Lower Tuolumne River Instream Flow Study
Study Coordination Workshop #5 — Summary
Thursday, February 3, 2011, 9:00
Stillwater Office, Davis, CA

Attendees:

Scott Wilcox (Stillwater)
Russ Liebig (Stillwater)
Bob Hughes (CDFG)
Jenny O'Brien (CDFG)
Steve Tsao (CDFG)
Bill Cowan (CDFG)
Ron Yoshiyama (CCSF-SF)
Allison Boucher (TRC)
Dave Boucher (TRC)
Mark Gard (USFWS)
Zac Jackson (USFWS)
Shaara Ainsley (FishBio)

The purpose of this workshop was to compile, review, and discuss available *O. mykiss* and Chinook salmon Habitat Suitability Criteria (HSC) for the lower Tuolumne River, select remaining HSC where possible, identify additional HSC literature data gathering needs, and discuss related topics. HSC for Chinook salmon and *O. mykiss* were previously selected at the September 20, 2010 and October 20, 2010 workshops where the group had come to consensus on suitability criteria for Chinook salmon spawning (depth, velocity, and substrate), and juvenile (depth and velocity) lifestages, and *O. mykiss* spawning (depth, velocity, and substrate), adult (depth and velocity), and juvenile (depth and velocity) life stages. The group had decided at the September 20, 2010 workshop to not apply substrate criteria to the juvenile and fry life stages.

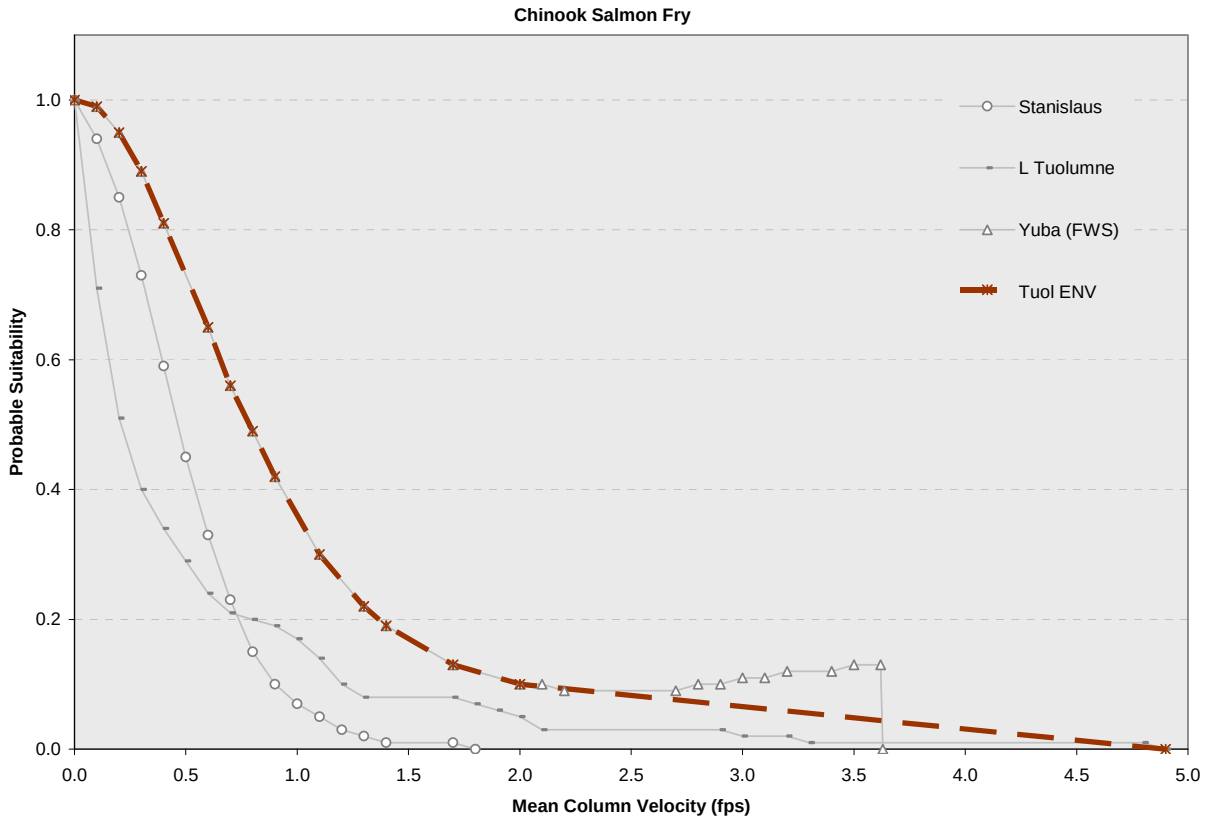
Scott Wilcox provided a brief overview of remaining action items from the previous workshops and introduced the revised Chinook salmon and *O. mykiss* HSC data packet compiled from USFWS data provided since the October workshop. The technical group reviewed Chinook salmon fry HSC and *O. mykiss* fry and adult HSC from various sources. The technical group also reviewed available cover HSC for Chinook salmon fry and *O. mykiss* fry provided by USFWS. Decisions and/or actions on HSC for each species and lifestage are noted below.

