

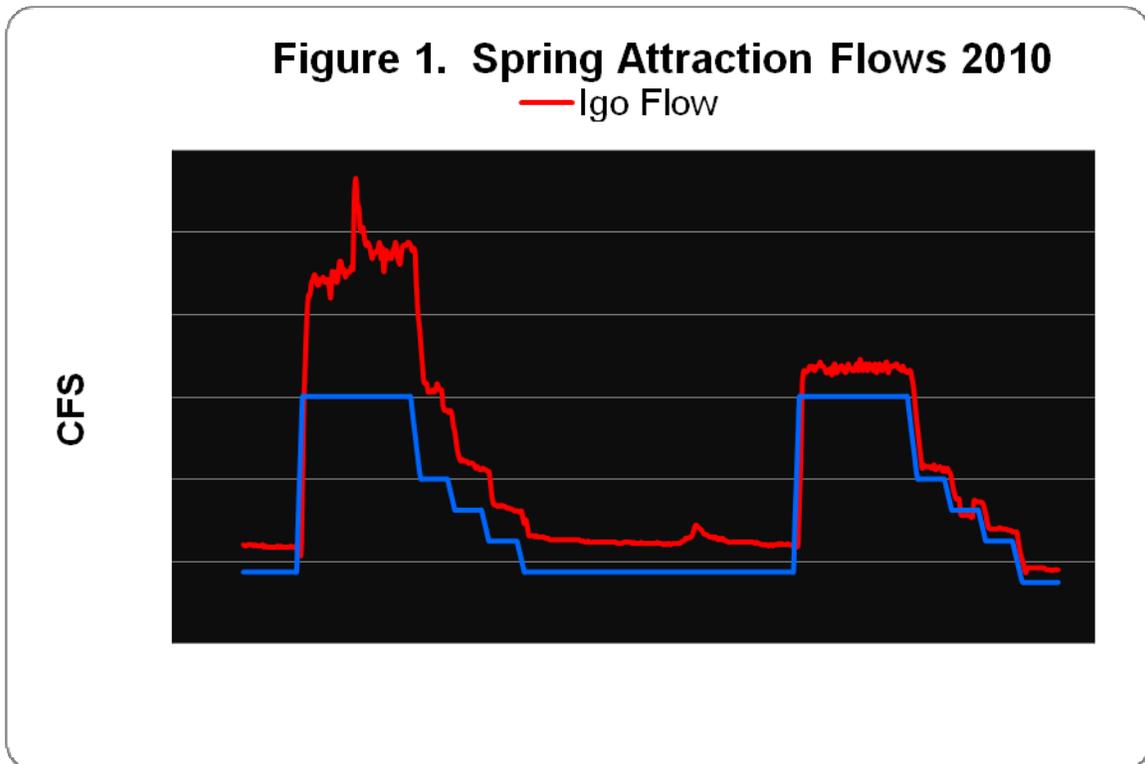
Clear Creek Actions I.1

Action I.1.1. Spring Attraction Flows

Objective: Encourage spring-run movement to upstream Clear Creek habitat for spawning.

Action: Reclamation shall annually conduct at least two pulse flows in Clear Creek in May and June of at least 600 cfs for at least three days for each pulse, to attract adult spring-run holding in the Sacramento River main stem. This may be done in conjunction with channel-maintenance flows (Action I.1.2).

Results: Two pulse flows were provided between May 24 and June 14, 2010 (Figure 1).



Flows were not successful in attracting spring-run Chinook into Clear Creek in 2010. Snorkel surveys counted one spring-run Chinook before the pulse flows, 10 after the first pulse flow and 11 after the second pulse flow. The August Spring-Run Index was 21 spring-run Chinook which was less than expected; counts in the previous three years were 194, 200 and 120. We targeted changes greater than 50% between surveys with the proviso that if the total number of spring-run Chinook was lower than 50, then the change in the number of spring-run Chinook would be considered in addition to the change in percent. The percent change in counts between the first and second snorkel surveys was 48% and the difference between

the first and third surveys was 52%. The 52% was greater than the 50% target but we have to consider the low number of spring-run Chinook (n=21). The counts only increased by 10 spring-run Chinook during the pulse flows. This low count does not seem to be a success, especially considering observation error, and the number of spring-run Chinook that would have entered Clear Creek anyway during the four weeks. After the pulse flow, an additional 48% of the August Index was counted, suggesting that the run may have been later in 2010. Other spring-run Chinook streams in the Central Valley had late runs in 2010 perhaps due to wet hydrologic conditions. Baseline data for the snorkel counts during May and June does not include wet water years. A change in run timing could have a large effect on changes in counts between surveys.

