



**KINGS RIVER FISHERIES MANAGEMENT PROGRAM
ANNUAL TECHNICAL REPORT
2007-2008**



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EXECUTIVE SUMMARY

The Kings River Water Association (KRWA), Kings River Conservation District (KRCD), and California Department of Fish and Game (CDFG) have jointly implemented habitat and trout population enhancement projects, and conducted a series of monitoring programs in the lower Kings River and Pine Flat Reservoir. These habitat enhancement projects have been implemented over the past nine years in response to the Kings River Fisheries Management Program (FMP) Framework Agreement, which was approved on May 28, 1999. The Framework Agreement includes a number of actions designed to protect and enhance fishery habitat within the lower Kings River and in Pine Flat Reservoir. The Technical Steering Committee (TSC) is responsible for implementing the actions authorized under the agreement and approved by the Executive Policy Committee (ExCom). The scope of activities undertaken as part of the FMP between May 2007 and May 2008 described in this annual technical report includes: a compilation and synthesis of information regarding habitat enhancements, trout population enhancements, and monitoring activities conducted as part of the FMP, including Water Quality Monitoring activities dating back from October of 2006.

Hydrologic conditions and Pine Flat Reservoir operations and flows within the lower river during 2007-2008 are characterized by high seasonal variability characteristic of the Kings River watershed and water supply operations. Findings and recommendations regarding hydrology and operations include:

- Pine Flat Reservoir operations were successful in maintaining the temperature control pool in the reservoir above the minimum level specified in the Framework Agreement;
- Results of daily flow measurements below Fresno Weir from June 2007 through May 2008 resulted in 4 days in which flows did not meet Exhibit C requirements. On October 10th and October 19th, the flow over Fresno Weir was 38 cfs, when Exhibit C requirements were 40 cfs. On December 2nd and December 10th, the flow over Fresno Weir was 43 cfs, when Exhibit C requirements were 45 cfs. The two instances in October were due to pumping that occurred by farmers along the river to irrigate crops due to warm weather, and the two instances in December were due to very cold weather overnight, which resulted in additional pumping by farmers for frost protection purposes. In both cases, additional water was released as soon as the shortages were realized, to counteract the effect of the pumping, thereby increasing the flows to the respective Exhibit C criterion or above.
- A real-time telemetry system provided information on flow at Fresno Weir that is available for monitoring and managing conditions within the lower river as part of the fishery program;
- Flows measured at Fresno Weir were subject to the levels representing a dry hydrologic year of the Exhibit C flow schedule (95 cfs at Fresno Weir, for a water year less than **2,100,000** acre feet);

- Results of daily flow measurements at Fresno Weir from June 2007 through May 2008 demonstrated **100%** compliance with the instream flow requirements as outlined in the Framework Agreement;
- During the late summer and fall of 2007, the Turbine Bypass was utilized heavily for temperature and dissolved oxygen management, by blending releases between the turbine bypass and the low-level sluices from the Pine Flat Dam. The turbine bypass provides additional flexibility in managing the cold water pool within Pine Flat Reservoir and the temperature of water released into the lower river to support suitable habitat conditions for trout as part of the FMP; and
- In December of 2006, the KRWA member units signed internal agreements that will govern Exhibit D contributions in the future. Prior to signing these agreements, the KRWA member units provided Exhibit D flows under draft agreements during the 2005-2006 and 2006-2007 water years. The TSC supports and applauds the activities of the KRWA in completing these essential agreements.

Results of water quality monitoring within Pine Flat Reservoir and the lower Kings River during 2007-2008 have shown:

- Pine Flat Reservoir becomes stratified during late spring, summer, and fall showing a characteristic pattern of warmer water near the surface (epilimnion) and colder water with reduced dissolved oxygen concentrations near the bottom of the reservoir (hypolimnion). The reservoir destratifies in the late-fall and winter due to water temperature becoming uniform throughout the water column;
- The temperature of water released from the reservoir into the lower river can be regulated and managed, to some extent, through selective operation of different outlet works, including the turbine bypass, which initiated operations during 2003. However, the ability to manage water temperatures is limited and constrained by the availability of cold water and release points during various seasonal periods within the reservoir, hydroelectric generation, requirements for irrigation releases, and other factors;
- Aeration and mixing of water released from the reservoir have proven to be effective in maintaining suitable dissolved oxygen concentrations within the lower river during periods when the power plant was in operation. Mean monthly dissolved oxygen concentrations, as measured at the ACOE Bridge, during 2007-2008 exceeded 7.0 mg/L.
- Water temperatures within the lower river showed a seasonal pattern with the coldest temperatures occurring during the late winter and temperatures generally increasing during the summer and early fall;
- Water temperature showed a characteristic longitudinal gradient downstream of Pine Flat Dam. During summer months the coldest temperatures were located immediately downstream of the dam and temperatures generally increased with distance downstream

from the dam. During the fall and winter, when atmospheric temperatures are cool, a reverse temperature gradient was observed with temperatures decreasing as a function of distance downstream from Pine Flat Dam;