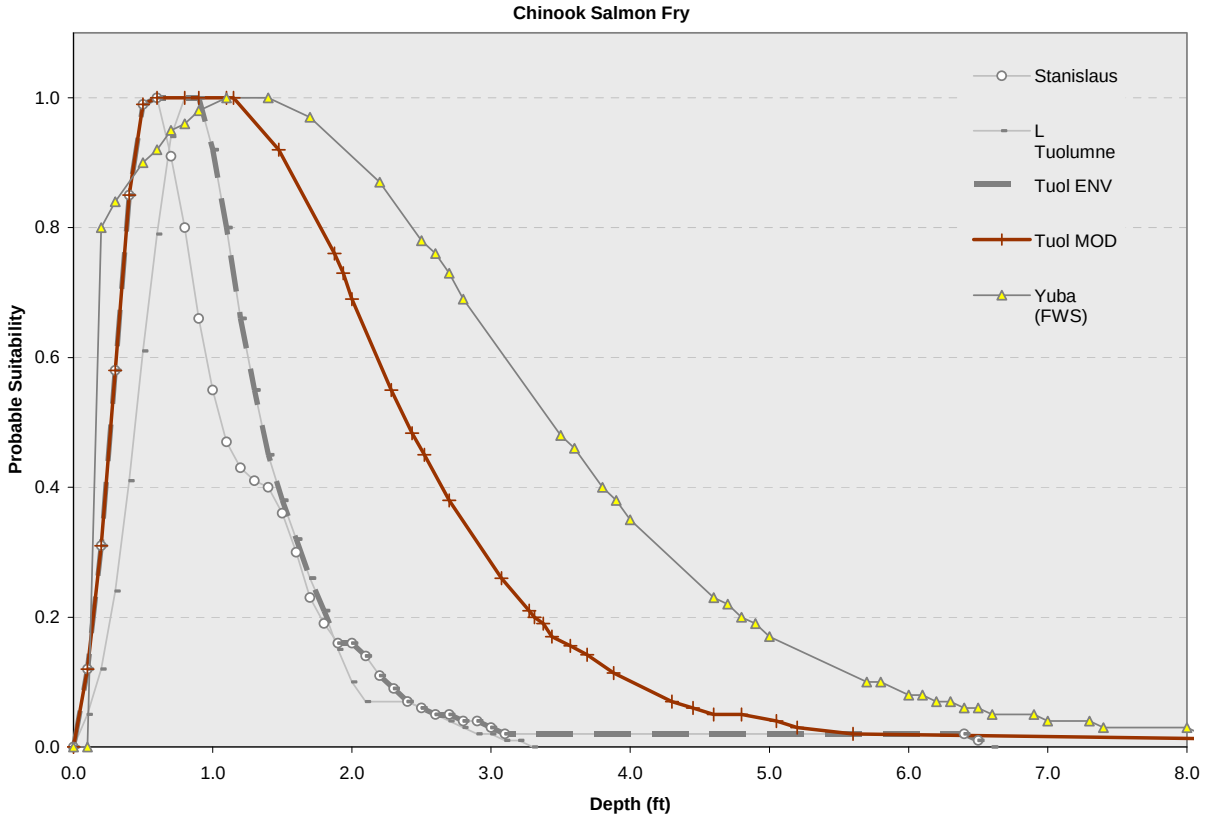
Chinook salmon fry

- The technical group had reviewed HSC during the September 20, 2010 workshop and initially narrowed the curve search to curves developed for the Tuolumne River and neighboring Stanislaus River. The similarity between the two data sets, and their similarity to the central tendency of other data sets, was not as great as the technical group had hoped, and some type of hybrid curve was considered. Decisions on depth and velocity HSC for this life stage had been deferred, pending review of the Tuolumne and Stanislaus reports that may provide some insight on reasons for the differences.

