TESTIMONY OF PAUL BRATOVICH

1. I am a Vice President and Principal Scientist of HDR|Surface Water Resources, Inc. (HDR|SWRI). I have over 24 years of professional water resources and fisheries experience and have been employed by SWRI since 1996. Exhibit YCWA-4 contains an accurate statement of my qualifications and experience.

2. I am providing this expert testimony on the issues pertaining to Yuba County Water Agency (YCWA), the Yuba River Development Project and related facilities that will be discussed during the December 11 and 12, 2006 State Water Resources Control Board (SWRCB) hearing to consider YCWA's petition to change the effective date of the long-term instream flow requirements established in Revised Decision 1644 (RD-1644).

3. HDR|SWRI prepared the Initial Study/Proposed Mitigated Negative Declaration (IS/ND) (Exhibit YCWA-9) for YCWA's petition to change the effective date of the long-term instream flow requirements in RD-1644.

4. The Initial Study (IS) examined potential environmental impacts of the proposed project, relative to the regulatory baseline (RD-1644 interim flows). The IS relied extensively on two-trace exceedance plots displaying the cumulative probability distribution of lower Yuba River flows (Appendix 3 of the IS) and water temperatures (Appendix 4 of the IS) that may occur each month with implementation of either the proposed project or the RD-1644 interim requirements, for the period extending from March 1, 2007 through March 31, 2008.

5. The IS included an Environmental Analysis (EA) (Appendix 2 of the IS) which also utilized exceedance plots displaying the cumulative probability distributions of lower Yuba River flows and water temperatures that may occur with implementation of either the proposed project or the RD-1644 long-term requirements (Appendix B of the EA), for the period extending from March 1, 2007 through December 31, 2007. Additionally, Appendix B of the EA displays the cumulative probability distributions of lower Yuba River flows and water temperatures for the period extending from January 2008 through March 2008. The IS (section 4.12) included a summary of the impact assessments included in the EA and evaluated potential impacts of the proposed project relative to RD-1644 long-term flows for the period of March 1, 2007 through March 31, 2008.

6. The flow and water temperature exceedance plots were examined to assess potential impacts that implementation of the proposed project would be expected to have on six fish species or runs of management concern in the lower Yuba River: (1) spring-run Chinook salmon; (2) fall-run Chinook salmon; (3) steelhead; (4) green sturgeon; (5) American shad; and (6) striped bass. (Although it is uncertain whether or not lower Yuba River spring-run Chinook salmon and fall-run Chinook salmon are distinct runs, this testimony treats them as distinct runs.)

For each month of the proposed project, the potential occurrence of each life stage of each of the six species was considered. If a species/life stage combination could be expected to occur in the lower Yuba River during a particular month of the proposed project, then the potential impact of the proposed project on that species/life stage combination was assessed, relative to that of either RD-1644 interim or RD-1644 long-term. Yuba River water temperature analyses were conducted for the months of May through October. During November through April, water temperatures in the lower Yuba River are generally cool and are assumed not to cause thermal impacts on salmonids and other fish species in the river. Therefore, although embryo incubation for some of these fish species may occur during November through April, it was not evaluated. The fish species or runs and life stages of management concern in the lower Yuba River evaluated for the 13 months of the proposed project are illustrated in slide 1.

7. For example, during September 2007, potential impacts of the proposed project, relative to RD-1644 interim and RD-1644 long-term, were considered for the following species or run/life stage combinations, which may be present in the lower Yuba River during that month:

   - Spring-run Chinook Salmon (Adult Immigration and Holding; Adult Spawning; Embryo Incubation; Juvenile Rearing)
   - Fall-run Chinook Salmon (Adult Immigration and Holding)
   - Steelhead (Adult Immigration and Holding; Juvenile Rearing)
   - Green Sturgeon (Juvenile Rearing and Juvenile Emigration)

8. As shown in slide 2, during September, proposed project flows at the Smartville Gage are expected to be from about 100 cfs to 200 cfs higher than the flows expected to occur under either RD-1644 interim or RD-1644 long-term for 90 percent of each of the cumulative probability distributions. Flows equal to or higher than 700 cfs are expected to occur under the proposed project with about a 98 percent probability, whereas flows are expected to exceed 700 cfs with about a 70 and 60 percent probability under RD-1644 interim or RD-1644 long-term, respectively. Under the proposed project, flows at the Marysville Gage are expected to be about 100 to 250 cfs higher than the flows under RD-1644 interim with about a 90 percent probability, and with about a 95 percent probability relative to RD-1644 long-term flows. Flows equal to or higher than 500 cfs are expected to occur under the proposed project with about a 90 percent probability, whereas flows under RD-1644 interim are expected to equal or exceed 500 cfs with less than a 70 percent probability, and are expected to equal or exceed 500 cfs under RD-1644 long-term with approximately a 65 percent probability.

9. As shown in slide 3, during September, a month of the proposed project when water temperatures may be an important stressor to lower Yuba River fish, water temperatures at Daguerre Point Dam with implementation of the proposed project are expected to be similar to water temperatures with implementation of either RD-1644 interim or RD-1644 long-term flows (always within 0.1°F of each other), and range from approximately 58.2°F to 58.3°F. During September, water temperatures simulated at Marysville generally range from about 59.2°F to 62.6°F under the proposed project, from 59.3°F to 63.9°F under RD-1644 interim, and from 59.3°F to 63.2°F under RD-1644 long-term. During the warmest 30 percent of the water temperature exceedance distribution, water temperatures simulated at Marysville under the proposed project are expected to be lower (by up to 2.1°F) than those under RD-1644 interim, and are expected to be lower (by about 1.5°F) than those under RD-1644 long-term. For the remainder of the water temperature exceedance distribution, average water temperatures under the proposed project are generally up to 1°F lower than those under RD-1644 interim or long-term.

10. In addition to monthly flow and water temperature analyses, evaluations of spring-run Chinook salmon, fall-run Chinook salmon, and steelhead spawning habitat availabilities in the lower Yuba River were conducted. The potential impacts of simulated proposed project flows on spawning habitat availabilities, expressed as weighted usable areas (WUA) (CDFG 1991), were evaluated by examining the months corresponding to their spawning periods. The analysis included summing the WUA values that correspond to average monthly flows during their spawning seasons within one section of the river (above Daguerre Point Dam) for spring-run Chinook salmon and steelhead, and two sections of the river (above and below Daguerre Point Dam) for fall-run Chinook salmon.