- Results of temperature monitoring, and results from the fishery monitoring program, provided no evidence that either dissolved oxygen concentrations or water temperature conditions within the lower river resulted in mortality to trout or other fish species during 2007-2008;
- Results of the 2007-2008 water temperature and dissolved oxygen monitoring are being used by the TSC to refine water quality monitoring as part of the FMP and as a basis for evaluating alternative operational strategies, including operations of the turbine bypass, to address water quality issues affecting habitat conditions for trout in the future;

The FMP continued habitat enhancement efforts on the lower Kings River during 2007-2008 by the following actions:

- Applied for permits from various State and Federal Agencies to complete construction of the Large Woody Debris Pilot Study;
- Requested extension of the FMP's 404 (Nationwide #27) Permit;
- Placed remaining gravel in the river behind Avocado Lake and near Winton Park;
- Placed approximately 2900 large (3 to 6 feet in diameter) boulders in the Kings River for habitat improvement;

The stocking of fish in State waters is the responsibility of the California Department of Fish and Game. During the 2007-2008 reporting period, Catchable and sub-catchable size rainbow trout were stocked in the Kings River between Pine Flat Dam and Fresno Weir. Due to a lack of availability, no trout eggs were supplied to the program by the CDFG for incubation and hatching in the lower river during the 2007-2008 reporting period. Catchable size rainbow trout were also planted in Pine Flat Reservoir and Avocado Lake. A brief summary of 2007-2008 stocking includes:

- Whitlock Vibert Boxes (WVB) were not used during this reporting period to hatch eyed rainbow trout eggs, inside the streamside incubators, as there were no trout eggs available from CDFG during this period;
- These incubators were not used during the 2007-2008 program year due to the lack of availability of trout eggs. The unfortunate lack of availability of trout eggs during the 2007-2008 program year led to the development of a new element in the 2008-2009 5-Year Plan to purchase trout eggs on a temporary basis until availability from CDFG improves;

- During the 2007-2008 program year, 2,000 pounds of sub-catchable rainbow trout (4-6 inches in length), representing over 25,000 fish, were stocked in the lower Kings River as part of the put-and-grow program. These fish were provided by the CDFG at no cost to the FMP;
- During the 2007-2008 program year, there were no Rainbow trout fingerlings planted in the lower river;
- A total of 19,665 pounds of catchable sized trout (31,123 fish) were stocked in the lower Kings River during this reporting period. During the 2007-2008 program year, an additional 8,115 pounds of trophy trout (2,131 fish) were planted in the put-and-take and catch-and-release sections. Normally, catchable trout (2 fish per pound) are stocked either once or twice per week during the non-irrigation period (roughly October through March) and once each week during the irrigation season when flows are high. The trophy trout in the program averaged over 4 pounds each overall, with the larger fish weighing over 6 pounds during the December through March period;
- No sub-catchable trout were planted in Pine Flat Reservoir during the reporting period;
- Between 11/1/2007 and 3/5/2008, 26,700 pounds (44,900 trout) were planted in Pine Flat Reservoir. The catchable trout averaged around ½ pound each (2 fish/pound) at the time they were stocked in the reservoir (load averages ranged 1.4 to 2.4 fish/pound);
- During the 2007-2008 Program Year, 871 pounds of Kokanee Salmon Fingerlings (72,692 fish) were planted in Pine Flat Reservoir;
- The most recent planting of Chinook salmon fingerling was 5/19/2008, which was 75,072 fingerlings weighing 782 pounds; and
- In 2007-2008 reporting period, the San Joaquin Hatchery planted 6,975 pounds (10,866 trout) of catchable size rainbow trout in Avocado Lake.