- Prior to the February 3, 2011 meeting, USFWS supplied additional background information for HSC they developed on the Yuba River, as well as additional unpublished HSC data they collected from Clear Creek.
- The group originally considered an "envelope" curve over the Stanislaus and Tuolumne curves, since the Stanislaus curve may have better correction for availability (being Category III curves), but the Tuolumne curve shows some greater utilization of higher velocities. When consensus was not reached, the group re-considered the Yuba River curves.
- **Velocity Decision**: The group concurred on the use of a modified Yuba River HSC curve for velocity (Tuol ENV). The modified curve was equal to the Yuba curve up to (2.0, 0.1), at which point the curve follows a straight line to (4.9, 0.0), the end point of the Tuolumne curve (see attached graphic and coordinate Table).
- **Depth**: The group did not come to consensus on the depth HSC curve. The most thoroughly discussed options included:
    1. An "envelope" over the Stanislaus and Tuolumne curves (Tuol ENV)
    2. Use an average between the envelope curve (Tuol ENV) and Yuba curves using the ascending limb of the Stanislaus curve, over to the Yuba curve at (1.1, 1.0) and down between the average of Tuol ENV and Yuba curves (Tuol MOD)
    3. Use the ascending limb of the Stanislaus curve, then the descending limb of the Yuba curve.

  Lacking consensus on this parameter, the Districts plan to apply option #2, since this option seemed to have the broadest support among the stakeholders present at the workshop.
- **Cover**: The group discussed the idea of using existing cover codes. Because of limited availability of published cover HSC and wide variation in codes, this item had been previously discussed as data to collect during field surveys in 2011, rather than trying to adapt other coding systems. Existing curves from the Yuba River and Clear Creek were presented by USFWS. The applicability, complexity, and sample size of the various cover code data were discussed. Possible use of Sacramento River cover codes was discussed, although the data were not presented or reviewed. Stillwater will consider combining cover data from various sources (including the USFWS Sacramento River Data) into a simplified cover code that could be circulated for comment.


Chinook Salmon Fry
Probable Suitability
Mean Column Velocity (fps)
Stanislaus
L Tuolumne
Yuba (FWS)
Tuol ENV
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0