11. Spring-run Chinook salmon reportedly spawn from September through November (CDFG 1991) in the Garcia Gravel Pit Reach, which is upstream of Daguerre Point Dam (SWRCB 2003). Thus, the spring-run Chinook salmon spawning habitat analysis focused on the annual spawning habitat availability for the Yuba River reach upstream of Daguerre Point Dam during the spawning months of September, October and November. The spring-run Chinook salmon spawning habitat analysis also emphasized the month of September, because this is the only month during the spring-run Chinook salmon spawning period that is assumed to not temporally overlap with fall-run Chinook salmon spawning (CDFG 2000). These months were used to compare the potential impacts of the proposed project on spring-run Chinook salmon spawning habitat availability, relative to either RD-1644 interim or RD-1644 long-term.

    As shown in slide 4, for September, spring-run Chinook salmon spawning habitat availability, expressed as percent maximum WUA, under the proposed project was higher (by up to about 5 percent) than under either RD-1644 interim or RD-1644 long-term for approximately 43 percent of the cumulative WUA distribution, and was lower (by up to approximately 10 percent) than under either RD-1644 interim or RD-1644 long-term for the remainder of the distribution.

Overall, over the entire simulation period, the proposed project provided an average of about 87 percent of maximum WUA, compared to 89 percent for RD-1644 interim and 90 percent for RD-1644 long-term. Under the proposed project, approximately 99 to 100 percent of the maximum WUA was provided for over 40 percent of the cumulative WUA distribution, whereas RD-1644 interim and RD-1644 long-term flows did not provide spawning habitat over about 96 percent of maximum WUA. Due to the specific characteristics of the spawning habitat – discharge relationship, more spawning habitat (WUA) is provided by the proposed project under the lower portion of the flow distribution rather than the higher portions of the flow distribution. Thus, the proposed project provides more spawning habitat for the lowest 40% of the flow distribution than either RD-1644 interim or RD-1644 long-term during "drier" conditions, when it is commonly assumed that habitat is most limiting.

As shown in slide 5, for the September through November spring-run Chinook salmon spawning period, implementation of the proposed project is expected to provide nearly equal or higher spawning habitat availability over the entire range of the cumulative probability distribution than either RD-1644 interim or RD-1644 long-term. With implementation of the proposed project, 80 percent or more of maximum WUA is expected with about an 89 percent probability, whereas RD-1644 interim and RD-1644 long-term are expected to provide 80 percent or more of maximum WUA with about an 83 percent probability. Overall, the proposed project is expected to provide an average of about 91 percent of maximum WUA, compared to 90 percent for either RD-1644 interim or RD-1644 long-term.

12. In the IS, flows and water temperatures during all months of the proposed project were evaluated in the manner described above for September. The monthly flow and water temperature evaluations, along with the spring-run Chinook salmon, fall-run Chinook salmon, and steelhead spawning habitat availability evaluations, and findings of YCWA's recent monitoring studies provided the basis for the following conclusions. Relative to either RD-1644 interim or RD-1644 long-term, the proposed project is expected to provide the following results for the following species:

Spring-run Chinook Salmon (see slides 6 and 7)

- Similar rates of non-indigenous adult Chinook salmon straying;
- Similar adult upstream migration and holding conditions;
- Higher spawning habitat availability during drier flow conditions, and lower spawning habitat availability during wetter conditions in September; higher spawning habitat availability from September through November; and nearly identical spawning water temperatures;
- Substantially lower (by up to 2°F relative to RD-1644 interim and by up to 1.5°F relative to RD-1644 long-term) and therefore more suitable water

temperatures during the juvenile spring-run Chinook salmon over-summer rearing period below Daguerre Point Dam;

- Similar protection against juvenile non-volitional downstream movement; and
- Generally equivalent or enhanced smolt outmigration conditions.

Fall-run Chinook Salmon (see slides 8 and 9)

- Substantially higher flows (by up to 250 cfs) and lower water temperatures (by up to 2°F relative to RD-1644 interim and by up to 1.5°F relative to RD-1644 long-term) below Daguerre Point Dam during the late-summer and fall period of the adult immigration and holding life stage;
- Similar rates of non-indigenous salmonid straying;
- More spawning habitat overall, and more spawning habitat (generally by 10 to 20 percent) when spawning habitat is least available, which occurs with about a 60 percent probability;
- Lower (by up to 1°F) and therefore more suitable water temperature during the early part (i.e., October) of the spawning and embryo incubation season;
- Similar protection against juvenile non-volitional downstream movement; and
- Generally equivalent or enhanced juvenile rearing and outmigration conditions (including flow requirements with an improved temporal pattern, with peak flow requirements earlier in the spring during drier conditions).

Steelhead (see slides 10 and 11)

- Substantially lower (by up to 2°F relative to RD-1644 interim and by up to 1.5°F relative to RD-1644 long-term) and therefore more suitable water temperatures below Daguerre Point Dam during the late summer and early fall portion of the adult immigration and holding period;
- Equivalent or better flow and water temperature conditions during the spawning and embryo incubation life stage;
- Substantially lower (by up to 2°F relative to RD-1644 interim and by up to 1.5°F relative to RD-1644 long-term) and therefore more suitable water temperatures below Daguerre Point Dam during the juvenile steelhead over-summer rearing period;
- Substantially lower (by up to 2°F relative to RD-1644 interim and by up to 1.5°F relative to RD-1644 long-term) and therefore more suitable water temperatures below Daguerre Point Dam during the late summer and early fall portion of the juvenile downstream movement life stage;
- generally equivalent or better flow and water temperature conditions during the smolt emigration life stage; and
- Similar protection against juvenile non-volitional downstream movement.

Green Sturgeon (see slide 12)

- Similar or better flows and water temperatures during the adult immigration and holding and spawning and embryo incubation life stages;
- Substantially lower, and therefore more suitable water temperatures during the over-summer juvenile rearing periods; and
- Similar flows and substantially lower, and therefore more suitable water temperatures during juvenile emigration.

American Shad (see slide 13)

- Flows of sufficient magnitude to attract American shad into the lower Yuba River to spawn (April through June).

