxter Boulevard, Suite 301 | Portland, ME 04103 207.239.3857 | f: 207.775.1742 rose.staples@hdrinc.com | hdrinc.com From: Sent: To: Staples, Rose

Monday, November 05, 2012 6:26 PM

Asay, Lynette; Barnes, James; Barnes, Peter; Beniamine Beronia; Blake, Martin; Bond, Jack; Borovansky, Jenna; Boucher, Allison; Bowes, Stephen; Bowman, Art; Brenneman, Beth; Brewer, Doug; Buckley, John; Buckley, Mark; Burt, Charles; Byrd, Tim; Cadagan, Jerry; Carlin, Michael; Charles, Cindy; Colvin, Tim; Costa, Jan; Cowan, Jeffrey; Cox, Stanley Rob; Cranston, Peggy; Cremeen, Rebecca; Damin Nicole; Day, Kevin; Day, P; Denean; Derwin, Maryann Moise; Devine, John; Donaldson, Milford Wayne; Dowd, Maggie; Drekmeier, Peter; Edmondson, Steve; Eicher, James; Fargo, James; Ferranti, Annee; Ferrari, Chandra; Fety, Lauren; Findley, Timothy; Fuller, Reba; Furman, Donn W; Ganteinbein, Julie; Giglio, Deborah; Gorman, Elaine; Grader, Zeke; Gutierrez, Monica; Hackamack, Robert; Hastreiter, James; Hatch, Jenny; Hayat, Zahra; Hayden, Ann; Hellam, Anita; Heyne, Tim; Holley, Thomas; Holm, Lisa; Horn, Jeff; Horn, Timi; Hudelson, Bill; Hughes, Noah; Hughes, Robert; Hume, Noah; Jackson, Zac; Jauregui, Julia; Jennings, William; Jensen, Art; Jensen, Laura; Johannis, Mary; Johnson, Brian; Justin; Keating, Janice; Kempton, Kathryn; Kinney, Teresa; Koepele, Patrick; Kordella, Lesley; Lein, Joseph; Levin, Ellen; Lewis, Reggie; Linkard, David; Loy, Carin; Lwenya, Roselynn; Lyons, Bill; Madden, Dan; Manji, Annie; Marko, Paul; Marshall, Mike; Martin, Michael; Martin, Ramon; Mathiesen, Lloyd; McDaniel, Dan; McDevitt, Ray; McDonnell, Marty; McLain, Jeffrey; Mein Janis; Mills, John; Minami Amber; Monheit, Susan; Morningstar Pope, Rhonda; Motola, Mary; Murphey, Gretchen; Murray, Shana; O'Brien, Jennifer; Orvis, Tom; Ott, Bob; Ott, Chris; Paul, Duane; Pavich, Steve; Pinhey, Nick; Pool, Richard; Porter, Ruth; Powell, Melissa; Puccini, Stephen; Raeder, Jessie; Ramirez, Tim; Rea, Maria; Reed, Rhonda; Richardson, Kevin; Ridenour, Jim; Robbins, Royal; Romano, David O; Roos-Collins, Richard; Roseman, Jesse; Rothert, Steve; Sandkulla, Nicole; Saunders, Jenan; Schutte, Allison; Sears, William; Shakal, Sarah; Shipley, Robert; Shumway, Vern; Shutes, Chris; Sill, Todd; Slay, Ron; Smith, Jim; Staples, Rose; Stapley, Garth; Steindorf, Dave; Steiner, Dan; Stender, John; Stone, Vicki; Stork, Ron; Stratton, Susan; Taylor, Mary Jane; Terpstra, Thomas; TeVelde, George; Thompson, Larry; Vasquez, Sandy; Verkuil, Colette; Vierra, Chris; Wantuck, Richard; Welch, Steve; Wesselman, Eric; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas; Wilcox, Scott; Williamson, Harry; Willy, Allison; Wilson, Bryan; Winchell, Frank; Wooster, John; Workman, Michelle; Yoshiyama, Ron; Zipser, Wayne Don Pedro Tuolumne River Chinook salmon - O mykiss Population Studies Modeling Workshop AGENDA - Live Meeting Link

Attachments: Don Pedro W-AR 6 - W-AR 10 Workshop Nov 2012_AGENDA_121105.pdf

Tuolumne River Chinook salmon (W&AR-6) and *O. mykiss* Population (W&AR-10) Studies Modeling Workshop No. 1

November 15–16, 2012 – MID Offices

Conference Line Call-In Number 866-994-6437; Conference Code 5424697994

.....

Join online meeting https://meet.hdrinc.com/jenna.borovansky/3D64F0F5

First online meeting?

Subject:

Thursday, November 15th Agenda

9:00 a.m. – 10:00 a.m.

Introductions and Background 1. Purpose of Meeting

	2. Review of W&AR-5 Workshop No. 2 Comments and Consultation Process
10.00	3. Relationship to Other Studies
10:00 a.m. – 12:00 p.m.	Discussion of Key Resource Issues Affecting Tuolumne River Salmonids
	1. Fall-run Chinook salmon
	2. Central Valley O. mykiss
12:00 p.m. – 1:00 p.m.	Lunch (on your own)
1:00 p.m. – 4:30 p.m.	W&AR-6: Modeling of In-River Factors Affecting Chinook salmon
	1. Review of Prior Population Models
	2. Modeling Approach to Address Key Resource Issues Affecting Juvenile
	Production
	3. Selection of Parameters to be Modeled
	4. Initial Hypothesis Development
Friday, November 1	<u>16th Agenda</u>
9:00 a.m. – 11:30 a.m.	W&AR-10: Modeling of In-River Factors Affecting O. mykiss
	1. Introductions

- 2. Modeling Approach to Address Key Resource Issues Affecting Juvenile Production
- 3. Selection of Parameters to be Modeled
- 4. Initial Hypothesis Development

11:30 a.m. – 12:00 p.m. Next Steps

 ROSE STAPLES
CAP-OM
 HDR Engineering, Inc.
Executive Assistant, Hydropower Services

 970 Baxter Boulevard, Suite 301 | Portland, ME 04103
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rose.staples@hdrinc.com | hdrinc.com





Tuolumne River Chinook salmon (W&AR-6) and O. mykiss Population (W&AR-10) Studies Modeling Workshop No. 1 November 15–16, 2012 – MID Offices

Conference Line Call-In Number 866-994-6437; Conference Code 5424697994

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Friday, November 16 th As	genda
9:00 a.m. – 11:30 a.m.	W&AR-10: Modeling of In-River Factors Affecting
	O. mykiss
	1. Introductions
	2. Modeling Approach to Address Key Resource Issues
	Affecting Juvenile Production
	3. Selection of Parameters to be Modeled
	4. Initial Hypothesis Development
11:30 a.m. – 12:00 p.m.	Next Steps

From: Sent: To: Staples, Rose

Thursday, November 15, 2012 9:06 AM

Amerine, Bill; Asay, Lynette; Barnes, James; Barnes, Peter; Beniamine Beronia; Blake, Martin; Bond, Jack; Borovansky, Jenna; Boucher, Allison; Bowes, Stephen; Bowman, Art; Brenneman, Beth; Brewer, Doug; Buckley, John; Buckley, Mark; Burt, Charles; Byrd, Tim; Cadagan, Jerry; Carlin, Michael; Charles, Cindy; Colvin, Tim; Costa, Jan; Cowan, Jeffrey; Cox, Stanley Rob; Cranston, Peggy; Cremeen, Rebecca; Damin Nicole; Day, Kevin; Day, P; Denean; Derwin, Maryann Moise; Devine, John; Donaldson, Milford Wayne; Dowd, Maggie; Drekmeier, Peter; Edmondson, Steve; Eicher, James; Fargo, James; Ferranti, Annee; Ferrari, Chandra; Fety, Lauren; Findley, Timothy; Fleming, Mike; Fuller, Reba; Furman, Donn W; Ganteinbein, Julie; Giglio, Deborah; Gorman, Elaine; Grader, Zeke; Gutierrez, Monica; Hackamack, Robert; Hastreiter, James; Hatch, Jenny; Hayat, Zahra; Hayden, Ann; Hellam, Anita; Heyne, Tim; Holley, Thomas; Holm, Lisa; Horn, Jeff; Horn, Timi; Hudelson, Bill; Hughes, Noah; Hughes, Robert; Hume, Noah; Jackson, Zac; Jauregui, Julia; Jennings, William; Jensen, Art; Jensen, Laura; Johannis, Mary; Johnson, Brian; Justin; Keating, Janice; Kempton, Kathryn; Kinney, Teresa; Koepele, Patrick; Kordella, Lesley; Le, Bao; Lein, Joseph; Levin, Ellen; Lewis, Reggie; Linkard, David; Loy, Carin; Lwenya, Roselynn; Lyons, Bill; Madden, Dan; Manji, Annie; Marko, Paul; Marshall, Mike; Martin, Michael; Martin, Ramon; Mathiesen, Lloyd; McDaniel, Dan; McDevitt, Ray; McDonnell, Marty; Mein Janis; Mills, John; Minami Amber; Monheit, Susan; Morningstar Pope, Rhonda; Motola, Mary; Murphey, Gretchen; Murray, Shana; O'Brien, Jennifer; Orvis, Tom; Ott, Bob; Ott, Chris; Paul, Duane; Pavich, Steve; Pinhey, Nick; Pool, Richard; Porter, Ruth; Powell, Melissa; Puccini, Stephen; Raeder, Jessie; Ramirez, Tim; Rea, Maria; Reed, Rhonda; Richardson, Kevin; Ridenour, Jim; Riggs T; Robbins, Royal; Romano, David O; Roos-Collins, Richard; Roseman, Jesse; Rothert, Steve; Sandkulla, Nicole; Saunders, Jenan; Schutte, Allison; Sears, William; Shakal, Sarah; Shipley, Robert; Shumway, Vern; Shutes, Chris; Sill, Todd; Slay, Ron; Smith, Jim; Staples, Rose; Stapley, Garth; Steindorf, Dave; Steiner, Dan; Stender, John; Stone, Vicki; Stork, Ron; Stratton, Susan; Taylor, Mary Jane; Terpstra, Thomas; TeVelde, George; Thompson, Larry; Vasquez, Sandy; Verkuil, Colette; Vierra, Chris; Wantuck, Richard; Welch, Steve; Wesselman, Eric; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas; White, David K; Wilcox, Scott; Williamson, Harry; Willy, Allison; Wilson, Bryan; Winchell, Frank; Wooster, John; Workman, Michelle; Yoshiyama, Ron; Zipser, Wayne Don Pedro Nov 15 Workshop Materials Posted on Relicensing Website

Subject:

I have just completed posting on the Don Pedro Relicensing website (<u>www.donpedro-relicensing.com</u>) materials to be used with today's W&AR-06 and W&AR-10 Studies Workshop No. 1 being held at the MID Offices in Modesto. The materials are:

- (1) Upload of the previously released Workshop Agenda, including the Live Meeting Link and the audio conference call-in number
- (2) Workshop PowerPoint presentation
- (3) W&AR-06 Preliminary Processes and Parameters for In-River Production Modeling

These documents are attached to both the meeting notice on the MEETING CALENDAR (accessed via the MEETINGS tab) and the announcement under the INTRODUCTION tab. If you have any difficulties locating and/or accessing these documents, please let me know.

Thank you.

ROSE STAPLES CAP-OM

HDR Engineering, Inc. Executive Assistant, Hydropower Services





Tuolumne River Chinook salmon (W&AR-6) and O. mykiss Population (W&AR-10) Studies Modeling Workshop No. 1 November 15–16, 2012 – MID Offices

Conference Line Call-In Number 866-994-6437; Conference Code 5424697994

Join online meeting https://meet.hdrinc.com/jenna.borovansky/3D64F0F5

First online meeting?