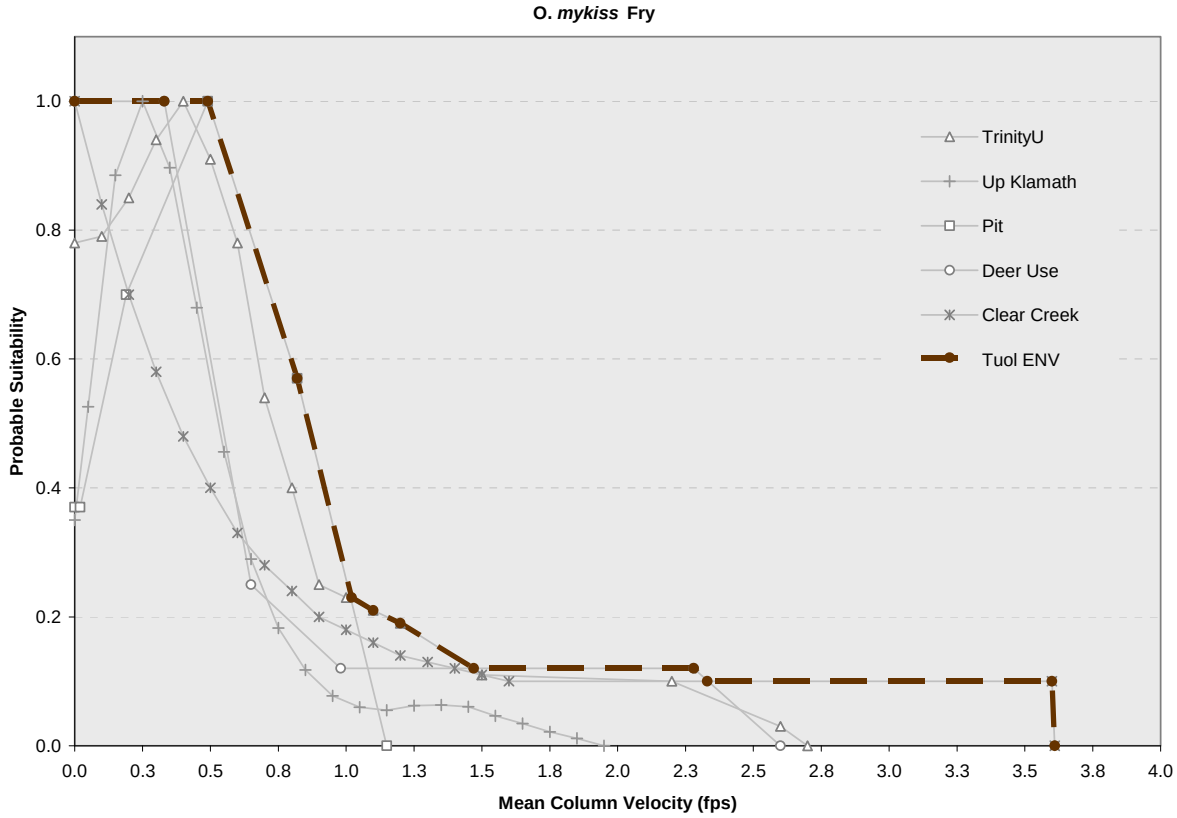

Chinook Salmon Fry
Probable Suitability
Depth (ft)
Stanislaus
L Tuolumne
Tuol ENV
Tuol MOD
Yuba (FWS)
0.0
0.2
0.4
0.6
0.8
1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0

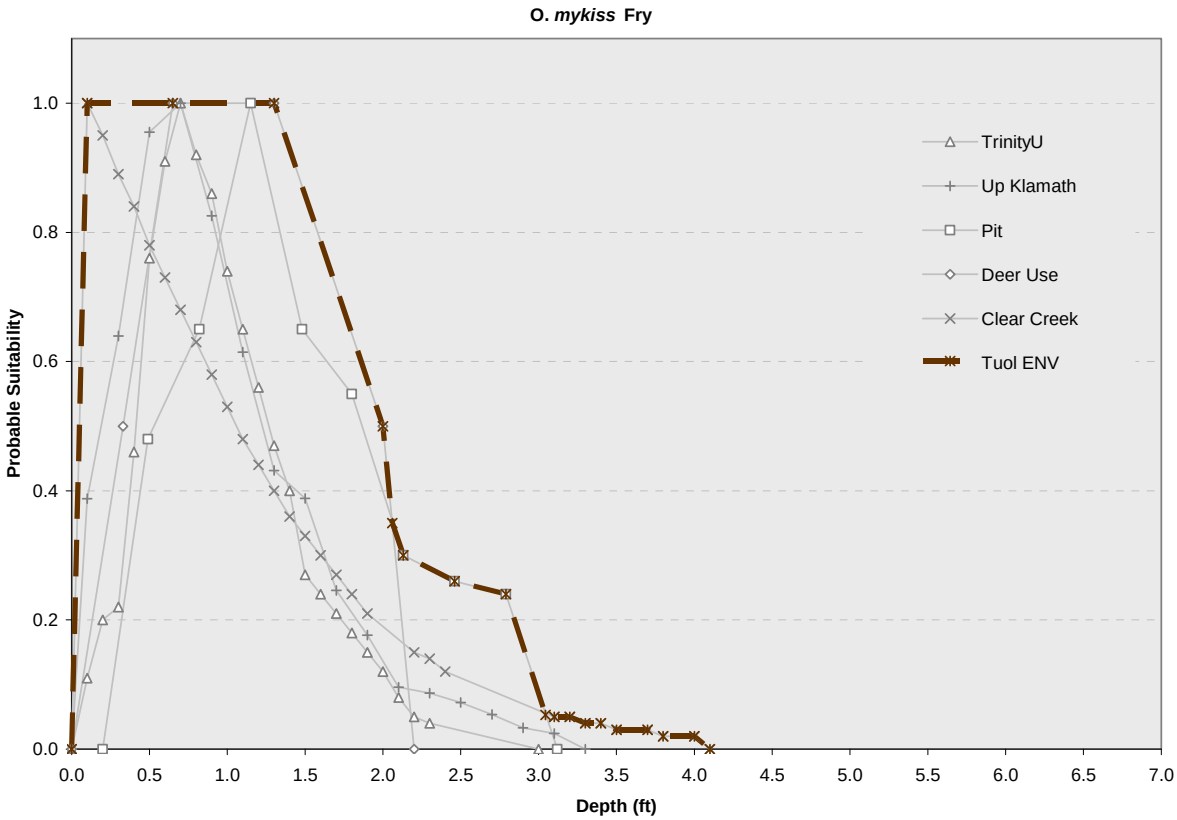
Chinook Salmon Fry: Velocity suitability criteria and three most discussed depth suitability criteria remaining following discussion on February 3, 2011