Two other metrics for success were the percent of spring-run Chinook downstream of the Igo Gage and the percent of spring-run Chinook downstream of the segregation weir. We targeted reductions of between zero and 33% downstream of the Igo Gage. The reach from Igo Gage to the segregation weir is 1/3 of the overall habitat from Whiskeytown to the segregation weir. In August 2010, 62% of the index was located upstream of the Igo gage. While an improvement, it did not achieve the target of 66%. Nineteen percent of the index was located downstream of the segregation weir. While only 4 spring-run Chinook were downstream of the weir, the proportion exceeded the goal of zero percent.

Recommendations: Continue providing attraction flows similar in magnitude and duration to 2010.

Action I.1.2. Channel Maintenance Flows

Objective: Minimize project effects by enhancing and maintain previously degraded spawning habitat for spring-run and CV steelhead.

Action: Reclamation shall re-operate Whiskeytown Glory Hole spills during the winter and spring to produce channel maintenance flows of a minimum of 3,250 cfs mean daily spill from Whiskeytown for one day, to occur seven times in a ten-year period, unless flood control operations provide similar releases. Re-operation of Whiskeytown Dam should be implemented with other project facilities described in the Environmental Water Program (EWP) Pilot Program.

Results: The CDFG ERP awarded a contract to the FWS, in the amount of \$813,745, to plan and implement a one-time re-operation. In 2008, Reclamation completed a Risk Analysis of the EWP proposed action. This action has not been implemented yet.

Recommendations: Reclamation and other agencies shall continue discussions for possible implementation. Increasing frequency of re-operation from three to seven years may require additional analyses.

Action I.1.3. Spawning Gravel Augmentation

Objective: Enhance and maintain previously degraded spawning habitat for spring-run and CV steelhead.

Action: Reclamation, in coordination with the Clear Creek Technical Team, shall continue spawning gravel augmentation efforts. By December 31 each year, Reclamation shall provide a report to NMFS on implementation and effectiveness of the gravel augmentation program.

Results: The table below shows locations and amounts of gravel added in 2009 and 2010.

2009 Gravel Injections	
Location	Amount (tons)
Below Dog Gulch	1,000
Above Peltier Bridge	770
Below Peltier Bridge (Paige Bar)	1,790
Above NEED Camp	980
Below NEED Camp	1,230
2010 Gravel Injections	
Location	Amount (tons)
Below NEED Camp	1,000
Phase 3A Upper	1,000
Phase 3A Lower	1,000

Long-term Permits- A 10-year programmatic environmental assessment for restoration including gravel augmentations on Clear Creek was finalized. This permit allows gravel augmentation on all of the anticipated sites on federal lands. A contract was awarded to prepare other long-term permits for gravel augmentation and the expected completion is September 30, 2011.

Long-term Gravel Supply- The program funded planning, design and permitting for a project to provide a long-term gravel supply for Clear Creek restoration. The project shows promise for providing an inexpensive, secure and long-term source of gravel with a fixed acquisition cost over the next 30 years. We anticipate all planning and permitting through bid package will be completed by July 31, 2011. Funding for implementation of the project has not been obtained. Current cost estimates for implementation are approximately \$3.5 million, although the project is being designed to allow two phases of \$1 million and \$2.5 million each.

Spawning Gravel Addition Effectiveness- Spawning area mapping performed annually since 2000 indicates the overall amount of spawning area used by fall-run Chinook has been increasing while the adult population has not increased. The amount of spawning habitat in 2008 was the highest measured and more than

double the amount present in 2000. This suggests the gravel augmentation program has been very successful in creating new spawning habitat.

Gravel addition projects have successfully created habitat suitable for spring-run Chinook spawning as evidenced by the number of redds directly observed in supplemental gravel or in supplemental gravel integrated into native gravel. In most locations, gravel additions created spawning habitat that did not exist or had limited prior use. While the majority of supplemental spawning gravel is placed into Clear Creek at long-term talus cone injection sites, awaiting high flows to move gravel into the creek, smaller gravel projects have also shown to be beneficial for creating spawning habitat.