Thursday, November 15th Agenda

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•	River Salmonids
	1. Fall-run Chinook salmon
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	1. Review of Prior Population Models
	2. Modeling Approach to Address Key Resource Issues
	Affecting Juvenile Production
	3. Selection of Parameters to be Modeled
	4. Initial Hypothesis Development
Friday, November 16 th As	genda
9:00 a.m. – 11:30 a.m.	W&AR-10: Modeling of In-River Factors Affecting
	O. mykiss
	1. Introductions
	2. Modeling Approach to Address Key Resource Issues
	Affecting Juvenile Production
	3. Selection of Parameters to be Modeled
	4. Initial Hypothesis Development
11:30 a.m. – 12:00 p.m.	Next Steps

Tuolumne River Chinook salmon (W&AR-6) and O. mykiss Population (W&AR-10) studies

Modeling Workshop No. 1

November 15–16, 2012

Don Pedro Project Relicensing FERC Project No. 2299

Agenda/Overview

Introductions and Background

- 1. Purpose of Meeting
- 2. W&AR-5 Workshop No. 2 Comments and Consultation Process
- 3. Relationship to Other Studies

Discussion of Key Resource Issues Affecting Tuolumne River Salmonids

- 1. Fall-run Chinook salmon
- 2. Central Valley steelhead/O. mykiss

W&AR-6: Modeling of In-River Factors Affecting Chinook salmon

- 1. Review of Prior Population Models
- 2. Modeling Approach to Address Key Resource Issues Affecting Juvenile Production
- 3. Selection of Parameters to be Modeled
- 4. Preliminary Hypotheses and Modeling Scenarios

Agenda/Overview

W&AR-10: Modeling of In-River Factors Affecting Central Valley steelhead and resident *O. mykiss*

- 1. Introductions
- 2. Modeling Approach to Address Key Resource Issues Affecting Juvenile Production
- 3. Selection of Parameters to be Modeled
- 4. Preliminary Hypothesis and Modeling Scenarios

Next Steps

Introduction

Workshop No. 1 Purpose

- Develop hypotheses on the relative influence of identified issues on juvenile Chinook salmon and steelhead/O. mykiss production
- Discuss preliminary modeling approaches and parameters
- Identify preliminary modeling scenarios

W&AR-5 Workshop No. 2 Comments and Consultation Process

Relationships to other Studies

- Information Review and Conceptual Model Development (Study W&AR-5)
- Spawning Gravel Conditions (Studies W&AR-4 and 8)
- Predation Study (W&AR-7)
- *O. mykiss* related studies (W&AR-12, 13, and 20)
- Temperature Criteria Assessment Study (W&AR-14)
- Ongoing Instream Flow Studies



Key Resource Issues Affecting Tuolumne River Salmonids

New Don Pedro Project FERC Project No. 2299

Fall-run Chinook Salmon Up-migration

- Ocean productivity and Harvest
- Homing and straying
- Hatchery origin fish
- Seasonal water temperatures





Escapement

New Don Pedro Project FERC Project No. 2299

Chinook salmon Spawning, Egg Incubation, & Fry Emergence

- Redd superimposition
- Gravel quality
- Seasonal water temperatures



Chinook salmon In-River Rearing & Outmigration

- Historical habitat changes, and predation
- Flow & temperature effects on salmon habitat, smolt outmigration, and vulnerability to predation
- Flow & temperature effects on predator habitat, year class success, and activity

Delta Rearing & Outmigration

- Predation
- Water temperature mortality
- Entrainment-related mortality by CVP and SWP exports
- Reductions in marsh and floodplain habitat, changes in tributary flow magnitudes and timing reduce access to food
- Low primary and secondary productivity in Delta

Ocean Rearing

- Variations in ocean circulation patterns and food web productivity
- Density-dependent competition with hatchery-origin fish
- Ocean harvest

New Don Pedro Project FERC Project No. 2299

Central Valley steelhead/ O. mykiss Life history



Central Valley steelhead/O. mykiss Upmigration

- Flow effects on homing and straying from other rivers
- Straying of hatchery-origin fish

Spawning, Egg Incubation, & Fry Emergence

- Redd superimposition (unknown) ?
- Gravel quality (unknown) ?
- Seasonal water temperatures (unknown) ?

In-River Rearing & Outmigration

- Summer rearing habitat (Age 0+, 1+ and older) Fish density, structural elements, water temperatures
- Predation (unknown) ?

Key Resource Issues Affecting Tuolumne River Salmonids

Central Valley steelhead Delta Rearing/ Outmigration

- Water temperature mortality (late out-migrants) ?
- Entrainment-related mortality by CVP and SWP exports
- Reductions in marsh and floodplain habitat, changes in tributary flow magnitudes and timing reduce access to food
- Low primary and secondary productivity in Delta

Ocean Rearing

• Variations in ocean circulation patterns and food web productivity

W&AR-6: Modeling In-River Factors Affecting Chinook salmon

Review of Prior Population Models

- EACH population model (TID/MID 1992, App 1)
- State-Space model (TID/MID 1992, App 2; TID/MID 1997, Report 96-5)
- Oak Ridge Chinook Salmon model (Jager and Rose 2003)
- CDFG (2005) San Joaquin River Salmon Population Model



W&AR-6: Modeling In-River Factors Affecting Chinook salmon

New Don Pedro Project FERC Project No. 2299

Modeling Approach to Address Key Resource Issues Affecting Juvenile Production

Stock Production approach (TID/MID 1992, CDFG 2005)



W&AR-6: Modeling In-River Factors Affecting Chinook salmon

New Don Pedro Project FERC Project No. 2299

Modeling Approach to Address Key Resource Issues Affecting Juvenile Production

Individual based approaches (e.g., Jager and Rose 2003)



W&AR-6: Modeling of In-River Factors Affecting Chinook salmon

New Don Pedro Project FERC Project No. 2299

Preliminary Processes/Parameters included in Model

- Adult Upmigration
 - Run timing
 - Run size and composition
- Spawning
 - Spawning habitat use
 - Egg Deposition
- Egg Incubation and Fry Emergence
 - Incubation rate
 - Redd superimposition mortality
 - Survival to emergence
- In-River Rearing and Smolt Emigration
 - Rearing habitat use
 - Juvenile migration/ movement
 - Growth rate
 - Predation Mortality
 - Temperature Mortality
 - Smoltification



W&AR-6: Modeling of In-River Factors Affecting Chinook salmon

Model Validation

 Examine predicted juvenile production in comparison to recent rotary screw trap estimates

Preliminary Hypotheses and Modeling Scenarios for Discussion

 Potential scenarios to examine: spawning habitat limitations, rearing habitat limitations, alternative flow and water temperature conditions

W&AR-10: Modeling of In-River Factors Affecting *O. mykiss*

New Don Pedro Project FERC Project No. 2299

Preliminary Processes/Parameters included in Model

- Adult Upmigration
 - Run timing
 - Run size and composition
- Spawning
 - Spawning habitat use
 - Egg Deposition
- Egg Incubation and Fry Emergence
 - Incubation rate
 - Redd superimposition mortality
 - Survival to emergence
- In-River Rearing
 - Resident fish introduced over La Grange Dam
 - Rearing habitat use by Age Class
 - Juvenile migration/ movement
 - Growth rate by Age Class
 - Predation Mortality
 - Temperature Mortality
 - Potential Smoltification and emigration





W&AR-10: Modeling of In-River Factors Affecting *O. mykiss*

Model Validation

- Compare predicted versus observed population size and structure (2008-2011)
- Preliminary Hypotheses and Modeling Scenarios for Discussion
- Potential scenarios to examine: spawning habitat limitations, rearing habitat limitations, alternative flow and water temperature conditions

- 1. W&AR-6 and -10 Model Development
- 2. Parameter Sensitivity Testing
- 3. Workshop 2 and Scenario Selection


Tuolumne River Chinook salmon Population Model Study (W&AR-6) Preliminary Processes and Parameters for In-River Production Modeling

Modeled Process	Mechanism	Model Parameters/Inputs		
Adult Upmigration				
Run Timing	Air/Water Temperature,	Date of 1st and last spawner arrival, peak live		
	Pulse Flows	count date, historical arrival patterns		
Run Size	Antecedent adult	No. of spawners (2, 3, 4 yrs old)		
	recruitment and ocean			
	conditions			
Pre-spawn mortality	Water Temperature	Temperature by reach or RM		
Spawning				
Spawning Habitat Use	Competition/Exclusion	No. of spawners (2, 3, 4 yrs old), suitable		
		spawning area by reach or riffle (location)		
	Spawner Preferences	Flow and WUA (depth, vel. substrate)		
		Historical redd count frequency by RM		
Egg Deposition	Fish size and fecundity per	No. of spawners (2, 3, 4 yrs old), fish size at		
	spawner	age.		
Egg Incubation				
Incubation rate	Water Temperature	Temperature by reach or RM		
Redd superimposition	Adult competition/	Suitable gravel area by reach or riffle, no. of		
mortality	exclusion, egg shock/	spawners		
	displacement			
Survival to emergence	Sediment intrusion, intra-	Gravel texture (% Fines < 0.85 mm, 9.5 mm)		
	gravel flow, oxygen			
	delivery			
In-River Rearing and smolt emigration				
Rearing Habitat Use	Food availability, predator	Habitat area and temperature by reach/RM		
	avoidance	(riffle, run, pool)		
	Habitat Preference	WUA with flow (depth, vel.)		
Juvenile migration/	Competition/ exclusion,	Flow, movement rates by fish size		
movement	displacement			
Growth rate	Food Availability/Water	Temperature by reach or RM, Ration		
	Temperature			
Predation Mortality	Introduced species, Water	Predator/prey distribution by Reach/RM,		
	Temperature, encounter	encounter frequency (fish density, flow),		
	frequency	probablility of piscivory (fish size,		
		temperature, turbidity)		
Temperature Mortality	Physiological tolerances	Temperature by reach or RM		
Smoltification	Water Temperature, Food	Fish size at Date, Temperature		
	Availability			

O. mykiss Population Study (W&AR-10) Preliminary Processes and Parameters for In-River Production Modeling

Modeled Process	Mechanism	Model Parameters		
Adult Upmigration				
Run Timing	Air/Water Temperature,	Date of 1st and last spawner arrival, peak live count		
	Pulse Flows	date, historical arrival patterns		
Run Size	Antecedent adult	No. of spawners (3, 4, 5 yrs old) arriving from outside		
	recruitment and ocean	the Tuolumne River (anadromous or resident from		
	conditions	other SJ tributaries)		
Pre-spawn mortality	Water Temperature	Temperature by reach or RM		
Spawning				
Spawning Habitat Use	Competition/Exclusion	No. of anadromous and resident spawners (3, 4, 5 yrs		
		old), suitable spawning area by reach or riffle (location)		
	Spawner Preferences	WUA with flow (depth, vel. substrate)		
		Assume uniform or linear function with distance		
Egg Deposition	Fish size and fecundity per	No. of anadromous and resident spawners (3, 4, 5 yrs		
	spawner	old), fish size at age.		
Egg Incubation				
Incubation rate	Water Temperature	Temperature by reach or RM		
Redd superimposition	Adult competition/	Suitable gravel area by reach or riffle (location), no. of		
mortality	exclusion, egg shock/	spawners		
	displacement			
Survival to emergence	Sediment intrusion, intra-	Gravel texture (% Fines < 0.85 mm, 9.5 mm)		
	gravel flow, oxygen			
	delivery			
In-River Rearing				
Resident fish introduced	Entrainment in spill events	Flow threshold, No. of resident fish introduced (Age 0-4)		
over La Grange Dam	at La Grange			
Rearing Habitat Use by Age	Food availability, predator	Habitat area and temperature by reach/RM (riffle, run,		
Class (U+ vs older)	avoidance			
	Habitat Preference	WUA with flow (depth, vel.)		
Juvenile migration/	Competition/ exclusion,	Flow, movement rates by fish size		
movement	displacement			
Currently water has A and Class		Tana anatura hu usa sh an DNA Datian		
Growth rate by Age Class	Food Availability/water	Temperature by reach or RIVI, Ration		
	Temperature			
Due detieur Mentelitu	Interesting of the state Materia	Duadatan (anal diatrikutian ku Daash (DNA) anaguntan		
Predation Mortality	Introduced species, water	Predator/prey distribution by Reach/Rivi, encounter		
	femperature, encounter	(fich size, temperature, turbiditu)		
	nequency	(iisii size, temperature, turbiulty)		
Tomporaturo Mortality	Physiological tolorances	Tomporature by reach or PM		
Potential smalt	Water Temperature Food	Fish size at Date Temperature		
outmigration	Availability	ו ואו אובי מו שמוב, ובווואבומנטופ		
outiligration	πναπασιπτγ			

From: Sent: To:

Subject:

Staples, Rose

Thursday, December 13, 2012 2:27 PM

Alves, Jim; Amerine, Bill; Anderson, Craig; Asay, Lynette; Barnes, James; Barnes, Peter; Beniamine Beronia; Blake, Martin; Bond, Jack; Borovansky, Jenna; Boucher, Allison; Bowes, Stephen; Bowman, Art; Brenneman, Beth; Brewer, Doug; Buckley, John; Buckley, Mark; Burt, Charles; Byrd, Tim; Cadagan, Jerry; Carlin, Michael; Charles, Cindy; Colvin, Tim; Costa, Jan; Cowan, Jeffrey; Cox, Stanley Rob; Cranston, Peggy; Cremeen, Rebecca; Damin Nicole; Day, Kevin; Day, P; Denean; Derwin, Maryann Moise; Devine, John; Donaldson, Milford Wayne; Dowd, Maggie; Drekmeier, Peter; Edmondson, Steve; Eicher, James; Fargo, James; Ferranti, Annee; Ferrari, Chandra; Fety, Lauren; Findley, Timothy; Fleming, Mike; Fuller, Reba; Furman, Donn W; Ganteinbein, Julie; Giglio, Deborah; Gorman, Elaine; Grader, Zeke; Gutierrez, Monica; Hackamack, Robert; Hastreiter, James; Hatch, Jenny; Hayat, Zahra; Hayden, Ann; Hellam, Anita; Heyne, Tim; Holley, Thomas; Holm, Lisa; Horn, Jeff; Horn, Timi; Hudelson, Bill; Hughes, Noah; Hughes, Robert; Hume, Noah; Jackson, Zac; Jauregui, Julia; Jennings, William; Jensen, Art; Jensen, Laura; Johannis, Mary; Johnson, Brian; Justin; Keating, Janice; Kempton, Kathryn; Kinney, Teresa; Koepele, Patrick; Kordella, Lesley; Le, Bao; Lein, Joseph; Levin, Ellen; Lewis, Reggie; Linkard, David; Loy, Carin; Lwenya, Roselynn; Lyons, Bill; Madden, Dan; Manji, Annie; Marko, Paul; Marshall, Mike; Martin, Michael; Martin, Ramon; Mathiesen, Lloyd; McDaniel, Dan; McDevitt, Ray; McDonnell, Marty; Mein Janis; Mills, John; Minami Amber; Monheit, Susan; Morningstar Pope, Rhonda; Motola, Mary; Murphey, Gretchen; Murray, Shana; O'Brien, Jennifer; Orvis, Tom; Ott, Bob; Ott, Chris; Paul, Duane; Pavich, Steve; Pinhey, Nick; Pool, Richard; Porter, Ruth; Powell, Melissa; Puccini, Stephen; Raeder, Jessie; Ramirez, Tim; Rea, Maria; Reed, Rhonda; Richardson, Kevin; Ridenour, Jim; Riggs T; Robbins, Royal; Romano, David O; Roos-Collins, Richard; Roseman, Jesse; Rothert, Steve; Sandkulla, Nicole; Saunders, Jenan; Schutte, Allison; Sears, William; Shakal, Sarah; Shipley, Robert; Shumway, Vern; Shutes, Chris; Sill, Todd; Slay, Ron; Smith, Jim; Staples, Rose; Stapley, Garth; Steindorf, Dave; Steiner, Dan; Stender, John; Stone, Vicki; Stork, Ron; Stratton, Susan; Taylor, Mary Jane; Terpstra, Thomas; TeVelde, George; Thompson, Larry; Ulibarri, Nicola; Vasquez, Sandy; Verkuil, Colette; Vierra, Chris; Wantuck, Richard; Welch, Steve; Wesselman, Eric; Wheeler, Dan; Wheeler, Dave; Wheeler, Douglas; White, David K; Wilcox, Scott; Williamson, Harry; Willy, Allison; Wilson, Bryan; Winchell, Frank; Wooster, John; Workman, Michelle; Yoshiyama, Ron; Zipser, Wayne Don Pedro November 15 W-AR-6 and W-AR-10 TR Chinook salmon and O.mykiss Population Modeling Workshop Draft Notes for Review

Attachments: W-AR_6-10_ModelWkshp1_DrftMtgNotes_121213.doc

Attached please find the DRAFT Meeting Notes from the Don Pedro Project Relicensing Water & Aquatic Resources ("W&AR") Study No. 6: Tuolumne River Chinook salmon and W&AR-10: O.mykiss Population Modeling Studies Consultation Workshop held on November 15, 2012. The file with Attachments 1, 2, and 3 is being uploaded to the Don Pedro relicensing website <u>www.donpedro-relicensing.com</u>, both under the ANNOUNCEMENTS section (Introduction Tab) and attached to the November 15 Meeting Date.

Please provide any comments on the draft notes to me at <u>rose.staples@hdrinc.com</u> by no later than Monday, January 14, 2013. Thank you.

ROSE STAPLES CAP-OM

HDR Engineering, Inc.

ROSE STAPLES HDR Engineering, Inc.



March 18, 2013 Electronic Filing Don Pedro Project FERC No. 2299-075

Honorable Kimberly D Bose, Secretary Federal Energy Regulatory Commission Mail Code: DHAC PJ-12.3 888 First Street NE Washington DC 20426

RE: Turlock Irrigation District and Modesto Irrigation District
Don Pedro Project - FERC Project No. 2299
Final Meeting Notes and Responses to Relicensing Participant Comments on the
W&AR-6 and W&AR-10 Modeling Workshop No. 1 held on November 15, 2012

As part of the ongoing studies under the Integrated Licensing Process (ILP) for the Don Pedro Project (Project), the Turlock Irrigation District and the Modesto Irrigation District, colicensees of the Project (collectively, the "Districts") held their first relicensing participant meeting (Consultation Workshop No. 1) on November 15, 2012 as proposed in the Tuolumne River Chinook Salmon Population Model Study Plan (W&AR-6) and the *Oncorhynchus mykiss* Population Study Plan (W&AR-10) and approved by FERC in its December 22, 2011 Study Plan Determination (SPD).

The November 15, 2012 Workshop was held to review preliminary conceptual models developed as part of the interrelated Salmonid Information Integration and Synthesis Study ("Synthesis Study", W&AR-5) and to present the approaches and parameters to be used in the development of life-stage-specific population models in accordance with the Tuolumne River Chinook Salmon Population Model (Study Plan W&AR-6) and the *Oncorhynchus mykiss (O. mykiss)* Population Study (Study Plan W&AR-10). A meeting agenda was provided to relicensing participants on November 5, 2012 and materials for the Workshop— conceptual model diagrams and preliminary lists of processes and parameters for in-river production modeling—were uploaded to the Don Pedro website on November 15, 2012. At the workshop, relicensing participants and the Districts discussed the model framework and approach for investigating the relative influence of factors identified by the Synthesis Study.

Draft notes for Workshop No. 1 were provided to relicensing participants on December 13, 2012 for 30-day review. Relicensing participants were encouraged to identify potential modeling scenario suggestions to the Districts and to express needs and desired outcomes for the population models at the workshop, in comments to the distributed meeting notes, and at any time during the comment period.

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Comments on the draft notes were provided by the California Department of Fish and Wildlife (CDFW)¹ only. In accordance with Appendix B of FERC's December 22, 2011 Study Plan Determination and the Final Workshop Consultation Protocols filed with FERC on May 18, 2012, this letter provides draft and final meeting notes, as well as relicensing participant comments and supplemental materials within Attachments A through C below:

Attachment A:	Final Meeting Notes and Workshop Materials - W&AR-6 and		
	W&AR-10 Modeling Workshop No. 1		
Attachment B:	Draft Meeting Notes - W&AR-6 and W&AR-10 Modeling Workshop		
	No. 1		
Attachment C:	California Department of Fish and Wildlife Comments on Meetings		
	Notes of the Workshop regarding Water & Aquatic Resources Studies		
	No. 6 and 10 (Chinook Salmon and O. mykiss Population Modeling)		
	and regarding the Water Temperature Criteria Assessment Update,		
	Don Pedro Hydroelectric Project No. 2299, Tuolumne River		

Districts' Responses to California Dept. of Fish and Wildlife Comments

The Districts appreciate the time CDFW staff devoted to attend the Workshop and review materials for the W&AR-6 and W&AR-10 modeling studies. In their letter of January 14, 2013 (Attachment C), CDFW provided comments on areas addressed by the modeling studies, including (1) affected resource issues, (2) definition of study purpose, (3) modeling approach for *O. mykiss* production, and (4) freshwater sportfishing regulations.

- 1. *Affected resource issues*. CDFW commented on the Draft notes for Workshop No. 1, reemphasizing the importance of flow with references to prior study planning comment letters of October 25, 2011 and December 4, 2011, as well as comment letters of May 16, 2012 and August 24, 2012 regarding the issues identified in Workshops No. 1 and No. 2 for the Synthesis Study (W&AR-5). The Districts appreciate the importance of flow and the W&AR-6 and W&AR-10 population models will incorporate flow and water temperatures effects upon individual salmonid life stages.
- 2. *Study purpose definition*. The stated purpose of the model(s), in their respective study plans, is to examine the relative influences of various factors on life-stage specific production. In its comments CDFW recommended development of a clear statement of

¹ The California Dept. of Fish and Game (CDFG) was renamed California Dept. of Fish and Wildlife (CDFW) per Assembly Bill 2402, which was signed September 25, 2012 by Gov. Edmund G. Brown Jr.

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the question(s) the Districts' two population models seek to answer. Initial study questions were discussed during the afternoon workshop sessions regarding modeling in-river factors affecting Chinook salmon (W&AR-6) and *O. mykiss* (W&AR-10) and are provided in Attachment A. While study questions and modeling scenarios may not be framed as formal hypotheses tests, the intent of the initial model development and sensitivity testing will be to examine the relative influences of various model parameters (e.g., flow, gravel area, etc.) in affecting salmonid production. CDFW is encouraged to review the initial study questions developed at the workshop to help in the selection of modeling scenarios in upcoming workshops during 2013.

- 3. Modeling approach for O. mykiss production. CDFW indicated that existing monitoring data such as rotary screw trap (RST) recoveries may not be sufficient to establish modeling parameters for the model. The Districts agree that developing precise estimates of absolute juvenile O. mykiss or steelhead production are subject to the availability of existing monitoring data, including the RST data. The model will also benefit from additional Tuolumne-specific information on population size developed through intensive snorkel surveys (2008–2011), fish size and age class structure developed through the O. mykiss Scale Collection and Age Determination Study (W&AR-20), as well as long-term records of species distribution and fish sizes developed through routine snorkel surveys (2001–2011).
- 4. Freshwater sportfishing regulations. CDFW provided a correction regarding references to freshwater sportfishing regulations as they relate to the Tuolumne River. Specifically, an excerpt to the 2012–2013 Freshwater Sport Fishing Regulations² was provided, and a clarification that "Angling for *O. mykiss* is allowed January 1st through October 31st in the Tuolumne River below La Grange Dam to Hickman Bridge using artificial lures with barbless hooks. During this time period, there is a zero (0) bag or possession limit. From November 1st through December 31st, the season is closed." The Final Workshop notes (Attachment A) have been revised to provide the correct angling restrictions and dates.

² Trout, Salmon and Special Regulation (CCR, T14, Chapter 3, Article 2), Section 7.50 (Alphabetical List of Waters with Special Fishing Regulations). Available: <<u>http://www.dfg.ca.gov/regulations/FreshFish-Mar2012/ccr-t14-ch3-art3.html</u>>

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Finally, CDFW provided comments regarding the Districts' *Water Temperature Criteria Assessment Study* (W&AR-14). The Districts' appreciate these comments and will address them under a separate cover.

Sincerely,

John Deven

John Devine, P.E. Project Manager

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Attachment A Final Meeting Notes and Workshop Materials W&AR-6 and W&AR-10 Modeling Workshop No. 1

Don Pedro Project Relicensing W&AR-6 and W&AR-10 Modeling Workshop No. 1 Final Meeting Notes

Thursday, November 15, 2012

Attendees Peter Barnes – SWRCB Patrick Koepele – Tuolumne River Trust Peter Baker – Stillwater Bao Le – HDR Jenna Borovansky – HDR Ellen Levin – CCSF Allison Boucher – Tuolumne River Gretchen Murphey - CDFG Conservancy, by phone Heather Bowen – Stillwater Bob Nees – TID Steve Boyd – TID Bill Paris – MID John Buckley - Central Sierra Environmental Bill Sears – CCSF Resource Center Chris Shutes – CSPA John Devine – HDR Karl English – LGL, Ltd. Dale Stanton – CDFG Tim Findley – Bay Area Water Users Larry Thompson – NMFS Association Donn Furman – CCSF Nicola Ulibarri - Researcher, Stanford Univ. Joy Warren – MID Art Godwin - TID/MID Scott Wilcox - Stillwater Jim Hastreiter – FERC, by phone Noah Hume – Stillwater Alison Willy – USFWS Ron Yoshiyama - Independent Consultant Bill Johnston - MID

Introductions and Background – 9:00 AM to 9:45 AM

Following introduction of Relicensing Participants (RPs) in the room and on the telephone, Mr. Devine briefly summarized the overall purpose and goals of W&AR-6 and W&AR-10 Modeling Workshop No. 1, the first of two separate workshops that will be conducted, as recommended in the FERC Study Determination released December 22, 2011. The Workshop was conducted as a narrative and dialogue using the Agenda and on-screen PowerPoint slides (Attachment 1) as a starting point for additional discussion.