Tuol ENV		Tuol ENV		Tuol MOD		Yuba (FWS)	
Velocity	Index	Depth	Index	Depth	Index	Depth	Index
0	1	0.0	0.00	0.0	0.00	0.0	0.00
0.1	0.99	0.1	0.12	0.1	0.12	0.1	0.00
0.2	0.95	0.2	0.31	0.2	0.31	0.2	0.80
0.3	0.89	0.3	0.58	0.3	0.58	0.3	0.84
0.4	0.81	0.4	0.85	0.4	0.85	0.5	0.90
0.6	0.65	0.5	0.99	0.5	0.99	0.6	0.92
0.7	0.56	0.6	1.00	0.6	1.00	0.7	0.95
0.8	0.49	0.8	1.00	0.8	1.00	0.8	0.96
0.9	0.42	0.9	1.00	0.9	1.00	0.9	0.98
1.1	0.3	1.0	0.92	1.1	1.00	1.1	1.00
1.3	0.22	1.1	0.80	1.2	1.00	1.4	1.00
1.4	0.19	1.2	0.66	1.5	0.92	1.7	0.97
1.7	0.13	1.3	0.55	1.9	0.76	2.2	0.87
2	0.1	1.4	0.45	1.9	0.73	2.5	0.78
4.90	0.00	1.5	0.38	2.0	0.69	2.6	0.76
		1.6	0.32	2.3	0.55	2.7	0.73
		1.7	0.26	2.4	0.48	2.8	0.69
		1.8	0.21	2.5	0.45	3.5	0.48
		1.9	0.16	2.7	0.38	3.6	0.46
		2.0	0.16	3.1	0.26	3.8	0.40
		2.1	0.14	3.3	0.21	3.9	0.38
		2.2	0.11	3.3	0.2	4.0	0.35
		2.3	0.09	3.4	0.19	4.6	0.23
		2.4	0.07	3.4	0.17	4.7	0.22
		2.5	0.06	3.6	0.16	4.8	0.20
		2.6	0.05	3.7	0.14	4.9	0.19
		2.7	0.05	3.9	0.11	5.0	0.17
		2.8	0.04	4.3	0.07	5.7	0.10
		2.9	0.04	4.5	0.06	5.8	0.10
		3.0	0.03	4.6	0.05	6.0	0.08
		3.1	0.02	4.8	0.05	6.1	0.08
		6.4	0.02	5.1	0.04	6.2	0.07
		6.5	0.01	5.2	0.03	6.3	0.07
		6.6	0.00	5.6	0.02	6.4	0.06
				12.6	0.00	6.5	0.06
						6.6	0.05
						6.9	0.05
						7.0	0.04
						7.3	0.04
						7.4	0.03
						8.0	0.03
						8.1	0.02
						18.4	0.02
						18.5	0.00

O. mykiss Fry

- A wide range of HSC from various sources were reviewed during the October 20, 2010 HSC workshop that displayed similar results for fry. USFWS Yuba River curves were presented in the "filtered" data sets, but they varied from the central tendency of the other curves due to the statistical approach used to generate them. USFWS subsequently provided the report and curves with underlying fish utilization histograms for discussion.
- The USFWS suggested the workshop group drop the Yuba *O. mykiss* fry curves from consideration due to the limited number of observations, but to add USFWS unpublished Clear Creek fry curves instead.
- **Decision**: The workshop group concurred on the use of an envelope curve for both depth and velocity around the Trinity U., Up Klamath, Pit, Deer Use, and Clear Creek curves, generally following the most inclusive ("outside") parts of the curve.