Striped Bass (see slide 13)

- Flows of sufficient magnitude to attract striped bass into the lower Yuba River to spawn (April through June).

13. In conclusion, the proposed project is expected to result in less-than-significant impacts on aquatic resources in the Project Area. Specifically, the proposed project is expected to provide an equivalent or higher level of protection, relative to either RD-1644 interim or RD-1644 long-term, for lower Yuba River populations of spring-run Chinook salmon, fall-run Chinook salmon, steelhead, green sturgeon, American shad, and striped bass.

14. In addition to my testimony regarding the evaluation of potential impacts presented in the IS, I also am providing a summary of the achievements of the 2006 Pilot Program. Although no water transfer occurred in 2006, the goals of the 2006 Pilot Program and the 2006 Pilot Program Fisheries Agreement were attained through implementation of the River Management Team (RMT) comprised of representatives from YCWA, National Marine Fisheries Service, United States Fish and Wildlife Service, United States Bureau of Reclamation, California Department of Fish and Game, and Non-governmental Organizations (South Yuba River Citizen's League). During 2006 the RMT has been, and continues to be engaged in the following monitoring and data collection activities:

- 2006 flow and water temperature monitoring
- 2006 adult Chinook salmon escapement surveys
- 2006 adult Chinook salmon egg retention survey
- 2006 September adult Chinook salmon redd surveys
- 2006 salmonid upstream migration evaluation using the VAKI Riverwatcher enumerative device at Daguerre Point Dam

- Development of a guidance framework for the long-term monitoring and evaluation program
- Identification and refinement of specific "core" and "focused" monitoring studies
- Preparation of detailed study plans

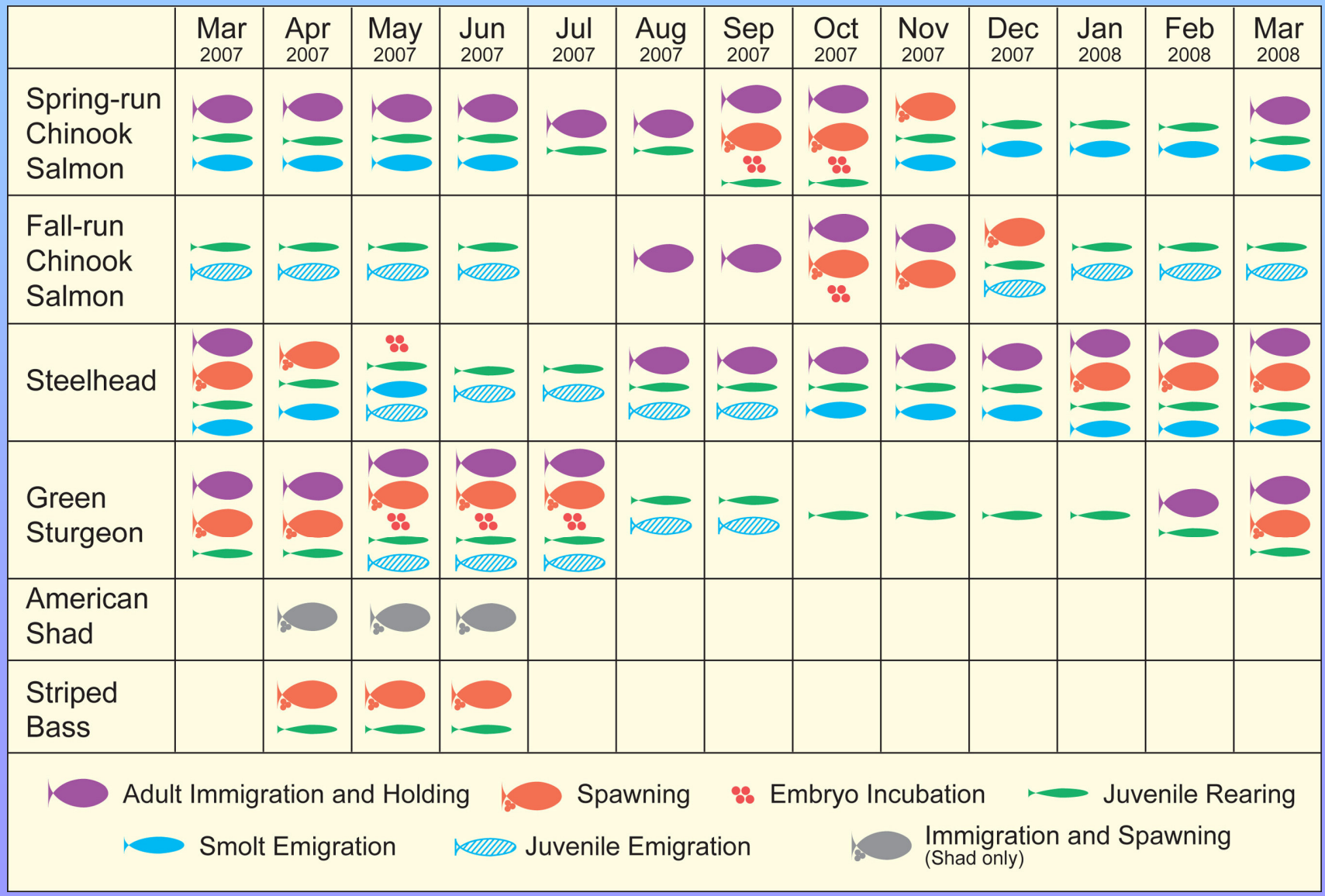
References

CDFG. 1991. Lower Yuba River Fisheries Management Plan.