1. Purpose and Objectives of Workshop No. 1

- a. The purpose of W&AR-6 and -10 Workshop No. 1 was to collaboratively identify key parameters and inform development of life-stage-specific population models in accordance with the *Tuolumne River Chinook Salmon Population Model* (Study Plan W&AR-6) and the *Oncorhynchus mykiss (O. mykiss) Population Study* (Study Plan W&AR-10).
- b. The objectives of W&AR-6 and -10 Workshop No. 1 were to:
 - build upon RP discussions and life stage-specific conceptual models resulting from two workshops associated with the *Salmonid Population Information Integration and Synthesis* (Study Plan W&AR-5) which identified potential

limiting factors affecting the Tuolumne River fall-run Chinook salmon and *O. mykiss* populations;

- gather additional feedback from RPs regarding model framework and approach for investigating the relative influence of factors identified by W&AR-5; and to
- encourage RPs to express needs and desired outcomes for the salmon and *O*. *mykiss* population models during the workshop, in comments to the distributed meeting notes, and at any time during the comment period.

2. Review of W&AR-5 Workshop No. 2 Comments and Consultation Process

Mr. Hume provided an overview of the Consultation Process and notes on the W&AR-5 Workshop No. 2, which convened on June 26, 2012. He described adjustments made to the preliminary conceptual models and key issues identified during W&AR-5 Workshop No. 2 and comments received from RPs.

3. Relationship to other Studies

- a. As with W&AR-5, data regarding salmonid abundance, distribution, timing, and other information affecting salmonid life history will be drawn from prior FERC monitoring studies, ongoing Relicensing studies, and broader information sources for use in the development of the population models for W&AR-6 and W&AR-10. Specific Relicensing Studies with relevant information include:
 - Salmonid Population Information Integration and Synthesis (Study W&AR-5)
 - Spawning Gravel (StudyW&AR-4)
 - Salmonid Redd Mapping (Study W&AR-8)
 - *Predation Study* (Study W&AR-7)
 - Oncorhynchus mykiss Habitat Assessment (Study W&AR-12)
 - Temperature Criteria Assessment (Study W&AR-14); and
 - Prior FERC-Ordered Instream Flow (IFIM) Studies

Although some study results remain outstanding at this time, Mr. Devine indicated that many Relicensing studies will be completed by January 2013, in time for inclusion in the Initial Study Report (ISR).

- b. RPs discussed the potential for including data from ongoing FERC-ordered IFIM studies in the ISR and recognizing that the IFIM studies were not directed as part of the Don Pedro Relicensing process. RPs request that the ongoing IFIM studies be documented as part of the official Relicensing record.
 - Mr. Devine clarified that the Districts intend that the IFIM studies be included as part of the Administrative Record for the Relicensing
 - Mr. Wilcox indicated that although the IFIM study sampling schedule was delayed due to an absence of low flow conditions, efforts have been expedited in order to try to include draft IFIM results in the Initial Study Report.

Discussion of Key Resource Issues Affecting Tuolumne River Salmonids - 10:00 AM to 11:30 AM

Mr. Hume provided an overview of key resource issues identified as part of Study W&AR-5. Additionally, he presented updates to the fall-run Chinook salmon and Central Valley steelhead life-stage-specific conceptual models which were previously developed in collaboration with RPs during the W&AR-5 workshops and subsequently updated to reflect Study W&AR-5 findings. These updated conceptual lifecycle models (excerpted as part of Attachment 2) were provided in the Final W&AR-5 Workshop No. 2 notes posted to the FERC e-Library.

1. Fall-Run Chinook Salmon Discussion

The discussion points summarize RP feedback on the previously completed models included in the Final notes for W&AR-5 Workshop No. 2. Mr. Hume reminded the RPs that the conceptual models were an exercise to identify the relevant life-stage-specific factors that may affect Tuolumne River salmonids throughout the geographic range of the species' life history, including the Tuolumne River, lower San Joaquin River, Delta, and Ocean. Many of the comments below have been previously addressed or are included in the W&AR-5 Study Report ("synthesis"). Specific issues requiring revision to the models or study report are highlighted below.

- a. Mr. Shutes suggested including the direction of flow and hydrodynamics that occur at Delta export pumps as a key factor, as well as using the term "entrainment." Mr. Hume stated that reverse flows will be discussed as part of the synthesis.
- b. Mr. Koepele suggested delineating the smolt outmigration lifestage from the Delta juvenile rearing lifestage if analyses of effects are differentiated. Mr. Hume indicated that the present combination of life stages is intended to incorporate geographic distinction of in-river and out-of-river effects.
- c. Mr. Shutes suggested including the "Bay-Delta" in the assessment of Delta impacts. Mr. Hume confirmed that a discussion of Bay-Delta issues will be included in the synthesis.
- d. Ms. Willy requested further clarification of the terms "probability of indirect mortality" and "probability of direct mortality" and suggested combining these estimates. Mr. Hume indicated that he would consider this suggestion, but currently "indirect" sources were confined to stress and disease related effects.
- e. Multiple RPs discussed the recent trend in Tuolumne River Chinook salmon population abundances (See figures on slide 6 of Attachment 1). RPs indicated that the observed "boom and bust" pattern is likely natural to the populations of the Tuolumne and other San Joaquin River basin tributaries.
- f. RPs did not have feedback regarding the inclusion of ocean abundance, ocean productivity nor the effect of water year type as factors in the fall-run Chinook salmon quantitative population model.
- g. RPs did not provide comments regarding factors affecting the spawning and incubation lifestage.
- h. RPs suggested including the relationship between juvenile growth rate and water temperature and flow conditions in the "habitat component" of the fall-run Chinook salmon quantitative population model. Mr. Hume indicates that these physical processes influencing habitat were well discussed in the synthesis and will also be

included in the quantitative population models as part of Study W&AR-6. He also indicated that juvenile salmon studies in late 80s and early 90s as well as more recent smolt evaluations in 2001 (USFWS) suggest food is not limiting in the Tuolumne River.

2. Resident and Anadromous O. mykiss Discussion

Prior to reviewing key issues affecting *O. mykiss*, Mr. Hume provided a discussion on anadromous and resident life history strategies and indicated that the quantitative population model would be centered upon predicting juvenile production of resident *O. mykiss* of sufficient size to potentially become anadromous. Actual steelhead production cannot be predicted through a modeling exercise of this type. The following discussion summarizes RP feedback on the key issues summary and underlying conceptual models:

- a. RPs discussed *O. mykiss* sport-fishing-related impacts on the Tuolumne River. Ms. Murphey indicated that harvest is restricted year-round; angling using artificial lures and barbless hooks is allowed January 1st through October 31st from La Grange Dam to Hickman Bridge with a zero (0) bag or possession limit. From November 1st through December 31st, the season is closed.
- b. RPs suggest including spawning habitat availability and redd dewatering in the *O. mykiss* model. Mr. Hume indicated that the effect of redd dewatering was added to the spawning and egg incubation model subsequent to W&AR-5 Workshop No. 2 because recent studies suggest that timing of *O. mykiss* spawning may allow use of higher elevations in the margin habitat during flood control releases, that may potentially be dewatered during flood recession. However, he stated that the location of steelhead spawning in the Tuolumne River remains unknown. Ms. Borovansky confirmed that the salmonid redd surveys have been conducted bi-weekly, consistent with methodology described in Study W&AR-8, and will increase to a weekly sampling frequency.
- c. With regards to potential steelhead use of the river, RPs suggest including results from the salmonid tracking study in the synthesis. Mr. Hume indicated that the existing tracking study was somewhat inconclusive as the tagged fish generally remained near the locations where they were tagged, possibly indicating resident fish behavior.

{Lunch Break - 11:30 PM to 12:30 PM}

W&AR-6: Modeling of In-River Factors Affecting Chinook salmon – 12:30 PM to 3:30 PM

1. Review of Prior Population Models

- a. Mr. Hume and Mr. Baker provided a review of presently available population models that may be appropriate for modeling the salmonid populations in the Tuolumne River consistent with Studies W&AR-6 and W&AR-10.
- b. Four population models were described: (1) EACH population model; (2) State-Space model; (3) Oak Ridge Chinook Salmon Model; and (4) CDFG (2005) San Joaquin River Salmon Population Model.
- c. Mr. Stanton indicated that the release date of an updated CDFG (2005) model is unknown, potentially January 2013.

2. Modeling Approach to Address Key Resource Issues Affecting Juvenile Production

Mr. Baker suggested that a generalized stock-production model specific to each life stage would allow for environmental and potential management variables to be used in parameterizing the model. A multi-stage stock production model was described in the approved Study Plan as the preferred approach. RPs provided no comment regarding the preferred population model.

3. Selection of Parameters to be Modeled

Mr. Hume presented life-stage-specific processes and parameters preliminarily identified for modeling the in-river factors affecting the Tuolumne River fall-run Chinook salmon population (Attachment 3). RPs identified possible factors that may be used to parameterize the Chinook salmon population model, and discussed the availability of data appropriate for model parameterization. The following points summarize model parameterization considerations that were discussed among RPs:

- a. RPs requested consideration of water temperature effects on timing of Chinook salmon upstream migration and spawning. Mr. Hume stated that information on variations of immigration timing with temperature is limited for the Tuolumne River and not available for the San Joaquin Basin. USFWS and CDFG are currently conducting tracking studies to better inform this issue.
- b. Mr. Hume stated that data available for parameterizing run timing, size and composition may be limited. Arrival timing data for the Tuolumne is limited to visual observations at the La Grange Powerhouse (1981–2006) as well as recent weir passage timing since 2009. Arrival dates of fish collected at the Tuolumne weir may be inaccurate in some years due to the presence of upstream migrating Chinook salmon at, and potentially upstream of, the weir location prior to its installation. Other data sources include Merced Fish Facility data. RPs suggested that weir timing estimates from the Stanislaus River have been obtained since 2003 and may be reasonable for use.
- c. Water temperature effects will be included in the model to parameterize the in-river juvenile rearing life-stage. Growth rates of juveniles also will be included in the model and will likely be a function of water temperature and food ration.
- d. Justification for including different life history strategies of juvenile outmigration may be limited.

4. Initial Hypothesis Development.

Preliminary hypothesis and modeling scenarios were discussed, specifically regarding the RPs desired outcomes of the W&AR-6 model. In an effort to develop a model that best suited the RPs needs, RPs were asked to contribute feedback as soon as possible regarding potential gaps in the model or study questions they would like the model to address. RPs additionally discussed potential in-basin and out-of-basin data sources, and the different utility of these data sources in the models.

RPs identified several preliminary modeling questions and initial concerns, including the following:

a. What are the primary factors affecting the populations and how are the primary factors affecting population abundances? Mr. Hume suggested that although the primary factors (e.g., flow, temperature, habitat, etc.) have been informed by the W&AR-5 Study, assessment of their relative influence would be accomplished through sensitivity testing of the completed model.

- b. What is the basis of comparison using the model? Mr. Hume indicated that for Chinook salmon, the completed model will be compared to recent estimates of juvenile production as estimated by the RSTs at Waterford (RM 30) and Grayson (RM 5).
- c. What are the most appropriate flow timing, frequency, duration and magnitude of release for the benefit of salmonids populations? Mr. Hume stated this will largely be the focus of various scenarios developed in the 2nd workshop.
- d. Will the model be transparent such that a modeler will be able to select to include a variety of parameters? Mr. Baker indicated that all programming will be clearly documented.
- e. If a limiting factor is later identified, would the integration of a sub-model be possible? Mr. Baker indicated that it should be possible to provide additional sub-models in the future.
- f. Will turbidity be included as a factor affecting upstream migrating *O. mykiss* and downstream migration of juvenile Chinook salmon and *O. mykiss*? Noah Hume indicated that there may be insufficient data to parameterize model responses to turbidity, but that this could be considered.
- g. Are there ways to adaptively inform the model with future management actions? Can the model be used as part of an adaptive management program? Mr. Hume indicated that the model design did not contemplate that specific purpose.
- h. Will the model allow for a sensitivity analysis to be conducted in order to evaluate and prioritize actions? Mr. Hume indicated that yes, this was the intention of the Study Plan.
- i. In what format will the model be developed? Mr. Baker indicated that programming will likely be completed in the 'R' software, which is available in the public domain. Programming the model in MS Excel would be too restrictive, and the coding difficult to follow.
- j. Could an interface such as MS Excel be considered? Mr. Baker indicated that MS Excel will likely be used for Input and Output and that implementing a user interface in Excel will be explored.