Tuolumne River suitability criteria for *O. mykiss* fry

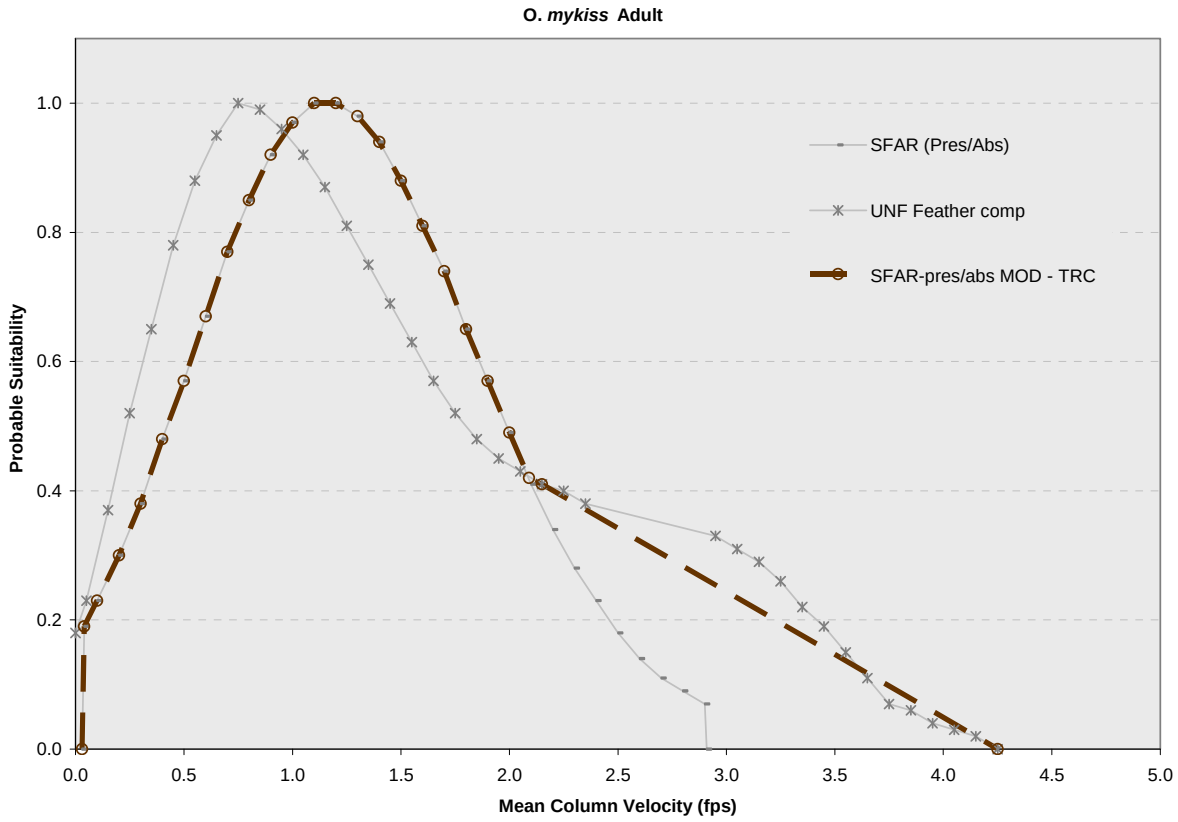
Velocity	Tuol ENV Index	Depth	Tuol ENV Index
0.00	1.00	0.00	0.00
0.33	1.00	0.10	1.00
0.49	1.00	0.65	1.00
0.82	0.57	1.30	1.00
1.02	0.23	2.00	0.50
1.10	0.21	2.06	0.35
1.20	0.19	2.13	0.30
1.47	0.12	2.46	0.26
2.28	0.12	2.79	0.24
2.33	0.10	3.05	0.05
3.60	0.10	3.10	0.05
3.61	0.00	3.20	0.05
		3.30	0.04
		3.40	0.04
		3.50	0.03
		3.70	0.03
		3.80	0.02
		4.00	0.02
		4.10	0.00