As part of the FMP habitat and fishery monitoring was conducted within the lower river and Pine Flat Reservoir. Results of the 2007-2008 monitoring program have shown:

- During the 2007-2008 study period, the FMP began to use the multi-pass depletion technique in performing the annual electrofishing surveys. This allowed for a more rigorous sampling and provided a more complete assessment of the species composition and abundance found in the sample site. Data collected during the survey include species and number of fish as well as length and weights. This data can then be used to determine trends in the populations and condition of the trout as well as other non-game species;

- During the 2007-2008 study period, electrofishing surveys were conducted two times, in November, 2007, and February, 2008;
- Nine sites were sampled using backpack electrofishers in November 2007 (Figure 6-1). The Doyals' Test site and Alta Test site were resampled again in February 2008. A final report is available in the KRCD library;
- In November 2007 and February 2008, KRCD staff collected insect samples from six sites on the lower Kings River;
- Transmitters were implanted and 2 groups of tagged fish were released in the Kings River for study;
- The fifth annual Technical Report was completed in November 2007;
- The 2006-2007 Water Quality Monitoring Report was produced and presented to the Public Advisory Group for review. It is due to be presented to the ExCom at the October 2008 meeting; and
- There were 40 permitted bass tournaments with complete data sets at Pine Flat Reservoir during the 2007-2008 program year. The number of participants was 1,413 and the average size of bass returned for Weigh-In was 1.34 pounds.

Public education and outreach activities during 2007-2008 included:

- An issue of Kings River Fisheries News newsletter was published and distributed in the early Fall of 2007 with the assistance of the Public Advisory Group;
- KRWA has developed a real-time telemetry system for monitoring water temperature and streamflow at Fresno Weir. During the summer and fall of 2004 information developed from monitoring being conducted on the lower Kings River was compiled in weekly reports and distributed by KRWA to members of the PAG and other interested parties to provide current information on environmental conditions occurring within the lower river that would affect habitat quality for trout. Weekly reports were distributed electronically to inform managers and other interested parties regarding conditions currently occurring within the lower river. The water temperature and flow monitoring and reporting provided a valuable tool for disseminating real-time information;
- The PAG developed a web page to inform the public, fishing groups, and government agencies about the FMP. The web page also presents angling opportunities and information related to the Kings River. The web page is available at <http://www.kingsriverfisheries.org>;
- An Ad-Hoc committee as approved by the Ex-Com met throughout the year on the development of public outreach materials for the Fisheries Management Program;

- During the program year, several educational tours were conducted at the Thorburn Spawning and Rearing Channel;
- The PAG worked extensively with the 2008 Kings River Day event, to provide valuable historical, operational, scientific and recreational opportunities to hundreds of 6th graders. The event was successfully held on May 16, 2008; and
- A Directed Enforcement Action on March 15, 2008 resulted in 26 citations, 20 warnings, and a total of 178 public contacts along the Fisheries Management Zone. The action was funded by local groups of fisherman, and was not an official action of the Fisheries Management Program.

1.0 INTRODUCTION

The Kings River Water Association (KRWA), Kings River Conservation District (KRCD), and California Department of Fish and Game (CDFG) have jointly implemented habitat and trout population enhancement projects, and conducted a series of monitoring programs in the lower Kings River (Figure 1-1) and Pine Flat Reservoir. These habitat enhancement projects have been implemented over the past nine years in response to the Kings River Fisheries Management Program (FMP) Framework Agreement, which was approved on May 28, 1999. The Framework Agreement includes a number of actions designed to protect and enhance fishery habitat within the lower Kings River and in Pine Flat Reservoir. The Technical Steering Committee (TSC) is responsible for implementing the actions authorized under the agreement and approved by the Executive Policy Committee (ExCom). The scope of activities undertaken as part of the FMP between May 2007 and May 2008 described in this annual technical report includes:

- Monitoring hydrology and operations including inflow to Pine Flat Reservoir, reservoir storage, reservoir releases, operation of remote sensing telemetry systems, turbine bypass operation, and activities to implement enhanced winter flows for fishery habitat as outlined in Exhibits C and D of the Framework Agreement;
- Monitoring water quality including water temperature and dissolved oxygen within Pine Flat Reservoir and the lower Kings River, compliance with dissolved oxygen requirements within the lower river, and planning and monitoring water temperature conditions at the completion of the irrigation season;
- Water Quality monitoring testing multiple constituents, including pesticides, at Fresno Weir to supplement data available from the Irrigated Lands Program. This sampling protocol included monthly samples taken from October 2006-October 2007 at Fresno Weir as per the suggestions from the 2004-2005 Water Quality Report. The results of this testing, and the results from the Irrigated Lands Program, are included in this annual report;
- Habitat enhancement projects including boulder acquisition and placement in the river, spawning gravel stockpiling and placement, operation and maintenance of the Thorburn Spawning and Rearing Channel, and riparian habitat protection;
- Fish stocking has occurred as part of the program within the lower river and Pine Flat Reservoir including Whitlock-Vibert box egg incubation, streamside egg incubators, routine stocking of sub-adult and catchable size trout, all done by the CDFG at no cost to the program (except for a small maintenance cost associated with streamside incubators);
- Monitoring activities associated with the FMP included electrofishing surveys within the lower river to develop annual fish population indices, monitoring of fish use within areas associated with habitat enhancement projects such as coves and jetties, monitoring within the Thorburn Spawning and Rearing Channel, water quality

monitoring within the lower river, and macroinvertebrate surveys. Monitoring within Pine Flat Reservoir included the compilation of bass tournament records;