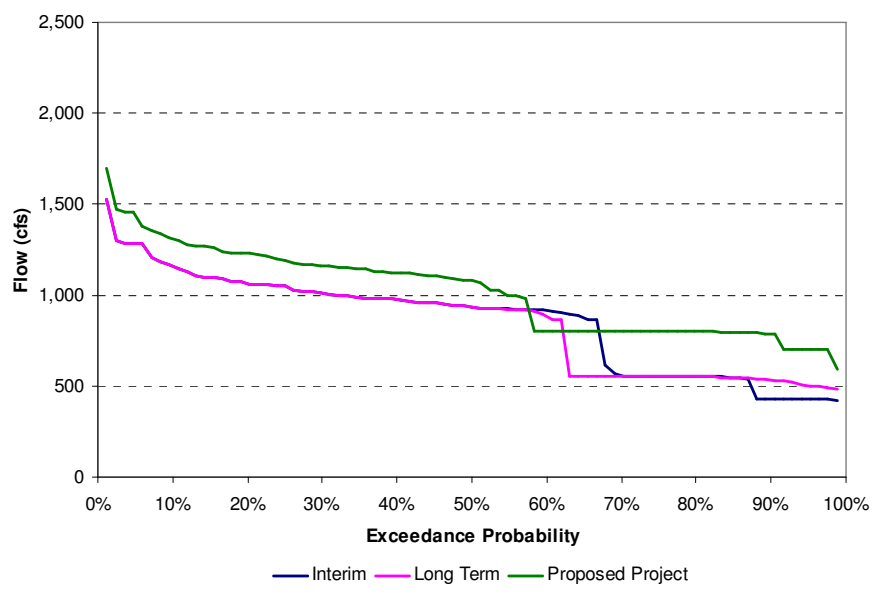
CDFG. 2000. Spring-Run Chinook Salmon. Annual Report Prepared for the Fish and Game Commission. Habitat Conservation Division, Native Anadromous Fish and Watershed Branch.

SWRCB. 2003. Revised Water Right Decision 1644 in the Matter of Fishery Resources and Water Right Issues of the Lower Yuba River.

Lower Yuba River Fish Life Stage Evaluations



September Flow

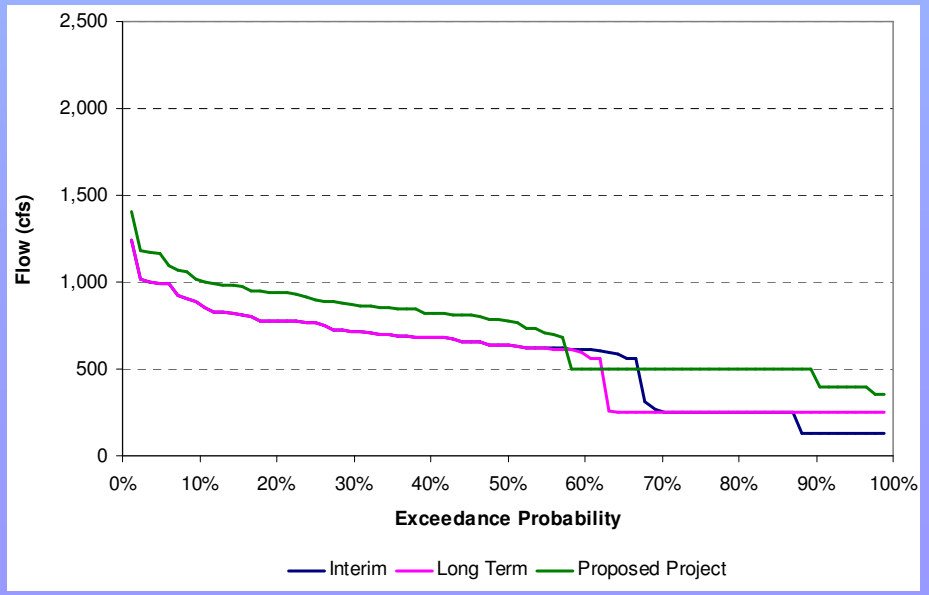


Smartville

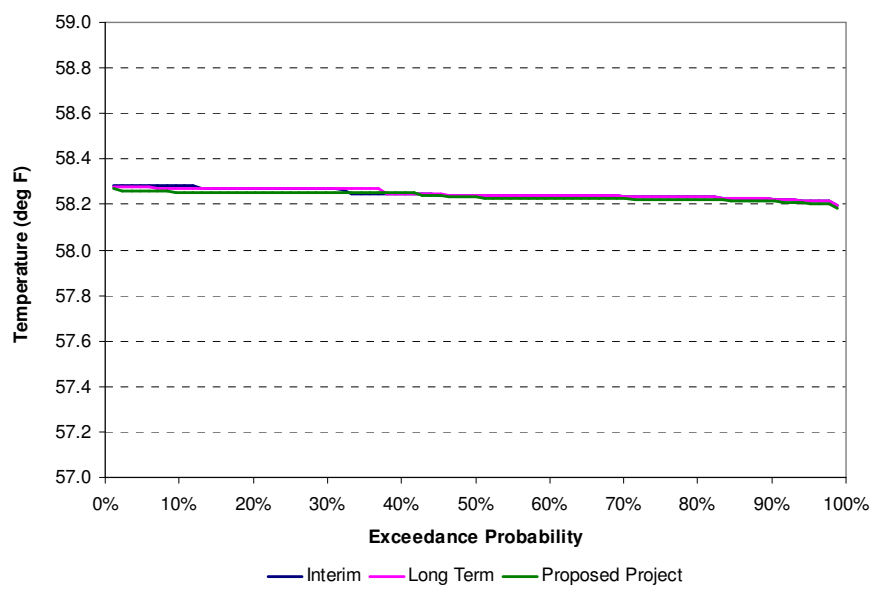
- Proposed project flows are about 100 – 200 cfs higher than RD-1644 interim or long-term for about 90% of the flow distribution
- Proposed project flows are about 200 – 250 cfs higher than RD-1644 interim or long-term during the lowest 30% of the flow distribution

Marysville

- Proposed project flows are about 100 – 250 cfs higher than RD-1644 interim or long-term for about 90% of the flow distribution
- Proposed project flows are about 150 – 250 cfs higher than RD-1644 interim or long-term during the lowest 30% of the flow distribution