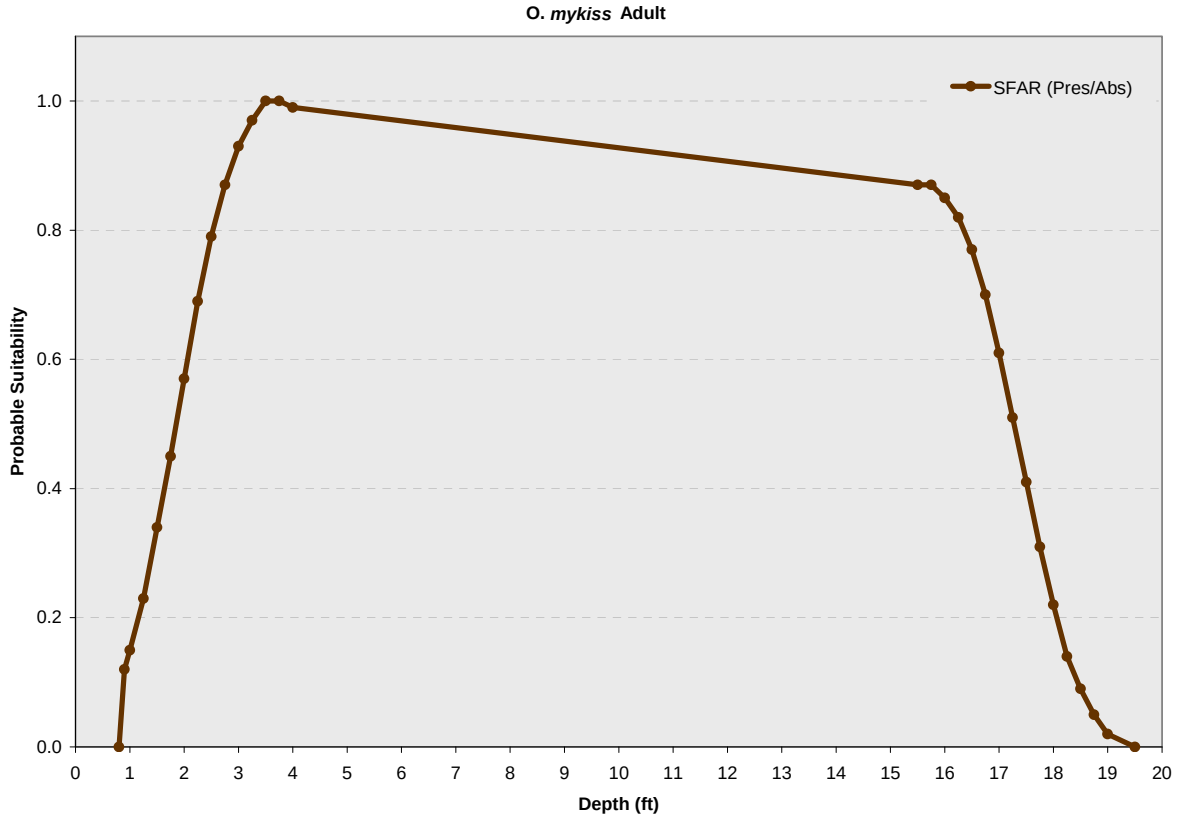
***O. mykiss* Adult**

- The workshop group had previously discussed use of the South Fork American River Logistic Regression (Pres/Abs) curves (SFAR Pres/Abs) proposed by the USFWS for both velocity and depth, and concurrence of the group was reported in the October 20, 2010 meeting summary. TRC suggested that the reported concurrence was in error in regard to their opinion, so the group re-opened the discussion.
- **Decision**: In response to TRC requests, the workgroup agreed to keep the South Fork American River Logistic Regression (Pres/Abs) curve (SFAR Pres/Abs) for depth, and use a modified curve for velocity. The modified velocity curve (SFAR Pres/Abs MOD-TRC) was equal to the SFAR Pres/Abs curve up to its intersection with the Upper North Fork Feather River composite curve (2.09, 0.42), at which point the modified curve follows a straight line to (4.25, 0.0), the end point of the UNF Feather comp curve.

Post-Workshop Correspondence

Subsequent to this February 3, 2011 workshop, TRC transmitted the attached email (Attachment #1) dated March 20, 2011, withdrawing their support for *O. mykiss* decisions regarding habitat suitability criteria.


O. mykiss Adult
Probable Suitability
Mean Column Velocity (fps)
SFAR (Pres/Abs)
UNF Feather comp
SFAR-pres/abs MOD - TRC
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0


O. mykiss Adult
Probable Suitability
Depth (ft)
SFAR (Pres/Abs)
0.0
0.2
0.4
0.6
0.8
1.0
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Tuolumne River suitability criteria for *O. mykiss* adults

Velocity	SFAR pres/abs MOD-TRC Index	Depth	SFAR (Pres/Abs) Index
0.03	0.00	0.80	0.00
0.04	0.19	0.90	0.12
0.10	0.23	1.00	0.15
0.20	0.30	1.25	0.23
0.30	0.38	1.50	0.34
0.40	0.48	1.75	0.45
0.50	0.57	2.00	0.57
0.60	0.67	2.25	0.69
0.70	0.77	2.50	0.79
0.80	0.85	2.75	0.87
0.90	0.92	3.00	0.93
1.00	0.97	3.25	0.97
1.10	1.00	3.50	1.00
1.20	1.00	3.75	1.00
1.30	0.98	4.00	0.99
1.40	0.94	15.50	0.87
1.50	0.88	15.75	0.87
1.60	0.81	16.00	0.85
1.70	0.74	16.25	0.82
1.80	0.65	16.50	0.77
1.90	0.57	16.75	0.70
2.00	0.49	17.00	0.61
2.09	0.42	17.25	0.51
2.15	0.41	17.50	0.41
4.25	0.00	17.75	0.31
		18.00	0.22
		18.25	0.14
		18.50	0.09
		18.75	0.05
		19.00	0.02
		19.50	0.00

HSC development status

The following table summarizes sources of HSC curves to be used in the Tuolumne River Instream Flow Study.