- Public education and outreach included summer hydrology and water temperature monitoring reports, internet web page development, news releases, issuance of a news letter on the FMP, and angler access improvements; and
- Maintenance activities included watering riparian vegetation planted along the Thorburn Channel, routine maintenance of the channel headgate, and repairs and maintenance of the streamside egg incubators.

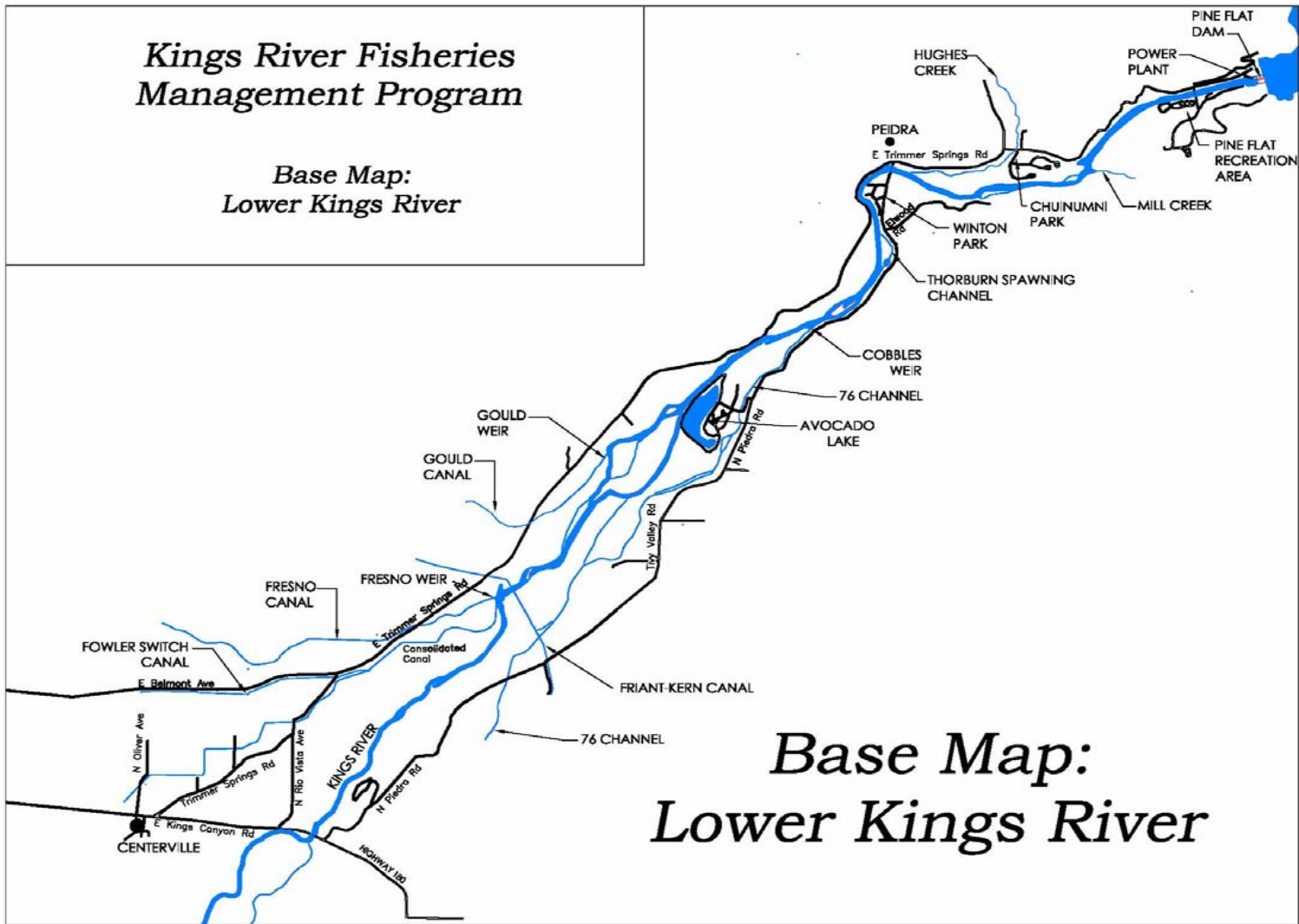


Figure 1-1. Map of the lower Kings River and key geographic locations.