W&AR-10: Modeling of In-River Factors Affecting *O. mykiss* – 3:30 PM to 4:00PM

Mr. Devine asked if RPs were in agreement to alter the original agenda and move ahead to discuss details of modeling in-river factors affecting the *O. mykiss* population in the Tuolumne River (previously scheduled to occur November 16, 2012 from 9AM to 12PM). RPs agreed that the topic could be covered today, and a November 16, 2012 session was not necessary.

1. Review of Prior Population Models

The presently available population models that may be appropriate for modeling the salmonid populations in the Tuolumne River consistent with Studies W&AR-6 and W&AR-10 were previously discussed. See the overview of other population models provided above in the *Modeling of In-River Factors Affecting Chinook Salmon*.

2. Modeling Approach to Address Key Resource Issues Affecting Juvenile Production

A multi-stage stock production model was proposed to RPs as the preferred approach to address key resources affecting Tuolumne River *O. mykiss*. Similar to that of the fall-run Chinook salmon modeling approach (see the overview provided in the *Modeling of In-River Factors Affecting Chinook Salmon* above), the objective will be to anchor the modeling parameters to existing monitoring data. RPs did not provide comment regarding the preferred population model at this time.

3. Selection of Parameters to be Modeled

Mr. Hume presented life-stage-specific processes and parameters preliminarily identified for modeling the in-river factors affecting the Tuolumne River *O. mykiss* population (Attachment 3). RPs identified possible factors that may be used to parameterize the *O. mykiss* population model, and discussed the availability of data appropriate for model parameterization.

The following points summarize model parameterization considerations that were discussed among RPs:

- a. Presently available data regarding steelhead is restricted to other Central Valley streams, given that Tuolumne River-specific data is largely limited to resident fish. Parameters specific to *O. mykiss* may be informed by available information from other river systems and populations. Additionally, mechanisms similar to those included in W&AR-6 will be assumed.
- b. Both anadromous and resident life history strategies will be included in the model as a single population.
- c. The *O. mykiss* population model will be restricted to in-river factors.
- d. Water temperature and ration estimates will be used to model fish size at age corresponding to potential smolt outmigrants.
- e. *O. mykiss* populations located in the reach of the Tuolumne River between La Grange Dam and Don Pedro Dam will be considered as a potential source of additional juveniles or older age-classes during high flow conditions. There was some discussion of potential genetic differences between these populations, but this will not be considered in the population model.

4. Initial Hypothesis Development

Preliminary hypothesis and modeling scenarios were discussed, specifically regarding the RPs desired outcomes of the W&AR-10 model. In an effort to develop a model that is best suited to the RPs needs, RPs were asked to contribute feedback as soon as possible regarding potential gaps in the model or study questions they would like the model to address. RPs additionally discussed potential in-basin and out-of-basin data sources, and the different utility of these data sources in the models.

RPs identified several preliminary modeling questions and initial concerns, including the following:

- a. Will otolith data be available for use in the model? Mr. Hume indicated that yes, this data has been invaluable to indicate the age structure and year-over-year growth rates of *O. mykiss* in the Tuolumne River.
- b. Ms. Boucher requested that the model consider predator movement within the Tuolumne River relative to flow and water temperature conditions as well as predator effects on the distribution of rearing juvenile *O. mykiss*. Mr. Hume indicated that although predator movements will not be modeled, predator distribution will be considered in development of the model. RPs suggested that resident bass located

within mining pits may have a greater impact on juvenile *O. mykiss* survival than striped bass because of life history timing.

c. RPs discussed the inclusion of a modeling scenario addressing juvenile recruitment relative to floodplain habitat suitability.

Next Steps/Action Items – 4:00 PM to 4:10 PM

- 1. RPs are requested to submit potential modeling scenario suggestions to the Relicensing Team as soon as possible. Scenarios will be developed as part of Modeling Workshop No. 2.
- Mr. Hume will integrate the previously developed conceptual model diagram elements from Study W&AR-5 for use in highlighting modeled factors in Modeling Workshop No. 2.
- 3. Mr. Baker and the rest of the Stillwater team will move forward with model development and begin parameterization and testing. Preliminary results will be available for presentation in Modeling Workshop No. 2.
- 4. Mr. Devine indicated that RP Modeling Workshop No. 2 is anticipated to occur during March 2013. Scheduling specifics for Modeling Workshop No. 2 will be issued as soon as possible. RPs propose the third or fourth week of March 2013.

Attachments

- Attachment 1: Agenda and Modeling Workshop No. 1 Slides
- Attachment 2: Revised W&AR-5 Conceptual Model Diagrams (excerpted from Synthesis Workshop No. 2 Final Notes)
- Attachment 3: Preliminary Processes and Parameters for In-River Production Modeling of Tuolumne River salmonids (Studies W&AR-6 and W&AR-10)

Attachment 1 Agenda and Modeling Workshop No. 1 Slides W&AR-6 and 10 Population Modeling Workshop No. 1





Tuolumne River Chinook salmon (W&AR-6) and O. mykiss Population (W&AR-10) Studies Modeling Workshop No. 1 November 15–16, 2012 – MID Offices Conference Line Call-In Number 866-994-6437; Conference Code 5424697994

Conference Line Call-In Number 866-994-6437; Conference Code 542469

Join online meeting https://meet.hdrinc.com/jenna.borovansky/3D64F0F5

First online meeting?

Thursday, November 15th Agenda

9:00 a.m. – 10:00 a.m.	Introductions and Background	
	1. Purpose of Meeting	
	2. Review of W&AR-5 Workshop No. 2 Comments and Consultation Process	
	3. Relationship to Other Studies	
10:00 a.m. – 12:00 p.m.	Discussion of Key Resource Issues Affecting Tuolumne	
-	River Salmonids	
	1. Fall-run Chinook salmon	
	2. Central Valley O. mykiss	
12:00 p.m. – 1:00 p.m.	Lunch (on your own)	
1:00 p.m. – 4:30 p.m.	W&AR-6: Modeling of In-River Factors Affecting Chinook salmon	
	1. Review of Prior Population Models	
	2. Modeling Approach to Address Key Resource Issues	
	Affecting Juvenile Production	
	3. Selection of Parameters to be Modeled	
	4. Initial Hypothesis Development	
Friday, November 16 th As	genda	
9:00 a.m. – 11:30 a.m.	W&AR-10: Modeling of In-River Factors Affecting	
	O. mykiss	
	1. Introductions	
	2. Modeling Approach to Address Key Resource Issues	
	Affecting Juvenile Production	
	3. Selection of Parameters to be Modeled	
	4. Initial Hypothesis Development	
11:30 a.m. – 12:00 p.m.	Next Steps	

ΡM

Tuolumne River Chinook salmon (W&AR-6) and O. mykiss Population (W&AR-10) studies

Modeling Workshop No. 1

November 15–16, 2012

Don Pedro Project Relicensing FERC Project No. 2299

Agenda/Overview

New Don Pedro Project FERC Project No. 2299

Introductions and Background

- 1. Purpose of Meeting
- 2. W&AR-5 Workshop No. 2 Comments and Consultation Process
- 3. Relationship to Other Studies

Discussion of Key Resource Issues Affecting Tuolumne River Salmonids

- 1. Fall-run Chinook salmon
- 2. Central Valley steelhead/O. mykiss

W&AR-6: Modeling of In-River Factors Affecting Chinook salmon

- 1. Review of Prior Population Models
- 2. Modeling Approach to Address Key Resource Issues Affecting Juvenile Production
- 3. Selection of Parameters to be Modeled
- 4. Preliminary Hypotheses and Modeling Scenarios

Agenda/Overview

New Don Pedro Project FERC Project No. 2299

W&AR-10: Modeling of In-River Factors Affecting Central Valley steelhead and resident *O. mykiss*

- 1. Introductions
- 2. Modeling Approach to Address Key Resource Issues Affecting Juvenile Production
- 3. Selection of Parameters to be Modeled
- 4. Preliminary Hypothesis and Modeling Scenarios

Next Steps

Introduction

New Don Pedro Project FERC Project No. 2299

Workshop No. 1 Purpose

- Develop hypotheses on the relative influence of identified issues on juvenile Chinook salmon and steelhead/O. mykiss production
- Discuss preliminary modeling approaches and parameters
- Identify preliminary modeling scenarios

W&AR-5 Workshop No. 2 Comments and Consultation Process

Relationships to other Studies

- Information Review and Conceptual Model Development (Study W&AR-5)
- Spawning Gravel Conditions (Studies W&AR-4 and 8)
- Predation Study (W&AR-7)
- O. mykiss related studies (W&AR-12, 13, and 20)
- Temperature Criteria Assessment Study (W&AR-14)
- Ongoing Instream Flow Studies

Key Resource Issues Affecting New Don Pedro Project **Tuolumne River Salmonids** FERC Project No. 2299 Fall-run Chinook Salmon Life history **UPMIGRANT ADULTS SPAWNERS** San Joaquin River **Tuolumne** River EGGS OCEAN ADULTS Ocean Delta Bay ALEVINS YEAR 0+ SMOLTS **FRY/JUVENILES** YEAR 1+ SMOLTS

New Don Pedro Project FERC Project No. 2299

Fall-run Chinook Salmon Up-migration

- Ocean productivity and Harvest
- Homing and straying
- Hatchery origin fish
- Seasonal water temperatures





Sacramento Basin Harvest and Escapement

New Don Pedro Project FERC Project No. 2299

Chinook salmon Spawning, Egg Incubation, & Fry Emergence

- Redd superimposition
- Gravel quality
- Seasonal water temperatures



New Don Pedro Project FERC Project No. 2299

Chinook salmon In-River Rearing & Outmigration

- Historical habitat changes, and predation
- Flow & temperature effects on salmon habitat, smolt outmigration, and vulnerability to predation
- Flow & temperature effects on predator habitat, year class success, and activity

New Don Pedro Project FERC Project No. 2299

Delta Rearing & Outmigration

- Predation
- Water temperature mortality
- Entrainment-related mortality by CVP and SWP exports
- Reductions in marsh and floodplain habitat, changes in tributary flow magnitudes and timing reduce access to food
- Low primary and secondary productivity in Delta

Ocean Rearing

- Variations in ocean circulation patterns and food web productivity
- Density-dependent competition with hatchery-origin fish
- Ocean harvest

New Don Pedro Project FERC Project No. 2299

Central Valley steelhead/ O. mykiss Life history



New Don Pedro Project FERC Project No. 2299

Central Valley steelhead/O. mykiss Upmigration

- Flow effects on homing and straying from other rivers
- Straying of hatchery-origin fish

Spawning, Egg Incubation, & Fry Emergence

- Redd superimposition (unknown) ?
- Gravel quality (unknown) ?
- Seasonal water temperatures (unknown) ?

In-River Rearing & Outmigration

- Summer rearing habitat (Age 0+, 1+ and older) Fish density, structural elements, water temperatures
- Predation (unknown) ?