September Water Temperature



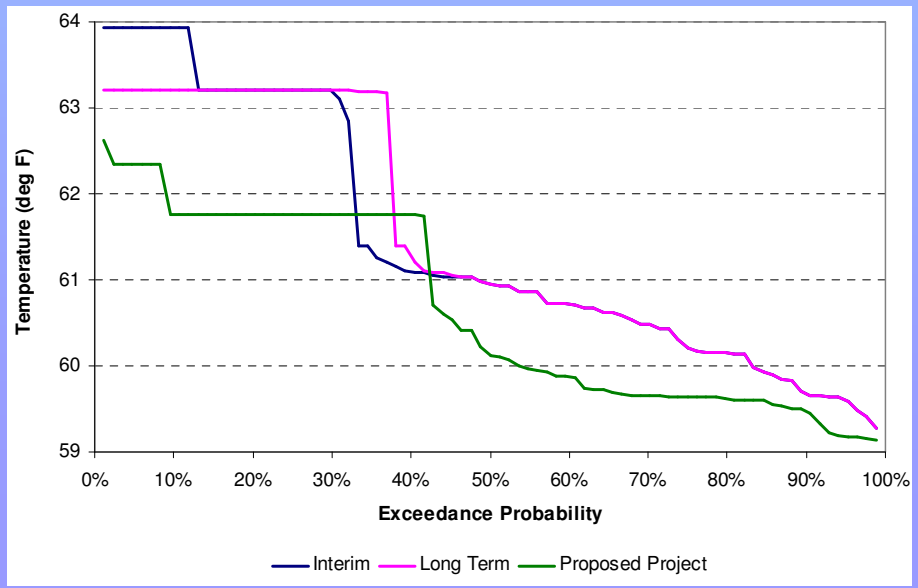
Daguerre Point Dam

- Over the entire distribution, proposed project water temperatures are similar (within 0.1°F) to RD-1644 interim and long-term

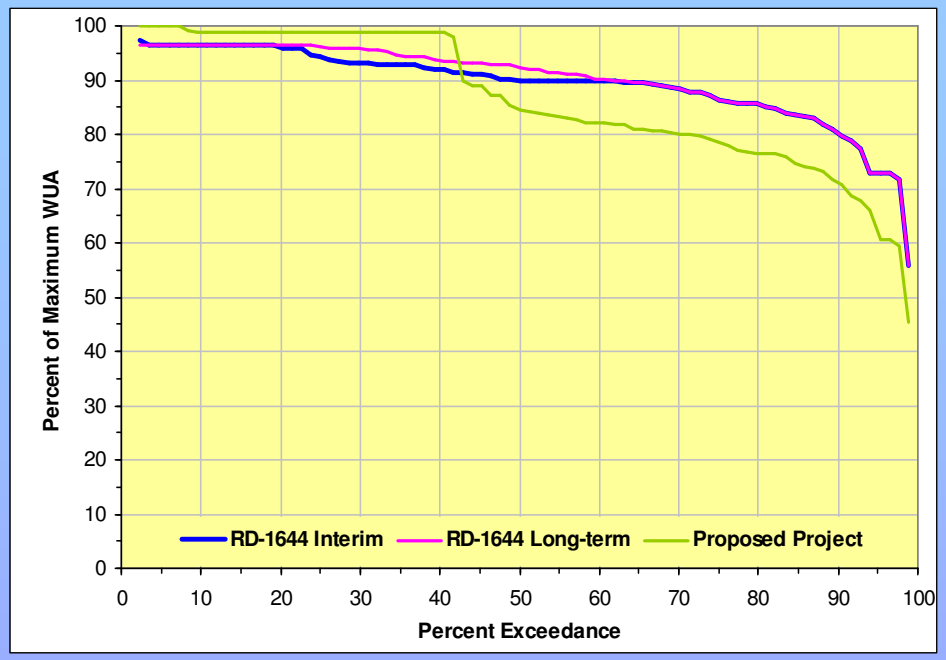
Marysville

- During the warmest 30% of the distribution, proposed project water temperatures are generally lower than RD-1644 interim (by up to 2.1°F) and lower than RD-1644 long-term (by up to 1.5°F)

- For the remainder of the distribution, proposed project water temperatures are up to about 1°F lower than those under RD-1644 interim or long-term