The following report presents a compilation and synthesis of information regarding these habitat enhancements, trout population enhancements, and monitoring activities during 2007-2008. Since the Framework Agreement has been in place since 1999, the technical compilation and synthesis report also presents data from earlier projects and monitoring activities as part of the Framework Agreement. This technical report is designed to compile and summarize information available on the implementation and performance of the FMP and to convey information on the FMP to the ExCom, the Public Advisory Committee (PAG) and other interested parties. This annual technical report is intended to accompany the 5-Year Plan to describe and document results of the FMP to date, and to serve as the technical and scientific foundation for the identification of priority actions to be implemented as part of subsequent 5-Year Plans, to identify significant findings that would affect the fishery monitoring within Pine Flat Reservoir and the lower river, or the identification of specific management actions designed to enhance and improve habitat conditions for resident trout and other desirable fish species inhabiting the Kings River system.

One of the principle objectives of the annual report is to provide a project management structure for reviewing and prioritizing existing and proposed habitat enhancement activities, fish stocking, and implementation of other elements contained in the Framework Agreement. Results of the fishery and habitat monitoring program are intended to provide a technical and scientific framework for identifying design criteria and priorities for determining the appropriate scale and location of habitat enhancement projects, linkages among potential projects to maximize biological benefits and reduce cost, identify priorities for habitat enhancement project locations, and identify potential opportunities for expanding enhancement projects through funding augmentation from collaborative grant applications from state, federal, and private funding sources. In addition, one of the key objectives of the annual report is to help ensure coordination and communication among the parties involved in implementing various elements of the Framework Agreement, and to facilitate a process for reviewing and evaluating the performance of management actions in achieving the overall goals of the FMP. The annual report also provides a framework to present monitoring results used by the TSC to evaluate a variety of alternative approaches each year for meeting the goals for the enhancement program, and for evaluating program performance.

1.1 ADMINISTRATIVE ACTIVITIES

The Kings River Fisheries Management Program's seventh 5-Year Implementation Plan (for program year 2007-2008) was presented and approved by the Executive Committee at their meeting on October 24, 2007. This 5-Year Plan provided the basic direction for the Technical Steering Committee and program activities through the year.

The ExCom met twice during the program year, on October 24, 2007 and February 27, 2008, to hear reports from the TSC and the public, and to provide direction to the TSC. The TSC met on an ongoing basis to continue their work on program development and administration. The PAG, with Hank Urbach as Chairman, met on a monthly basis to discuss and develop issues important to them. Members of the TSC and ExCom routinely attend the PAG meetings to report on their activities and to provide input as requested.

1.2 ANNUAL TECHNICAL REPORT

A number of interested parties and stakeholders, including the ExCom, PAG, resource and water agencies, local angling groups, and others have expressed interest in the information being collected as part of the FMP's monitoring program. Preparation and distribution of an annual technical report has been identified as a useful method of conveying information regarding the program status and monitoring results to interested parties.

Fishery enhancement work under the guidance of the Framework Agreement has occurred on the lower Kings River and Pine Flat Reservoir since the signing of the Framework Agreement on May 28, 1999. The first annual report for the FMP covered the period of May 2002 through May 2003 and was released in September 2004. The second annual technical report covered the period of May 2003 through May 2004 and was released in February 2005. The third annual technical report, which summarizes results of the habitat enhancement activities, trout management, and fishery and habitat monitoring between May 2004 and May 2005, was released in February 2006, the fourth in August 2007, and the fifth in February of 2008. This report represents the sixth in the series, and covers the program year between May 2007 and May 2008.

The annual technical report summarizes key accomplishments and performance of the habitat enhancement actions and findings of the monitoring program. Compilation and analyses of available information used to assess performance of the FMP and habitat enhancement program is based upon results of both baseline monitoring within the Kings River and results of project-specific monitoring and performance evaluations. Information from a variety of program elements has been compiled each year representing results of each element of the Kings River monitoring program, as outlined in the 5-Year Plan. The annual technical report includes an executive summary followed by brief descriptions of individual monitoring program elements and results of key findings. The annual technical report summarizes information regarding the status and trends of the physical conditions affecting habitat quality and availability for rainbow trout within the river, and provides guidance and recommendations for future actions and modifications to the program. Documentation of data and other relevant information are included as appendices.