New Don Pedro Project FERC Project No. 2299

Central Valley steelhead Delta Rearing/ Outmigration

- Water temperature mortality (late out-migrants) ?
- Entrainment-related mortality by CVP and SWP exports
- Reductions in marsh and floodplain habitat, changes in tributary flow magnitudes and timing reduce access to food
- Low primary and secondary productivity in Delta

Ocean Rearing

• Variations in ocean circulation patterns and food web productivity

W&AR-6: Modeling In-River Factors Affecting Chinook salmon

New Don Pedro Project FERC Project No. 2299

Review of Prior Population Models

- EACH population model (TID/MID 1992, App 1)
- State-Space model (TID/MID 1992, App 2; TID/MID 1997, Report 96-5)
- Oak Ridge Chinook Salmon model (Jager and Rose 2003)
- CDFG (2005) San Joaquin River Salmon Population Model



W&AR-6: Modeling In-River Factors Affecting Chinook salmon

New Don Pedro Project FERC Project No. 2299

Modeling Approach to Address Key Resource Issues Affecting Juvenile Production

Stock Production approach (TID/MID 1992, CDFG 2005)



W&AR-6: Modeling In-River Factors Affecting Chinook salmon

New Don Pedro Project FERC Project No. 2299

Modeling Approach to Address Key Resource Issues Affecting Juvenile Production

Individual based approaches (e.g., Jager and Rose 2003)



W&AR-6: Modeling of In-River Factors Affecting Chinook salmon

New Don Pedro Project FERC Project No. 2299

Preliminary Processes/Parameters included in Model

- Adult Upmigration
 - Run timing
 - Run size and composition
- Spawning
 - Spawning habitat use
 - Egg Deposition
- Egg Incubation and Fry Emergence
 - Incubation rate
 - Redd superimposition mortality
 - Survival to emergence
- In-River Rearing and Smolt Emigration
 - Rearing habitat use
 - Juvenile migration/ movement
 - Growth rate
 - Predation Mortality
 - Temperature Mortality
 - Smoltification



W&AR-6: Modeling of In-River Factors Affecting Chinook salmon

New Don Pedro Project FERC Project No. 2299

Model Validation

 Examine predicted juvenile production in comparison to recent rotary screw trap estimates

Preliminary Hypotheses and Modeling Scenarios for Discussion

 Potential scenarios to examine: spawning habitat limitations, rearing habitat limitations, alternative flow and water temperature conditions

W&AR-10: Modeling of In-River Factors Affecting *O. mykiss*

New Don Pedro Project FERC Project No. 2299

Preliminary Processes/Parameters included in Model

- Adult Upmigration
 - Run timing
 - Run size and composition
- Spawning
 - Spawning habitat use
 - Egg Deposition
- Egg Incubation and Fry Emergence
 - Incubation rate
 - Redd superimposition mortality
 - Survival to emergence
- In-River Rearing
 - Resident fish introduced over La Grange Dam
 - Rearing habitat use by Age Class
 - Juvenile migration/ movement
 - Growth rate by Age Class
 - Predation Mortality
 - Temperature Mortality
 - Potential Smoltification and emigration




W&AR-10: Modeling of In-River Factors Affecting *O. mykiss*

New Don Pedro Project FERC Project No. 2299

Model Validation

• Compare predicted versus observed population size and structure (2008-2011)

Preliminary Hypotheses and Modeling Scenarios for Discussion

• Potential scenarios to examine: spawning habitat limitations, rearing habitat limitations, alternative flow and water temperature conditions

Next Steps

New Don Pedro Project FERC Project No. 2299

- 1. W&AR-6 and -10 Model Development
- 2. Parameter Sensitivity Testing
- 3. Workshop 2 and Scenario Selection



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Attachment 2 Revised W&AR-5 Conceptual Model Diagrams (excerpted from Synthesis Workshop No. 2 Final Notes)







Chinook In-River Rearing/Outmigration





Process/Mechanism

Biotic Response

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Process/Mechanism



Attachment 3 Preliminary Processes and Parameters for In-River Production Modeling of Tuolumne River salmonids W&AR-6 and 10 Population Modeling Workshop No. 1

Tuolumne River Chinook salmon Population Model Study (W&AR-6) Preliminary Processes and Parameters for In-River Production Modeling

Modeled Process	Mechanism	Model Parameters/Inputs
Adult Upmigration		
Run Timing	Air/Water Temperature,	Date of 1st and last spawner arrival, peak live
	Pulse Flows	count date, historical arrival patterns
Run Size	Antecedent adult	No. of spawners (2, 3, 4 yrs old)
	recruitment and ocean	
	conditions	
Pre-spawn mortality	Water Temperature	Temperature by reach or RM
Spawning		
Spawning Habitat Use	Competition/Exclusion	No. of spawners (2, 3, 4 yrs old), suitable
		spawning area by reach or riffle (location)
	Snawner Preferences	Elow and WIIA (denth yel substrate)
	spawner references	Historical redd count frequency by BM
Egg Deposition	Fish size and focundity per	No. of spawners $(2, 3, 4)$ yrs old) fish size at
Egg Deposition	chawpor	10. 01 spawners (2, 5, 4 yrs old), fish size at
EggIncubation	spawnei	age.
	Water Temperature	Tomporature by reach or PM
Podd superimposition		Suitable gravel area by reach or riffle no. of
mortality	Addit competition/	Suitable graver area by reach of fille, no. of
mortality	displacement	spawners
Survival to emergence	Sediment intrusion intra-	Gravel texture (% Fines < 0.85 mm, 9.5 mm)
	gravel flow oxygen	
	delivery	
In-River Rearing and smo	t emigration	
Rearing Habitat Use	Food availability, predator	Habitat area and temperature by reach/RM
	avoidance	(riffle, run, pool)
	Habitat Preference	WUA with flow (depth. vel.)
Juvenile migration/	Competition/ exclusion.	Flow, movement rates by fish size
movement	displacement	
Growth rate	Food Availability/Water	Temperature by reach or RM, Ration
	Temperature	, , ,
Predation Mortality	Introduced species, Water	Predator/prey distribution by Reach/RM,
	Temperature, encounter	encounter frequency (fish density, flow),
	frequency	probablility of piscivory (fish size,
		temperature, turbidity)
Temperature Mortality	Physiological tolerances	Temperature by reach or RM
Smoltification	Water Temperature. Food	Fish size at Date, Temperature
	Availability	

O. mykiss Population Study (W&AR-10)

Preliminary Processes and Parameters for In-River Production Modeling

Modeled Process	Mechanism	Model Parameters
Adult Upmigration	•	
Run Timing	Air/Water Temperature,	Date of 1st and last spawner arrival, peak live count
	Pulse Flows	date, historical arrival patterns
Run Size	Antecedent adult	No. of spawners (3, 4, 5 yrs old) arriving from outside
	recruitment and ocean	the Tuolumne River (anadromous or resident from
	conditions	other SJ tributaries)
Pre-spawn mortality	Water Temperature	Temperature by reach or RM
Spawning		
Spawning Habitat Use	Competition/Exclusion	No. of anadromous and resident spawners (3, 4, 5 yrs
		old), suitable spawning area by reach or riffle (location)
	Spawner Preferences	WUA with flow (depth, vel. substrate)
		Assume uniform or linear function with distance
Egg Deposition	Fish size and fecundity per	No. of anadromous and resident spawners (3, 4, 5 yrs
	spawner	old), fish size at age.
Egg Incubation	•	
Incubation rate	Water Temperature	Temperature by reach or RM
Redd superimposition	Adult competition/	Suitable gravel area by reach or riffle (location), no. of
mortality	exclusion, egg shock/	spawners
	displacement	
Survival to emergence	Sediment intrusion, intra-	Gravel texture (% Fines < 0.85 mm, 9.5 mm)
	gravel flow, oxygen	
	delivery	
In-River Rearing		
Resident fish introduced	Entrainment in spill events	Flow threshold, No. of resident fish introduced (Age 0-4)
over La Grange Dam	at La Grange	
Rearing Habitat Use by Age	Food availability, predator	Habitat area and temperature by reach/RM (riffle, run,
Class (0+ vs older)	avoidance	
	Habitat Preference	WUA with flow (depth, vel.)
Juvenile migration/	Competition/ exclusion,	Flow, movement rates by fish size
movement	displacement	
	E 1. A. 11. 1. 11. (A.C.).	
Growth rate by Age Class	Food Availability/Water	Temperature by reach or RM, Ration
	Temperature	
	1	Deside the stand to the transfer Deside (DM as a second stand
Predation Mortality	Introduced species, water	Predator/prey distribution by Reach/Rivi, encounter
	frequencial freque	(fich size, temperature, turbiditu)
	requency	(iisii size, temperature, turbiulty)
Temperaturo Mortality	Physiological tolorances	Temperature by reach or PM
remperature wortality	rnysiological tolerances	
Potontial smalt	Water Temperature Food	Eich size at Date. Temperature
outmigration	Availability	ו ואו אובי מו שמוב, ובווואבומנטופ
outingration	Availability	

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Attachment B Draft Meeting Notes W&AR-6 and W&AR-10 Modeling Workshop No. 1

Don Pedro Project Relicensing W&AR-6 and W&AR-10 Modeling Workshop No. 1 Draft Meeting Notes

Thursday, November 15, 2012

Attendees Peter Barnes –SWRCB Patrick Koepele – Tuolumne River Trust Peter Baker- – Stillwater Bao Le – HDR Jenna Borovansky – HDR Ellen Levin – CCSF Attorney Allison Boucher – Tuolumne River Gretchen Murphey – CDFG Conservancy, by phone Heather Bowen – Stillwater Bob Nees - TID Steve Boyd – TID Bill Parish – MID John Buckley - Central Sierra Environmental Bill Sears – CCSF Chris Shutes – CSPA John Devine – HDR Karl English – LGL, Ltd. Dale Stanton-CDFG Jim Findley – bay area water supply Larry Thompson - NOAA Donn Furman - CCSF Nicola Ulibarri – Researcher, Stanford Univ. Art Godwin – TID/MID Joy Warren - MID Jim Hastreiter –FERC, by phone Scott Wilcox – Stillwater Noah Hume – Stillwater Allison Willy – USFWS Bill Johnston – MID Ron Yoshiyama – CCSF

Introductions and Background – 9:00 AM to 9:45 AM

Following introduction of Relicensing Participants (RPs) in the room and on the telephone, John Devine briefly summarized the overall purpose and goals of W&AR-6 and W&AR-10 Modeling Workshop No. 1, the first of two separate workshops that will be conducted, as recommended in the FERC Study Determination released December 22, 2011. The Workshop was conducted as a narrative and dialogue, using the Agenda, and on-screen Power-Point slides (Attachment 1) as a starting point for additional discussion.

1. Purpose and Objectives of Workshop No. 1

- a. The purpose of W&AR-6 and -10 Workshop No. 1 was to collaboratively identify key parameters and inform development of life-stage-specific population models in accordance with the *Tuolumne River Chinook Salmon Population Model* (Study Plan W&AR-6) and the *Oncorhynchus mykiss (O. mykiss) Population Study* (Study Plan W&AR-10).
- b. The objectives of W&AR-6 and -10 Workshop No. 1 were to:
 - build upon RP discussions and life stage-specific conceptual models resulting from two workshops associated with the *Salmonid Population Information Integration and Synthesis* (Study Plan W&AR-5) which identified potential limiting factors affecting the Tuolumne River fall-run Chinook salmon and *O. mykiss* populations;

- gather additional feedback from RPs regarding model framework and approach for investigating the relative influence of factors identified by W&AR-5; and to
- encourage RPs to express needs and desired outcomes for the salmon and *O*. *mykiss* population models during the workshop, in comments to the distributed meeting notes, and at any time during the comment period.

2. Review of W&AR-5 Workshop No. 2 Comments and Consultation Process

Noah Hume provided an overview of the Consultation Process and notes on the W&AR-5 Workshop No. 2, which convened on June 26, 2012. He described adjustments made to the preliminary conceptual models and key issues identified during W&AR-5 Workshop No. 2 and comments received from RPs.

3. Relationship to other Studies

- a. As with W&AR-5, data regarding salmonid abundance, distribution, timing, and other information affecting salmonid life history will be drawn from prior FERC monitoring studies, ongoing Relicensing studies, and broader information sources for use in the development of the population models for W&AR-6 and W&AR-10. Specific Relicensing Studies with relevant information include:
 - Salmonid Population Information Integration and Synthesis (Study W&AR-5)
 - Spawning Gravel (StudyW&AR-4)
 - Salmonid Redd Mapping (Study W&AR-8)
 - *Predation Study* (Study W&AR-7)
 - Oncorhynchus mykiss Habitat Assessment (Study W&AR-12)
 - Temperature Criteria Assessment (Study W&AR-14); and
 - Prior FERC-Ordered Instream Flow (IFIM) Studies

Although some study results remain outstanding at this time, John Devine indicated that most Relicensing studies will be completed in January 2013, in time for inclusion in the Initial Study Report (ISR).

- b. RPs discussed the potential for including data from ongoing FERC-ordered IFIM studies in the ISR, and recognizing that the IFIM studies were not directed as part of the Don Pedro Relicensing process. RPs request that the ongoing IFIM studies be documented as part of the official Relicensing record.
 - John Devine clarified that the Districts intend that the IFIM studies be included as part of the Administrative Record for the Relicensing
 - Scott Wilcox indicated that although the IFIM study sampling schedule was delayed due to an absence of low flow conditions, efforts have been expedited in order to try to include draft IFIM results in the Initial Study Report.