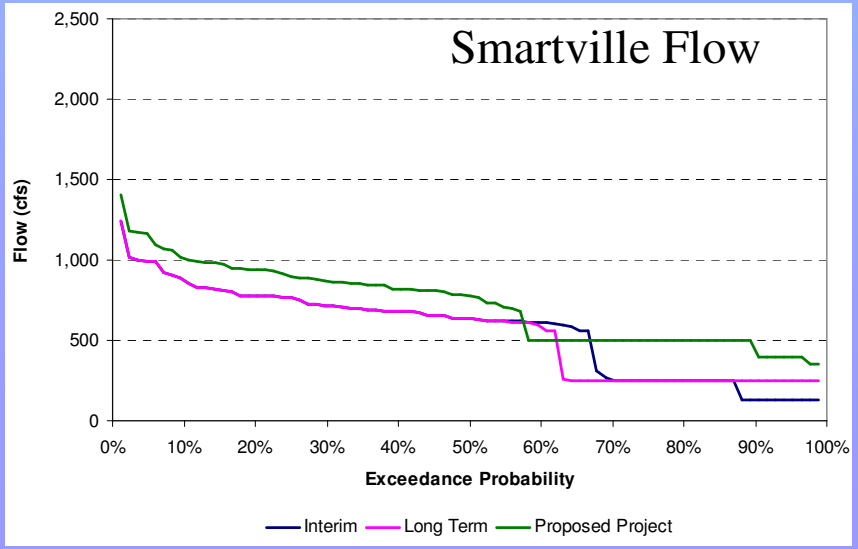


Spring-run Chinook Salmon Spawning Habitat Availability - September

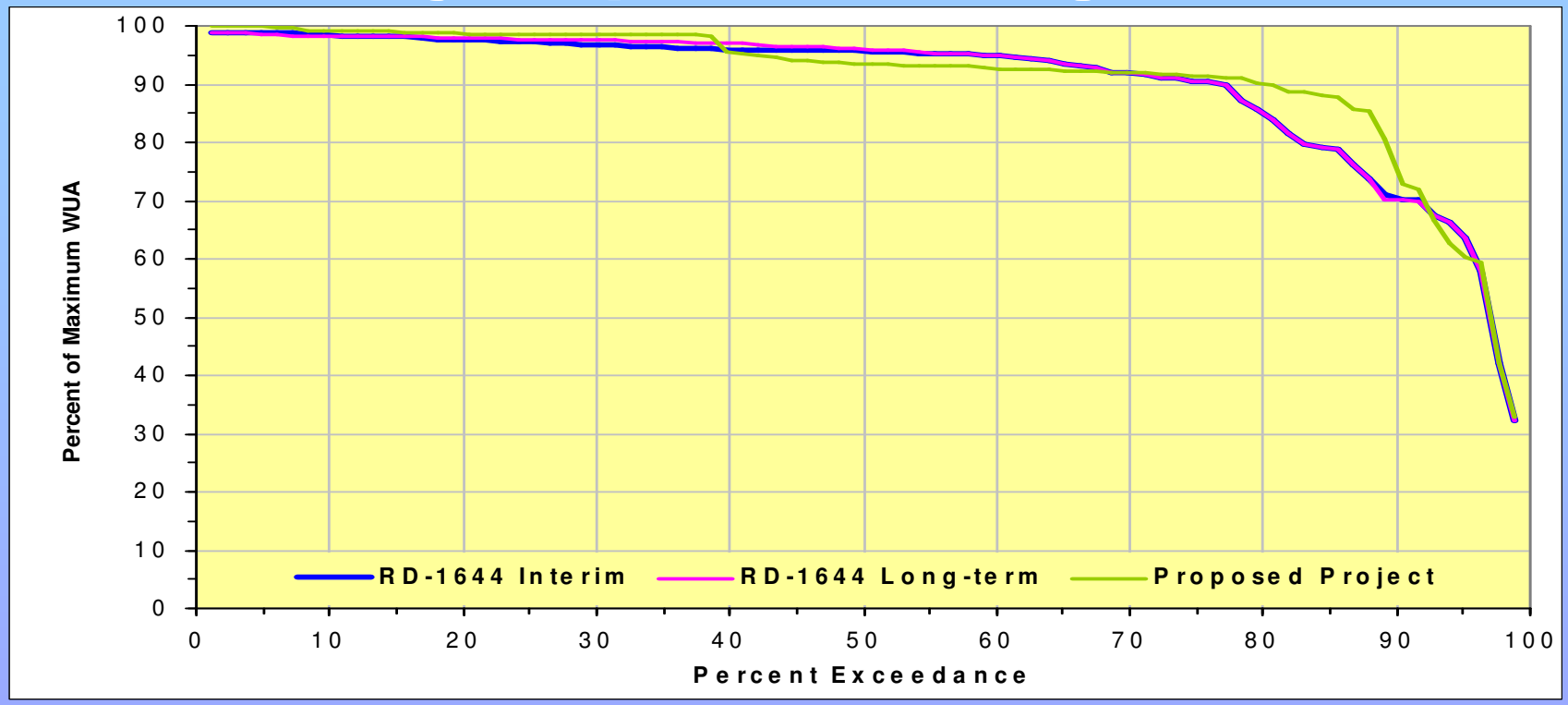


- Proposed project provides higher spawning habitat availability (% maximum WUA) than either RD-1644 interim or long-term for 43% of the distribution; lower for 57% of the distribution
- Proposed project provides an average of about 87% maximum WUA vs. about 89% under RD-1644 interim and 90% under RD-1644 long-term

- Proposed project provides more spawning habitat for the lowest 40% of the flow distribution than either RD-1644 interim or long-term during "drier" conditions, when it is commonly assumed that habitat is most limiting



Spring-run Chinook Salmon Spawning Habitat Availability - September through November



- Proposed project provides nearly equal or higher spawning habitat availability than either RD-1644 interim or long-term over the entire range of the distribution

- Proposed project provides 80% or more of maximum WUA with about an 89% probability; 80% or more of maximum WUA under RD-1644 interim or long-term occurs with about an 83% probability

- Proposed project provides about 91% of maximum WUA; RD-1644 interim and long-term provide 90% of maximum WUA

Spring-run Chinook salmon

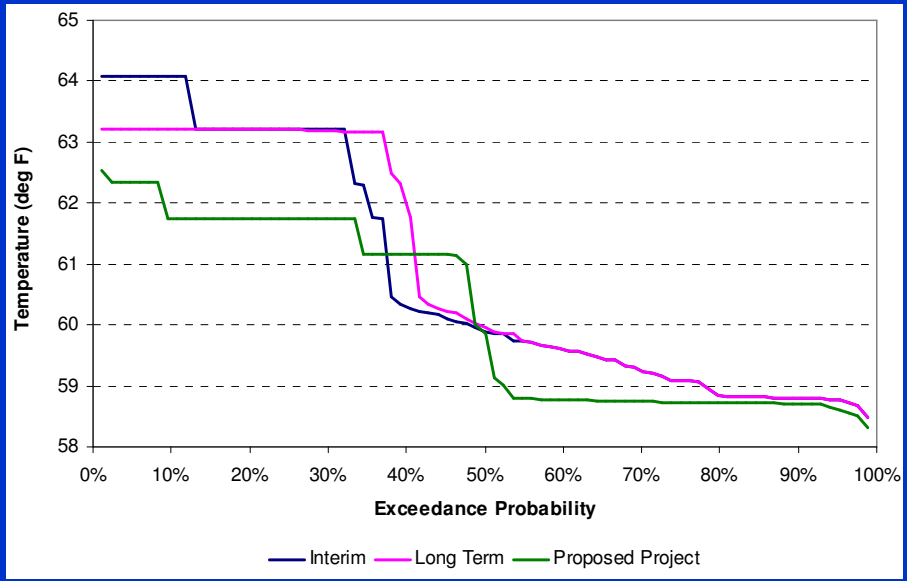
Relative to RD-1644 interim and RD-1644 long-term, the proposed project is expected to provide:

- Similar rates of non-indigenous adult Chinook salmon straying
- Similar adult upstream migration and holding conditions
- Higher spawning habitat availability during drier flow conditions, and lower spawning habitat availability during wetter conditions in September; higher spawning habitat availability from September through November; and nearly identical spawning water temperatures

Spring-run Chinook salmon (cont.)