Recommendations: Continue the following: 1) supplementing spawning gravel at existing sites, 2) incorporating new sites including method-types such as talus-cone injection, in-stream placement, and lateral berms, and 3) providing controlled pulse flows from Whiskeytown dam to move supplemental gravel into the creek and create spawning habitat.

Action I.1.4. Spring Creek Temperature Curtain

Objective: Reduce adverse impacts of project operations on water temperature for listed salmonids in the Sacramento River.

Action: Reclamation shall replace the Spring Creek Temperature Control Curtain in Whiskeytown Lake by 2011.

Results: Contract awarded September 10, 2010. New curtain installation will begin spring 2011 with estimated completion by June 30, 2011.

Recommendations: None.

Action I.1.5. Thermal Stress Reduction

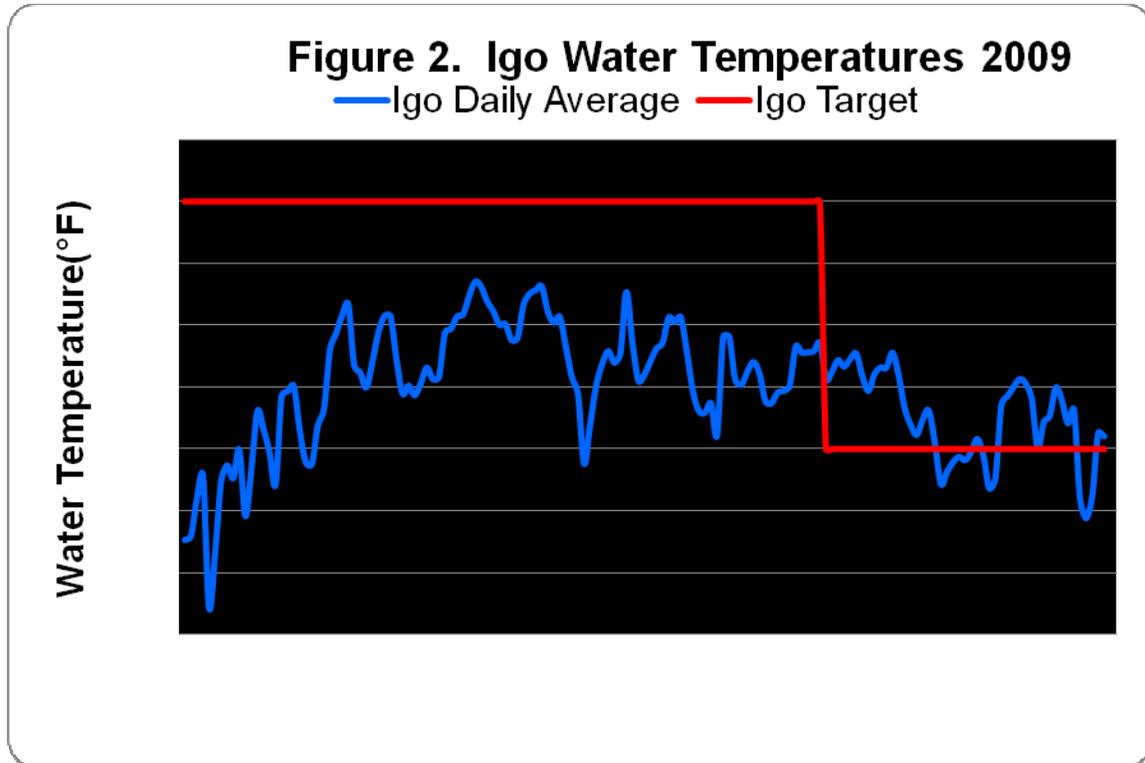
Objective: To reduce thermal stress to over-summering steelhead and spring-run during holding, spawning, and embryo incubation.

Action: Reclamation shall manage Whiskeytown releases to meet a daily water temperature of:

- 1) 60°F at the Igo gage from June 1 through September 15; and
- 2) 56°F at the Igo gage from September 15 to October 31.

Reclamation, in coordination with NMFS, will assess improvements to modeling water temperatures in Clear Creek and identify a schedule for making improvements.

Results: In 2009, the 60°F water temperature requirement was achieved 100% of the time between June 1 and September 14 (Figure 2). However, the 56°F water temperature requirement was achieved only 26% of the time between September 15 and October 31 (12 days achieved, 35 days not achieved).