2.0 HYDROLOGY AND OPERATIONS

2.1 RESERVOIR INFLOW

Daily runoff into Pine Flat Reservoir from June 1, 2007 through May 31, 2008 is shown in Figure 2-1. Inflow into Pine Flat Reservoir is characterized by high seasonal and inter-annual variability reflecting variation in precipitation, snow pack, and runoff within the watershed. The total estimated annual inflow into Pine Flat Reservoir and the corresponding percent water year is summarized below (Table 2-1):

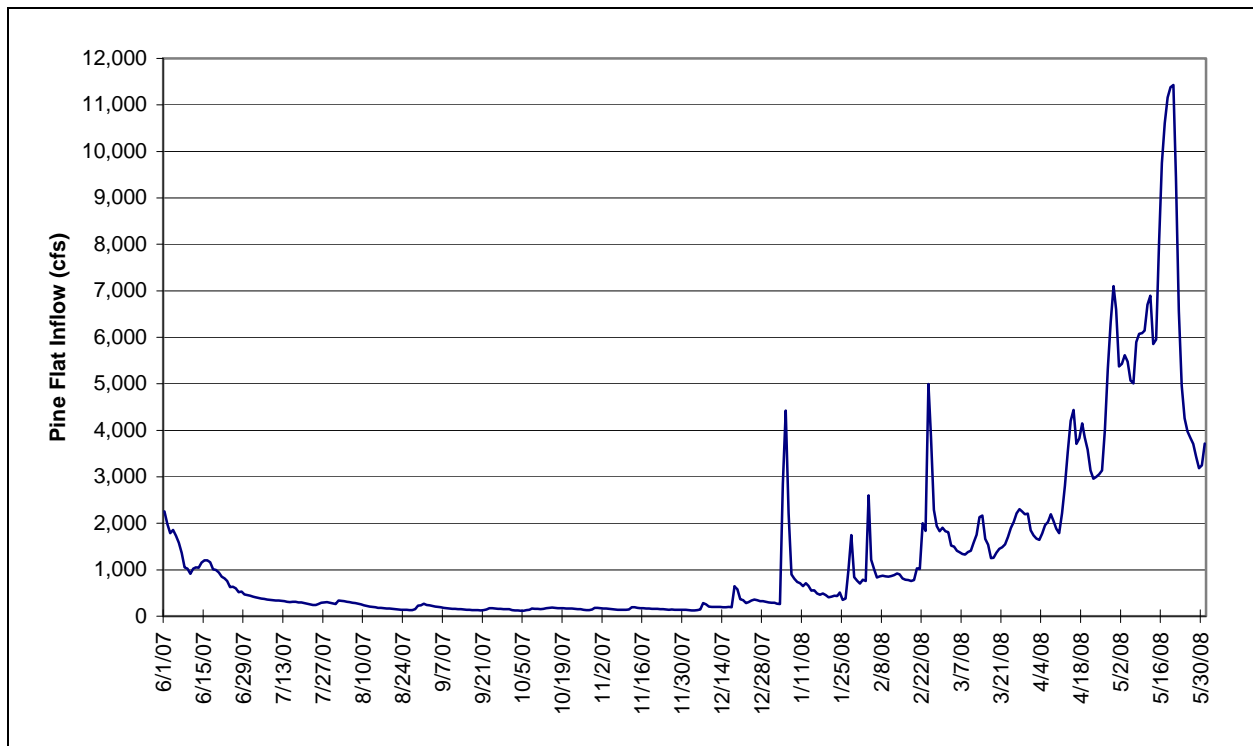


Figure 2-1. Daily inflow into Pine Flat Reservoir between June 1, 2007 and May 31, 2008.

2.2 RESERVOIR STORAGE

Daily reservoir water storage volume and water surface elevation in Pine Flat Reservoir from June 2007 through May 2008 is shown in Figure 2-2. Reservoir storage reflects the combined effects of reservoir inflow, releases from Pine Flat Reservoir to the lower Kings River, and evaporation. As part of the Framework Agreement, a voluntary 100,000 acre-feet temperature control pool was established. Reservoir operations since implementation of the Framework Agreement have retained the temperature control pool at or above the 100,000 acre-foot pool.

Table 2-1. Annual runoff in thousands of acre-feet (TAF) and Percent Water Year from October 1999 through September 2008.