Relative to RD-1644 interim and RD-1644 long-term, the proposed project is expected to provide:

August – Marysville Water Temperature

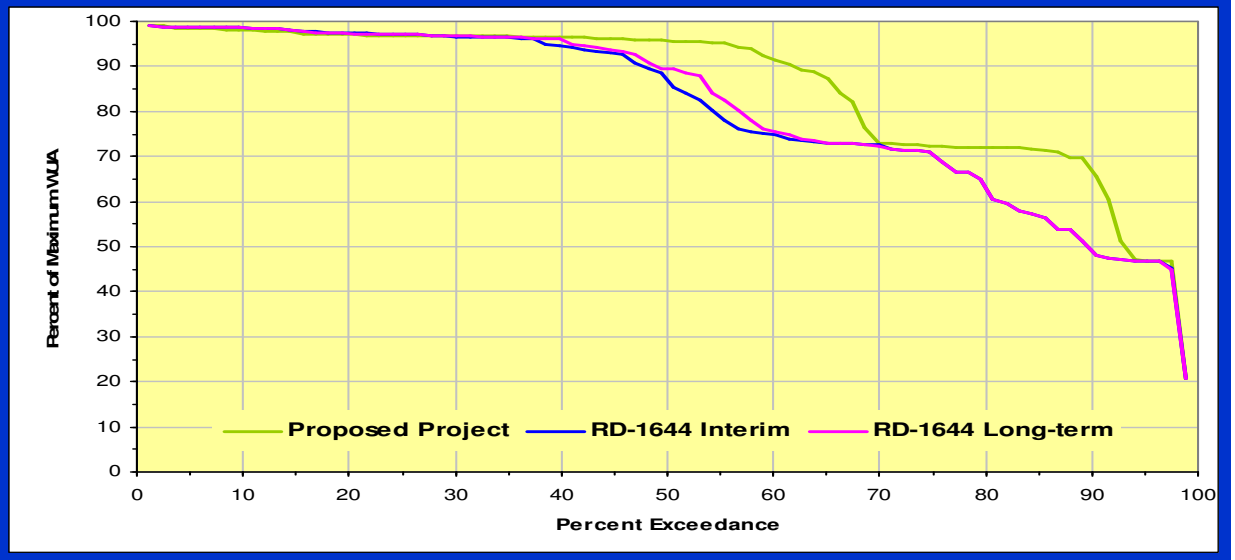


- Substantially lower (by up to 2°F relative to RD-1644 interim and by up to 1.5°F relative to RD-1644 long-term) and therefore more suitable water temperatures during the juvenile spring-run Chinook salmon over-summer rearing period below Daguerre Point Dam
- Similar protection against juvenile non-volitional downstream movement
- Generally equivalent or enhanced smolt outmigration conditions

Fall-run Chinook Salmon

Relative to RD-1644 interim and RD-1644 long-term, the proposed project is expected to provide:

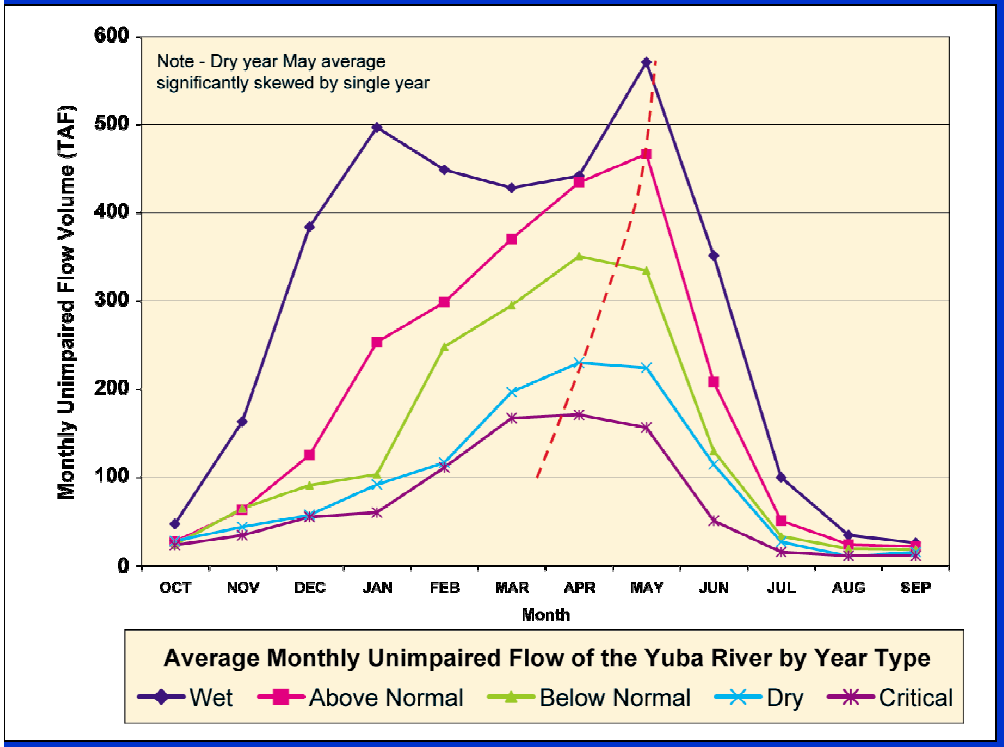
- Substantially higher flows (by up to 250 cfs) and lower water temperatures (by up to 2°F relative to RD-1644 interim and by up to 1.5°F relative to RD-1644 long-term) below Daguerre Point Dam during the late-summer and fall period of the adult immigration and holding life stage
- Similar rates of non-indigenous salmonid straying
- More spawning habitat overall, and more spawning habitat (generally by 10 to 20 percent) when spawning habitat is least available, which occurs with about a 60 percent probability



Fall-run Chinook Salmon (cont.)

- Lower (up to 1°F) and therefore more suitable water temperature during the early part (i.e., October) of the spawning and embryo incubation season
- Similar protection against juvenile non-volitional downstream movement
- Generally equivalent juvenile or enhanced rearing and outmigration conditions (including flow requirements with an improved temporal pattern, with peak flow requirements earlier in the spring during drier conditions)

Average Monthly Unimpaired Flow at Smartville



Accord Flow Schedules Marysville Gage (cfs)

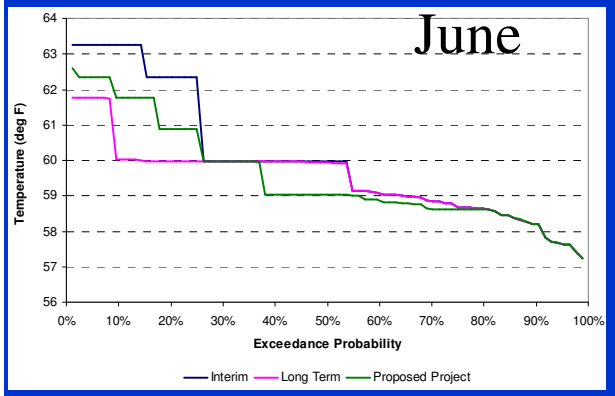
Schedule	MAR	APR		MAY		JUN		JUL
	1-31	1-15	16-30	1-15	16-31	1-15	16-30	1-31
1	700	1000	1000	2000	2000	1500	1500	700
2	700	700	800	1000	1000	800	500	500
3	500	700	700	900	900	500	500	500
4	500	600	900	900	600	400	400	400
5	500	500	600	600	400	400	400	400
6	350	350	500	500	400	300	150	150