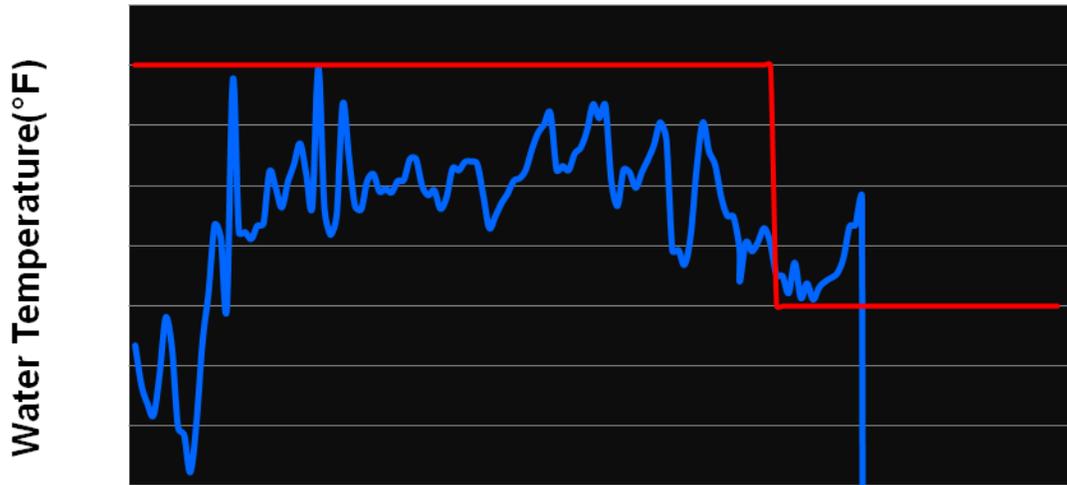


The inability to consistently meet this requirement was likely a result of necessary operational changes during implementation of the Spring Creek Arm of Keswick Reservoir Dredging Project. During this project's implementation, cold water diversions from the Trinity Basin to Whiskeytown Reservoir were significantly reduced and increased Whiskeytown Reservoir water temperatures. This in turn caused warmer water releases into Clear Creek.

In 2010, the 60°F water temperature requirement was achieved 100% of the time between June 1 and September 14 (Figure 3). The 56°F water temperature requirement has not been achieved between September 15 and 29. Igo water temperatures have been approximately 0.1°F to 1.8°F higher than the target.

Figure 3. Igo Water Temperatures 2010

— Igo Daily Average



The inability to meet this requirement is likely a result of higher Whiskeytown Reservoir water temperatures and a reduced cold water pool.

Recommendations: Work closely with Reclamation's Central Valley Operations to manage diversion schedules and releases to maximize success of meeting Igo temperature criteria annually.

When considering implementing projects which could affect Whiskeytown Reservoir cold pool or temperature of releases to Clear Creek, Reclamation shall coordinate with other agencies to discuss options to avoid negative impacts to temperature control.

Action I.1.6. Adaptively Manage to Habitat Suitability/IFIM Study Results

Objective: Decrease risk to Clear Creek spring-run and CV steelhead population through improved flow management designed to implement state-of-the-art scientific analysis on habitat suitability.

Action: Reclamation shall operate Whiskeytown Reservoir as described in the Project Description with the modifications in Action I.1 until September 30, 2012, or until 6 months after current Clear Creek salmonids habitat suitability (e.g. IFIM) studies are completed, whichever occurs later.

Results: The FWS began a new IFIM study in 2004. In 2010, a draft report on fall-run Chinook salmon spawning study sites in the lower reach of Clear Creek and data

collection for fall-run Chinook salmon juvenile rearing study sites in the lower reach of Clear Creek were completed. In 2011, three IFIM reports will be finalized after peer review. Work continues on model bio-validation. The 32 IFIM flow-habitat models will be synthesized with population, temperature, and restoration information to provide flow prescriptions that optimize habitat needs for all species, runs and life stages of salmonids in the different reaches of the creek, throughout the year. In 2011, alternative flow prescriptions will be compared and a new long-term flow schedule to NMFS.

Recommendations: Review completed IFIM results in 2011 and 2012. Working with NMFS and the Clear creek Technical Team, assess if Clear Creek flows shall be further adapted to reduce adverse impacts on spring-run Chinook and steelhead.