Discussion of Key Resource Issues Affecting Tuolumne River Salmonids – 10:00 AM to 11:30 AM

Noah Hume provided an overview of key resource issues identified as part of Study W&AR-5. Additionally, he presented updates to the fall-run Chinook salmon and Central Valley steelhead life-stage-specific conceptual models which were previously developed in collaboration with RPs during the W&AR-5 workshops and subsequently updated to

reflect Study W&AR-5 findings. These updated conceptual lifecycle models (excerpted as part of Attachment 2) were provided in the Final W&AR-5 Workshop No. 2 notes posted to the FERC e-Library.

1. Fall-Run Chinook Salmon Discussion

The discussion points summarize RP feedback on the previously completed models included in the Final notes for W&AR-5 Workshop No. 2. Noah Hume reminded the RPs that the conceptual models were an exercise to identify the relevant life-stage-specific factors that may affect Tuolumne River salmonids throughout the geographic range of the species' life history, including the Tuolumne River, lower San Joaquin River, Delta, and Ocean. Many of the comments below have been previously addressed or are included in the W&AR-5 Study Report ("synthesis"). Specific issues requiring revision to the models or study report are highlighted below.

- a. Chris Shutes suggested including the direction of flow and hydrodynamics that occur at Delta export pumps as a key factor, as well as using the term "entrainment." Noah Hume stated that reverse flows will be discussed as part of the synthesis.
- b. Patrick Koepele suggested delineating the smolt outmigration lifestage from the Delta juvenile rearing lifestage if analyses of effects are differentiated. Noah Hume indicated that the present combination of life stages is intended to incorporate geographic distinction of in-river and out-of-river effects.
- c. Chris Shutes suggested including the "Bay-Delta" in the assessment of Delta impacts. Noah Hume confirmed that a discussion of Bay-Delta issues will be included in the synthesis.
- d. Alison Willy requested further clarification of the terms "probability of indirect mortality" and "probability of direct mortality" and suggested combining these estimates. Noah Hume indicated that he would consider this suggestion, but currently "indirect" sources were confined to stress and disease related effects.
- e. Multiple RPs discussed the recent trend in Tuolumne River Chinook salmon population abundances (See figures on slide 6 of Attachment 1). RPs indicated that the observed "boom and bust" pattern is likely natural to the populations of the Tuolumne and other San Joaquin River basin tributaries.
- f. RPs did not have feedback regarding the inclusion of ocean abundance, ocean productivity nor the effect of water year type as factors in the fall-run Chinook salmon quantitative population model.
- g. RPs did not provide comments regarding factors affecting the spawning and incubation lifestage.
- h. RPs suggested including the relationship between juvenile growth rate and water temperature and flow conditions in the "habitat component" of the fall-run Chinook salmon quantitative population model. Noah Hume indicates that these physical processes influencing habitat were well discussed in the synthesis and will also be included in the quantitative population models as part of Study W&AR-6. He also indicated that juvenile salmon studies in late 80s and early 90s as well as more recent smolt evaluations in 2001 (USFWS) suggest food is not limiting in the Tuolumne River.

2. Resident and Anadromous O. mykiss Discussion

Prior to reviewing key issues affecting *O. mykiss*, Noah Hume provided a discussion on anadromous and resident life history strategies and indicated that the quantitative population model would be centered upon predicting juvenile production of resident *O. mykiss* of sufficient size to potentially become anadromous. Actual steelhead production cannot be predicted through a modeling exercise of this type. The following discussion summarizes RP feedback on the key issues summary and underlying conceptual models:

- a. RPs discussed *O. mykiss* sport-fishing-related impacts on the Tuolumne River. Gretchen Murphey indicated that harvest is restricted during most of the year with allowable harvest occurring annually between November 1 and December 31. Catch and release is permitted during other months.
- b. RPs suggest including spawning habitat availability and redd dewatering in the *O*. *mykiss* be discussed. Noah Hume indicated that the effect of redd dewatering was added to the spawning and egg incubation model subsequent to W&AR-5 Workshop No. 2 because recent studies suggest that timing of *O*. *mykiss* spawning may allow use of higher elevations in the margin habitat during flood control releases, that may potentially be de-watered during flood recession. However, he stated that the location of steelhead spawning in the Tuolumne River remains unknown. Jenna Borovanski confirmed that the salmonid redd surveys have been conducted bi-weekly, consistent with methodology described in Study W&AR-8, and will increase to a weekly sampling frequency.
- c. With regards to potential steelhead use if the river, RPs suggest including results from the salmonid tracking study in the synthesis. Noah Hume indicated that the existing tracking study was somewhat inconclusive as the tagged fish generally remained near the locations where they were tagged, possibly indicating resident fish behavior.

{Lunch Break - 11:30 PM to 12:30 PM}

W&AR-6: Modeling of In-River Factors Affecting Chinook salmon – 12:30 PM to 3:30 PM

1. Review of Prior Population Models

- a. Noah Hume and Peter Baker provided a review of presently available population models that may be appropriate for modeling the salmonids populations in the Tuolumne River consistent with Studies W&AR-6 and W&AR-10
- b. Four population models were described and included the following: (1) EACH population model; (2) State-Space model; (3) Oak Ridge Chinook Salmon Model; and (4) CDFG (2005) San Joaquin River Salmon Population Model.
- c. Dale Stanton indicated that the release date of an updated CDFG (2005) model is unknown, potentially January 2013.
- 2. Modeling Approach to Address Key Resource Issues Affecting Juvenile Production

Peter Baker suggested that a generalized stock-production model specific to each life stage would allow for environmental and potential management variables to be used in parameterizing the model. A multi-stage stock production model was proposed to RPs in the approved Study Plan as the preferred approach. RPs did not provide comment regarding the preferred population model at this time.

3. Selection of Parameters to be Modeled

Noah Hume presented life-stage-specific processes and parameters preliminarily identified for modeling the in-river factors affecting the Tuolumne River fall-run Chinook salmon population (Attachment 3). RPs identified possible factors that may be used to parameterize the Chinook salmon population model, and discussed the availability of data appropriate for model parameterization. The following points summarize model parameterization considerations that were discussed among RPs:

- a. RPs requested consideration of water temperature effects on timing of Chinook salmon upstream migration and spawning. Noah Hume stated that information on variations of immigration timing with temperature is limited for the Tuolumne River and not available for the San Joaquin Basin. USFWS and CDFG are currently conducting tracking studies to better inform this issue.
- b. Noah Hume stated that data available for parameterizing run timing, size and composition may be limited. Arrival timing data for the Tuolumne is limited to visual observations at the La Grange Powerhouse (1981–2006) as well as recent weir passage timing since 2009. Arrival dates of fish collected at the Tuolumne weir may be inaccurate in some years due to the presence of upstream migrating Chinook salmon at, and potentially upstream of, the weir location prior to its installation. Other data sources include Merced Fish Facility data. RPs suggested that weir timing estimates from the Stanislaus River have been sampled since 2003 and may be reasonable for use.
- c. Water temperature effects will be included in the model to parameterize the in-river juvenile rearing life-stage. Growth rates of juveniles also will be included in the model and will likely be a function of water temperature and food ration.
- d. Justification for including different life history strategies of juvenile outmigration may be limited.

4. Initial Hypothesis Development.

Preliminary hypothesis and modeling scenarios were discussed, specifically regarding the RPs desired outcomes of the W&AR-6 model. In an effort to develop a model that best suited the RPs needs, RPs were asked to contribute feedback as soon as possible regarding potential gaps in the model or study questions they would like the model to address. RPs additionally discussed potential in-basin and out-of-basin data sources, and the different utility of these data sources in the models.

RPs identified several preliminary modeling questions and initial concerns, including the following:

- a. What are the primary factors affecting the populations and how are the primary factors affecting population abundances? Noah Hume suggested that although the primary factors (e.g., flow, temperature, habitat, etc.) have been informed by the W&AR-5 Study, assessment of their relative influence would be accomplished through sensitivity testing of the completed model.
- b. What is the basis of comparison using the model? Noah Hume indicated that for Chinook salmon, the completed model will be compared to recent estimated of juvenile production as estimated by the RSTs at Waterford (RM 30) and Grayson (RM 5).

- c. What is the most appropriate flow timing, frequency, duration and magnitude of release for the benefit of salmonids populations? Noah Hume stated this will largely be the focus of various scenarios developed in the 2nd workshop.
- d. Will the model be transparent such that a modeler will be able to select to include a variety of parameters? Peter Baker indicated that all programming will be clearly documented.
- e. If a limiting factor is later identified, would the integration of a sub-model be possible? Peter Baker indicated that it should be possible to provide additional sub-models in the future.
- f. Will turbidity be included as a factor affecting upstream migrating *O. mykiss* and downstream migration of juvenile Chinook salmon and *O. mykiss*? Noah Hume indicated that there may be insufficient data to parameterize model responses to turbidity, but that this could be considered.
- g. Are there ways to adaptively inform the model with future management actions?
- h. Will the model allow for a sensitivity analysis to be conducted in order to evaluate and prioritize actions? Noah Hume indicated that yes, this was the intention of the Study Plan.
- i. In what format will the model be developed? Peter Baker indicated that programming will likely be completed in the 'R' software, which is available in the public domain. Programming the model in MS Excel would be too restrictive, and the coding difficult to follow.
- j. Could an interface such as MS Excel be considered? Peter Baker indicated that MS Excel will likely be used for Input and Output and that implementing a user interface in Excel will be explored.

W&AR-10: Modeling of In-River Factors Affecting *O. mykiss* – 3:30 PM to 4:00PM

John Devine asked if RPs were in agreement to alter the original agenda and move ahead to discuss details of modeling in-river factors affecting the *O. mykiss* population in the Tuolumne River (previously scheduled to occur November 16, 2012 from 9AM to 12PM). RPs agreed that the topic could be covered today, and a November 16, 2012 session was not necessary.

1. Review of Prior Population Models

The presently available population models that may be appropriate for modeling the salmonid populations in the Tuolumne River consistent with Studies W&AR-6 and W&AR-10 were previously discussed. See the overview of other population models provided above in the *Modeling of In-River Factors Affecting Chinook Salmon*

2. Modeling Approach to Address Key Resource Issues Affecting Juvenile Production

A multi-stage stock production model was proposed to RPs as the preferred approach to address key resources affecting Tuolumne River *O. mykiss*. Similar to that of the fall-run Chinook salmon modeling approach (see the overview provided in the *Modeling of In-River Factors Affecting Chinook Salmon* above), the objective will be to anchor the modeling parameters to existing monitoring data. RPs did not provide comment regarding the preferred population model at this time.

3. Selection of Parameters to be Modeled

Noah Hume presented life-stage-specific processes and parameters preliminarily identified for modeling the in-river factors affecting the Tuolumne River *O. mykiss* population (Attachment 3). RPs identified possible factors that may be used to parameterize the *O. mykiss* population model, and discussed the availability of data appropriate for model parameterization.

The following points summarize model parameterization considerations that were discussed among RPs:

- a. Presently available data regarding steelhead is restricted to other Central Valley streams, given that Tuolumne River-specific data is largely limited to resident fish. Parameters specific to *O. mykiss* may be informed by available information from other river systems and populations. Additionally, mechanisms similar to those included in W&AR-6 will be assumed.
- b. Both anadromous and resident life history strategies will be included in the model as a single population.
- c. The *O. mykiss* population model will be restricted to in-river factors.
- d. Water temperature and ration estimates will be used to model fish size at age corresponding to potential smolt outmigrants.
- e. *O. mykiss* populations located in the reach of the Tuolumne River between La Grange Dam and Don Pedro Dam will be considered as a potential source of additional juveniles or older age-classes during high flow conditions. There was some discussion of potential genetic differences between these populations, but this will not be considered in the population model.

4. Initial Hypothesis Development

Preliminary hypothesis and modeling scenarios were discussed, specifically regarding the RPs desired outcomes of the W&AR-10 model. In an effort to develop a model that best suited to the RPs needs, RPs were asked to contribute feedback as soon as possible regarding potential gaps in the model or study questions they would like the model to address. RPs additionally discussed potential in-basin and out-of-basin data sources, and the different utility of these data sources in the models.