Species	Life Stage	Depth	Velocity	Substrate[1]	Cover
Fall Chinook salmon	Spawning	L Tuolumne Sept 20, 2010	L Tuolumne Sept 20, 2010	Tuol/Wentworth Sept 20, 2010[2]	--
	Juvenile	Stanislaus (modified) Sept 20, 2010	Stanislaus Sept 20, 2010	--	TBD
	Fry	Tuol ENV[3] Feb 03, 2011	Tuol ENV Feb 03, 2011	--	TBD
O. mykiss	Adult	SFAR Pres/Abs Oct 20, 2010	SFAR Pres/Abs Oct 20, 2010 or SFAR Pres/Abs MOD-TRC Feb 2, 2011[4]	--	TBD
	Spawning	Tuolumne ENV Oct 20, 2010	Tuolumne ENV Oct 20, 2010	Tuolumne ENV Oct 20, 2010	--
	Juvenile	Tuolumne ENV Oct 20, 2010	Tuolumne ENV Oct 20, 2010	--	TBD
	Fry	Tuol ENV Feb 03, 2011	Tuol ENV Feb 03, 2011	--	TBD

[1] The workgroup decided not to apply substrate criteria to fry and juvenile life stages since they do not typically select habitat based on substrate and may occur over a full range of possibilities.

[2] Adapted from CDFG 1982 with minor expansion to indicate suitability of 1-2 inch gravel.

[3] Lacking consensus on this parameter, the Districts plan to apply the Tuolumne Envelope curve (Tuol ENV) since this option seemed to have the broadest support among the stakeholders present at the workshop.

[4] Although TRC subsequently withdrew their support for *O. mykiss* HSC curves, the Districts tentatively plan to use, or at least include, the *O. mykiss* adult curve (SFAR Pres/Abs MOD-TRC) modified at TRC's request.

Upcoming meeting dates:

There are no additional HSC meetings scheduled at this time. Additional meetings may be required following the collection of field data in 2011.

Attachment #1

From: Allison Boucher [mailto:aboucher@bendbroadband.com]
Sent: Sunday, March 20, 2011 4:39 PM
To: Zachary_Jackson@fws.gov; wsears@sfwater.org; Whittaker, John; Wayne Swaney; walterw@mid.org; tramirez@sfwater.org; Tim O'Laughlin; theyne@dfg.ca.gov; stsao@dfg.ca.gov; steve@mlode.com; Shaara Ainsley; Scott@mcbaintrush.com; Scott Wilcox; Russell Liebig; Russ Kanz; Robert W. Hughes; rmyoshiyama@ucdavis.edu; rmnees@tid.org; rmasuda@calwaterlaw.com; Ramon_Martin@fws.gov; pbrantley@dfg.ca.gov; Patrick@tuolumne.org; Nsandkulla@bawsca.org; Noah Hume; Monica.Gutierrez@noaa.gov; Michelle_Workman@fws.gov; Mark_Gard@fws.gov; Maria Rea; kim_webb@fws.gov; Kelleigh Crowe; Karlha@tuolumne.org; jvick@sfwater.org; joyw@mid.org; john.devine@hdrinc.com; JMEANS@dfg.ca.gov; jkobrien@dfg.ca.gov; Jessie Raeder; Jesse.roseman@tuolumne.org; jen@riversandwater.com; Jarvis Caldwell; Greg Dias; Gantenbein@n-h-i.org; Erich Gaedeke; Eric@tuolumne.org; Donn Furman; dmarston@dfg.ca.gov; deltakeep@aol.com; deborah_giglio@fws.gov; Darren@mcbaintrush.com; Cindy@ccharles.net; chrissysonke@fishbio.com; Chris Shutes; andreafuller@fishbio.com; anadromous@bendbroadband.com; Alison_Willy@fws.gov; AJensen@bawsca.org; agengr6@aol.com
Cc: dave Boucher
Subject: IFIM O. mykiss

To all interested parties,

After much consideration, we are withdrawing our support for the IFIM O. mykiss decisions. We are not comfortable with the available studies and the resulting decisions.

We look forward to future meetings to discuss Tuolumne River O. mykiss, particularly steelhead.

Allison and Dave Boucher
Tuolumne River Conservancy, Inc.