<u>Period</u>	<u>Annual Runoff (TAF)</u>	<u>Percent Water Year</u>
October 1999 -- September 2000	1,534	90%
October 2000 -- September 2001	1,010	59%
October 2001 -- September 2002	1,141	67%
October 2002 -- September 2003	1,426	84%
October 2003 -- September 2004	1,050	62%
October 2004 -- September 2005	2,531	149%
October 2005 -- September 2006	2,952	173%
October 2006 -- September 2007	679	39%
October 2007 -- September 2008		

2.3 RESERVOIR RELEASES

Water releases from Pine Flat Reservoir to the lower Kings River show high variability within the year as shown in Figure 2-3. Releases from Pine Flat Reservoir during the late fall, winter, and spring months have been in accordance with the Exhibit C flow schedule established by the Framework Agreement. Average daily flow in the lower Kings River from June 2007 through May 2008 ranged from 100 to 5,465 cubic feet per second (cfs) (Figure 2-3).

The Framework Agreement established minimum instream Exhibit C flow releases from Pine Flat Reservoir, flow at Piedra, in Dennis Cut, at Fresno Weir and below Fresno Weir to support resident fish populations in the lower river. Results of daily flow measurements below Fresno Weir from June 2007 through May 2008 resulted in 4 days in which flows did not meet Exhibit C requirements. On October 10th and October 19th, the flow over Fresno Weir was 38 cfs, when Exhibit C requirements were 40 cfs. On December 2nd and December 10th, the flow over Fresno Weir was 43 cfs, when Exhibit C requirements were 45 cfs. The two instances in October were due to pumping that occurred by farmers along the river to irrigate crops due to warm weather, and the two instances in December were due to very cold weather overnight, which resulted in additional pumping by farmers for frost protection purposes. In both cases, additional water was released as soon as the shortages were realized, to counteract the effect of the pumping, thereby increasing the flows to the respective Exhibit C criterion or above. These results are shown in Figure 2-4.

Flows measured at Fresno Weir were subject to the levels representing a dry hydrologic year of the Exhibit C flow schedule (95 cfs at Fresno Weir, for a water year less than **2,100,000** acre feet), and the corresponding results are shown in Figure 2-5. Results of daily flow measurements at Fresno Weir from June 2007 through May 2008 demonstrated **100%** compliance with the

instream flow requirements as outlined in the Framework Agreement, and these results are shown in Figure 2-5.

While the 2007-2008 program year did have 4 days of flows that were below the instream flow requirement below Fresno Weir, there were only 3 days in which the Exhibit C targets below Fresno Weir were reached exactly. In every single instance other than these 7 days, the flow requirements over Fresno Weir were exceeded, meaning that the flow was at 36 cfs, 41cfs, or 46 cfs or more for every other day during the low flow period. In fact, because of maintenance during this year, diversions at Fresno Weir were not at full capacity, resulting in significantly more water on a daily average downstream of the weir than in previous program years. Information on daily water releases from Pine Flat Reservoir and daily flows at Fresno Weir is summarized in Appendix A.