RPs identified several preliminary modeling questions and initial concerns, including the following:

- a. Will otolith data be available for use in the model? Noah Hume indicated that yes, this data has been invaluable to indicate the age structure and year-over-year growth rates of *O. mykiss* in the Tuolumne River.
- b. Allison Boucher requested that the model consider predator movement within the Tuolumne River relative to flow and water temperature conditions as well as predator effects on the distribution of rearing juvenile *O. mykiss*. Noah Hume indicated that although predator movements will not be modeled, predator distribution will be considered in development of the model. RPs suggested that resident bass located within mining pits may have a greater impact on juvenile O. mykiss survival than striped bass because of life history timing.
- c. RPs discussed the inclusion of a modeling scenario addressing juvenile recruitment relative to floodplain habitat suitability.

Next Steps/Action Items – 4:00 PM to 4:10 PM

- 1. RPs are requested to submit potential modeling scenario suggestions to the Relicensing Team as soon as possible. Scenarios will be developed as part of Modeling Workshop No. 2.
- Noah Hume will integrate the previously developed conceptual model diagram elements from Study W&AR-5 for use in highlighting modeled factors in Modeling Workshop No. 2.
- 3. Peter Baker and the rest of the Stillwater team will move forward with model development and begin parameterization and testing. Preliminary results will be available for presentation in Modeling Workshop No. 2.
- 4. John Devine indicated that RP Modeling Workshop No. 2 is anticipated to occur during March 2013. Scheduling specifics for Modeling Workshop No. 2 will be issued as soon as possible. RPs propose the third or fourth week of March 2013.

Attachments

Attachment 1: Agenda and Modeling Workshop No. 1 Slides

- Attachment 2: Revised W&AR-5 Conceptual Model Diagrams (excerpted from Synthesis Workshop No. 2 Final Notes)
- Attachment 3: Preliminary Processes and Parameters for In-River Production Modeling of Tuolumne River salmonids (Studies W&AR-6 and W&AR-10)

Attachment 1 Agenda and Modeling Workshop No. 1 Slides W&AR-6 and 10 Population Modeling Workshop No. 1

Included with Final Meeting Notes

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Attachment 2 Revised W&AR-5 Conceptual Model Diagrams (excerpted from Synthesis Workshop No. 2 Final Notes)

Included with Final Meeting Notes

Attachment 3 Preliminary Processes and Parameters for In-River Production Modeling of Tuolumne River salmonids W&AR-6 and 10 Population Modeling Workshop No. 1

Included with Final Meeting Notes

Attachment C

California Dept. of Fish and Wildlife comments on Notes of the Workshop regarding Water & Aquatic Resources Studies No. 6 and 10 (Chinook salmon and *O. mykiss* Population Modeling) and regarding the Water Temperature Criteria Assessment Update, Don Pedro Hydroelectric Project No. 2299, Tuolumne River

EDMUND G. BROWN, Jr., Governor

CHARLTON H. BONHAM, Director



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CALIFORNIA

January 14, 2013

Via Electronic Submission

Kimberly D. Bose, Secretary Federal Energy Regulatory Commission 888 First Street, NE Washington, D.C. 20426

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Subject: California Department of Fish and Wildlife Comments on Meetings Notes of the Workshop regarding Water & Aquatic Resources (W&AR) Studies No. 6 and 10 (Chinook Salmon and *O. mykiss* Population Modeling) and regarding the Water Temperature Criteria Assessment Update, Don Pedro Hydroelectric Project No. 2299, Tuolumne River

Dear Secretary Bose and Messrs. Nees and Dias:

The California Department of Fish and Wildlife¹ (CDFW) has reviewed meeting notes from a November 15, 2012 salmonid population workshop posted on the Don Pedro Hydroelectric Project (Project) relicensing website (<u>www.donpedro-relicensing.com</u>). This workshop was hosted by the Turlock Irrigation District and Modesto Irrigation District (collectively, the Districts) in Modesto. On the following day, November 16, 2012, the Districts hosted an update on their assessment of site-specific water temperature criteria. The Districts posted draft meeting notes from this second meeting on their relicensing website. By this letter, CDFW respectfully provides comments on the salmonid population workshop, water temperature criteria assessment update meeting, and associated meeting notes.

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¹ Please note that as of January 1, 2013, our new name is the California Department of Fish and Wildlife (CDFW).

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As background, CDFW has previously submitted comments on the District's proposed salmonid population modeling studies and assessment of water temperature criteria. These comments include the following CDFW letters submitted to the Districts and filed with the Federal Energy Regulatory Commission (Commission):

- An October 24, 2011 letter providing CDFW's comments on the Districts' proposed studies (see pages 19-21 and 23-24, in particular).
- A December 6, 2011 letter providing CDFW's comments on the Districts' revisions to proposed studies (see pages 4 and 6-7, in particular).
- A May 16, 2012 letter providing CDFW's comments on the Districts' first salmonid population information synthesis workshop held on April 10, 2012 (see page 3, in particular)
- An August 31, 2012 letter providing CDFW's comments on the Districts' second salmonid population information synthesis workshop held on June 26, 2012 (see pages 3-4 and 16-25, in particular).

Chinook salmon and O. mykiss Population Modeling Workshop

As reflected in the previous comment letters, CDFW has concerns about both the feasibility and scientific basis of the proposed modeling work. As these concerns have been documented and are now part of the administrative record for this proceeding, this letter provides the following limited set of general comments on the salmonid population modeling workshop.

CDFW appreciates that the November 15, 2012 workshop covered an extensive suite of resource issues affecting Tuolumne River salmonids. However, the workshop discussions still do not explicitly identify modified flow scenarios as a key impact and topic for analysis. As described in detail in the previously referenced filings, CDFW considers the relationship of instream flow to salmonid growth and survival to be a fundamental ecological process. Understanding this relationship is essential for identifying and mitigating Project impacts on salmonid populations.

It is our understanding that the proposed model will be a generalized stock production model, simulating one life stage to another life stage and from one monitoring point to another monitoring point as the fish grow and move downstream. However, it is still not clear what hypothesis the proposed life cycle model will test or what questions will be answered once the Districts commit the necessary resources into model development. We recommend development of a clear statement of the question(s) the Districts' two population models seek to answer as a first step. The brainstorming that ensued during

the November 15, 2012 workshop to identify preliminary modeling questions did not appear to identify testable hypotheses.

For the *O. mykiss* stock production model (W&AR- 10), we understand that the Districts' objective will be to anchor the modeling parameters to existing monitoring data such as rotary screw trap data. This approach would seem problematic given the very limited data available for such anchoring. As a consequence, we are concerned the resulting steelhead model will be rather tenuous.

Finally, the meeting notes includes a misstatement involving input from CDFW's Gretchen Murphey. Section 2a, on page 5, indicates Ms. Murphey stated that *O. mykiss* harvest is restricted during most of the year with allowable harvest occurring annually between November 1st and December 31st and that only catch and release is permitted during other months. This statement is not accurate. Angling for *O. mykiss* is allowed January 1st through October 31st in the Tuolumne River below La Grange Dam to Hickman bridge using artificial lures with barbless hooks. During this time period, there is a zero (0) bag or possession limit. From November 1st through December 31st, the season is closed. For reference, we provide the following excerpt from the CDFW's Freshwater Sport Fishing Regulations 2012-2013:

Trout, Salmon and Special Regulation (CCR, T14, Chapter 3, Article 2)

Section 7.50 Alphabetical List of Waters with Special Fishing Regulations (198) Tuolumne River (Stanislaus and Tuolumne cos.)

(D) From La Grange Dam downstream to Hickman bridge

(Open Season and Special Regulations):

Jan 1 through Oct 31.

Only artificial lures with barbless hooks may be used.

(Daily Bag and Possession Limit):

0 trout or steelhead.

Closed to salmon fishing.

No take or possession of salmon.

This regulation can be accessed at: <u>http://www.dfg.ca.gov/regulations/FreshFish-Mar2012/ccr-t14-ch3-art3.html.</u>

Water Temperature Criteria Assessment Update

The second meeting day, on November 16, 2012, focused on an update of four studies the Districts propose to implement in an effort to assess site-specific water temperature criteria for salmonids. CDFW understands these are not studies required by the Commission but rather work the Districts undertake at their own discretion. As such,

there is no formal consultation component of the subject water temperature criteria assessment. However, in the spirit of developing the best available information, CDFW provides the following comments.

As a general comment, the draft meeting notes, on page 3, include a question from Commission staff regarding when full written descriptions of the four newly proposed water temperature assessment studies will be available. Bill Snider with HDR. Inc., (the Districts' consultant), responded that the studies had been uploaded to the Project's website on November 8, 2012 and participants so notified. Given the large amount of information posted on the website, it can be difficult to locate a specific posting after the fact. As an example, CDFW staff could not find the aforementioned study plans on the District's website. Searches of "Introduction/Announcements/November 16, 2012 Water Temperature Criteria Assessment Draft Meeting Notes" and

"Documents/Studies/Updated Study Plans" did not prove productive. In the future, when study plans are referenced in meeting notes, it would be very helpful to provide specific website links to facilitate review.

Study 1. The Districts are proposing to study the local adaptation of *O. mykiss* juveniles in the lower Tuolumne River. However, the proposal incorrectly uses the terms adaptation and tolerance interchangeably. **Resistance or adaptation** is the result of the evolutionary process that takes generations to develop, whereas **tolerance or acclimation** results from multiple exposures across the lifetime of an individual or a group of individuals. Thus, resistance or adaptation results in a genetic change across generations and tolerance or acclimation results in physiological change over the life of the individual.

As a result of this distinction, the proposed study design is not suited for the stated question. The Districts propose to use a swim tunnel across a short period. Such a study is appropriate for an acute tolerance study of individuals, but does not address chronic population exposure, which is the criteria set by the EPA (2003). Comparing acute to chronic threshold criteria is inappropriate. The study design is equivalent to studying office workers' respiratory rates at room temperature at 70°F and 100°F across a 24-hour period. Such study design may show that workers can survive and tolerate the hot temperatures for a day. However, the study design does not measure worker productivity across the career of the worker population under chronic hot temperatures.

EPA (2003) criteria are designed as population thresholds to protect a population, whereas an individual threshold is designed to protect an individual or small group of individuals. Population thresholds result in **resistance or adaptation**, while an individual threshold will only identify **tolerance or acclimation**. As a result, population thresholds are always less than an individual threshold and chronic thresholds are

always less than acute thresholds. Thus, fish water temperature experiments that address tolerance/acclimation will not provide an understanding for resistance or adaptation.

One of the limitations of the proposed study is that it does not address reproductive success or recruitment across generations. CDFW is concerned that the proposed study will only address acute individual tolerance. As such it will not provide meaningful results and will be unable to inform future population management decisions. Another concern with this study as described involves timing. The study design calls for collecting fish and running studies during March-April 2013. However, this is not the period when fish experience maximum temperatures and the greatest thermal stress. The period of interest would typically occur during middle to late summer when flows in the lower Tuolumne River have decreased. For relevancy, the testing should be conducted during critical or near critical temperatures. Testing should also include sampling near the upstream, coolest stretches just below La Grange Dam in order to gain a baseline fitness for the fish.

Study 2. The Districts propose to study juvenile *O. mykiss* spatial rearing distribution. This study approach as described also emphasizes tolerance for survival, but not chronic population reproductive and recruitment success. The study proposes an assessment of occupancy sites ranging from15 to 20°C. However, the study does not address what would occur if fish had a choice to move to more favorable temperature locations. Based on CDFW's water temperature monitoring, there is no cold water refugia along the lower Tuolumne River. If fish do not have water temperature refugia to seek and move towards, they are limited to unfavorable conditions. This limits the utility of any results collected as proposed.

Study 3. The Districts propose to study the influence of temperature on growth of *O. mykiss* and Chinook salmon. There are a number of variables that influence fish growth. Temperature is one, but there are numerous stress factors that need to be taken into account, namely food availability. It will be difficult to determine food availability under field conditions, thus the temperature study as proposed will be an incomplete evaluation. CDFW believes that no matter what the optimal or "tolerable" temperatures will be, growth rates will not be informative without knowing corresponding food consumption. Thus, this type of study will not address chronic population questions related to reproductive success and recruitment.

CDFW does not have any comments on the fourth water temperature assessment study proposed by the Districts at this time.
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The CDFW appreciates the opportunity to provide comments on the proposed research efforts on the lower Tuolumne River. If you have any questions regarding CDFW's comments provided in this letter, please contact Annie Manji, Staff Environmental Scientist, at (530) 224-4924 or <u>Annie.Manji@wildlife.ca.gov</u>.

Sincerely Jeffrey R. Single, Ph.D.

Regional Manager, Central Region

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References

Environmental Protection Agency. 2003. Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards. EPA 910-B-03-002. Region 10 Office of Water, Seattle, WA. 57 pp.