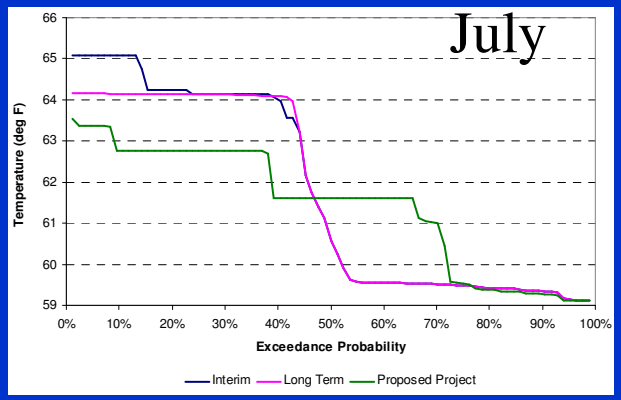
Steelhead

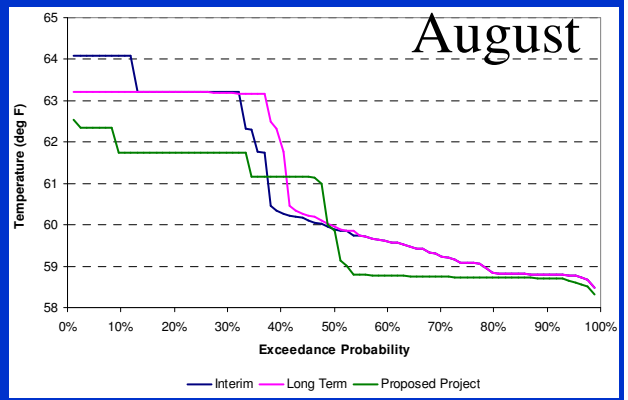
	Mar 2007	Apr 2007	May 2007	Jun 2007	Jul 2007	Aug 2007	Sep 2007	Oct 2007	Nov 2007	Dec 2007	Jan 2008	Feb 2008	Mar 2008
Steelhead													

Relative to RD-1644 interim and RD-1644 long-term, the proposed project is expected to provide:

- Substantially lower (by up to 2°F relative to RD-1644 interim and by up to 1.5°F relative to RD-1644 long-term) and therefore more suitable water temperatures below Daguerre Point Dam during:
  - the late summer and early fall portion of the adult immigration and holding period
  - the juvenile steelhead over-summer rearing period
  - the late summer and early fall portion of the juvenile downstream movement life stage



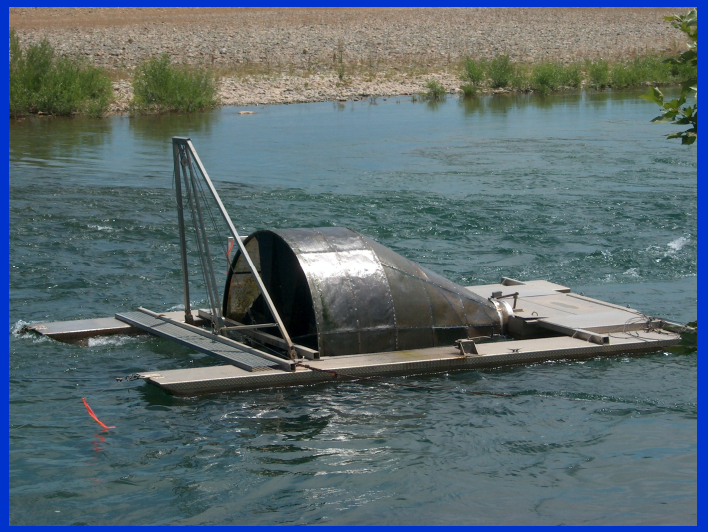




Steelhead (cont.)

Relative to RD-1644 interim and RD-1644 long-term, the proposed project is expected to provide:

- Equivalent or better flow and water temperature conditions during the spawning and embryo incubation life stage
- Generally equivalent or better flow and water temperature conditions during the smolt emigration life stage
- Similar protection against juvenile non-volitional downstream movement



Green Sturgeon

Relative to RD-1644 interim and RD-1644 long-term, the proposed project is expected to provide:

- Similar or better flows and water temperatures during the adult immigration and holding and spawning and embryo incubation life stages
- Substantially lower, and therefore more suitable water temperatures during over-summer juvenile rearing periods
- Similar flows and substantially lower, and therefore more suitable water temperatures during juvenile emigration

American Shad and Striped Bass

Relative to RD-1644 interim and RD-1644 long-term, the proposed project is expected to provide:

- Flows of sufficient magnitude to attract American shad and striped bass into the lower Yuba River to spawn (April through June)

Percent Difference in Proportional Mean Monthly Flows for the Lower Yuba River (Marysville) Relative to the Lower Feather River (Gridley)

	Apr	May	Jun
Feather River Mean Monthly Flow (cfs)[1]	4,418	4,069	4,003
Yuba River Mean Monthly Flow (cfs) with Proposed Project[2]	2,582	2,883	2,329
Yuba River Mean Monthly Flow (cfs) with RD-1644 Interim[2]	2,202	2,898	1,967
Difference in Proportional Flow (%)	9	0	9
Yuba River Mean Monthly Flow (cfs) with RD-1644 Long-term[2]	2,240	3,075	2,066
Difference in Proportional Flow (%)	8	-5	7

[1]Source: CDEC, period of record 1993 through 2005
[2]Simulated at Marysville

Conclusions

Proposed project is expected to:

- Result in less-than-significant impacts on aquatic resources in the Project Area, relative to either RD-1644 interim or long-term
- Provide an equivalent or higher level of protection, relative to either RD-1644 interim or RD-1644 long-term, for lower Yuba River populations of spring-run Chinook salmon, fall-run Chinook salmon, steelhead, green sturgeon, American shad, and striped bass