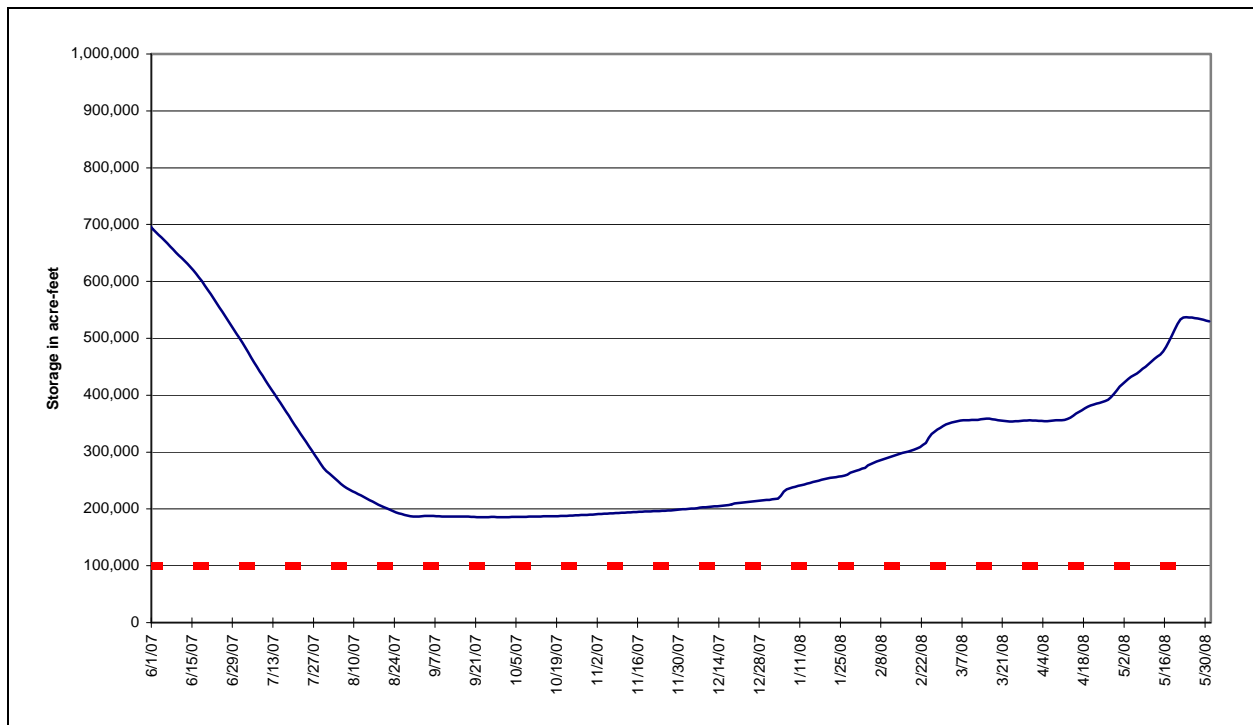


Figure 2-2. Daily storage volume in Pine Flat Reservoir from June 2007 to May 2008.

Note: ----- Dashed Line indicates Temperature Control Pool of 100,000 acre-feet.

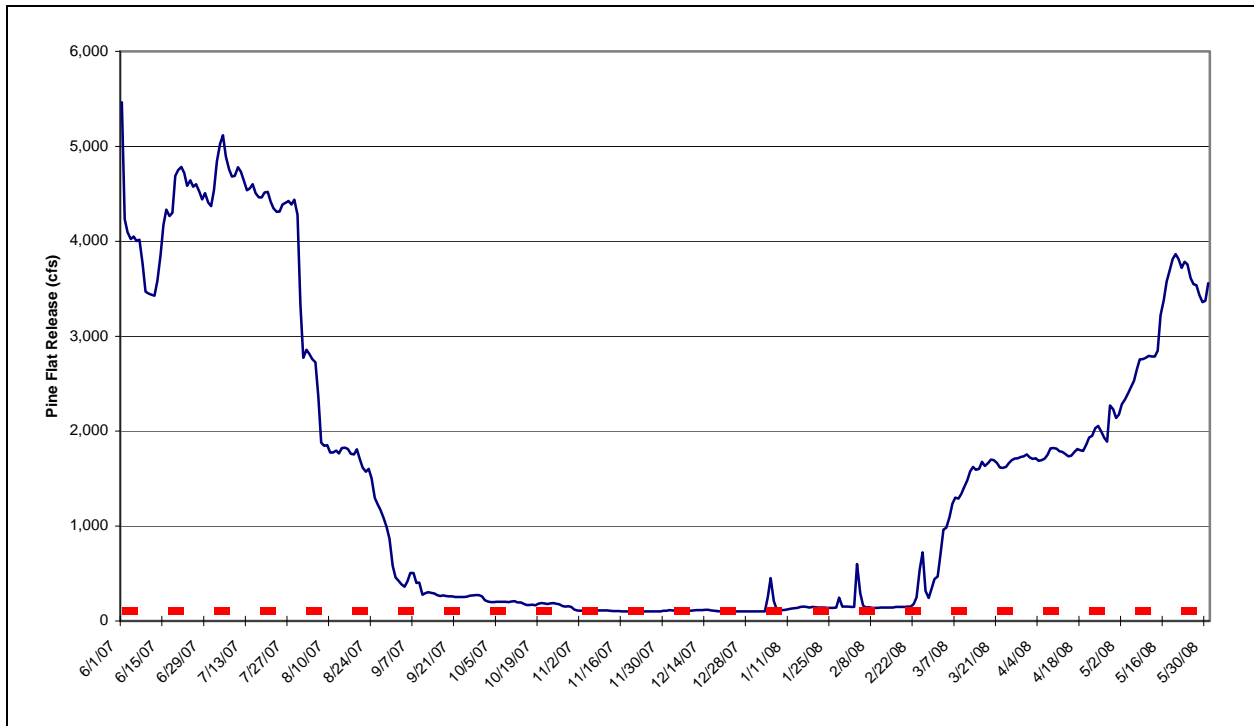


Figure 2-3. Average daily water releases from Pine Flat Reservoir to the lower Kings River between June 2007 and May 2008. Note: -----Dashed Line represents minimum flow rate as established by Exhibit D criteria (cfs).

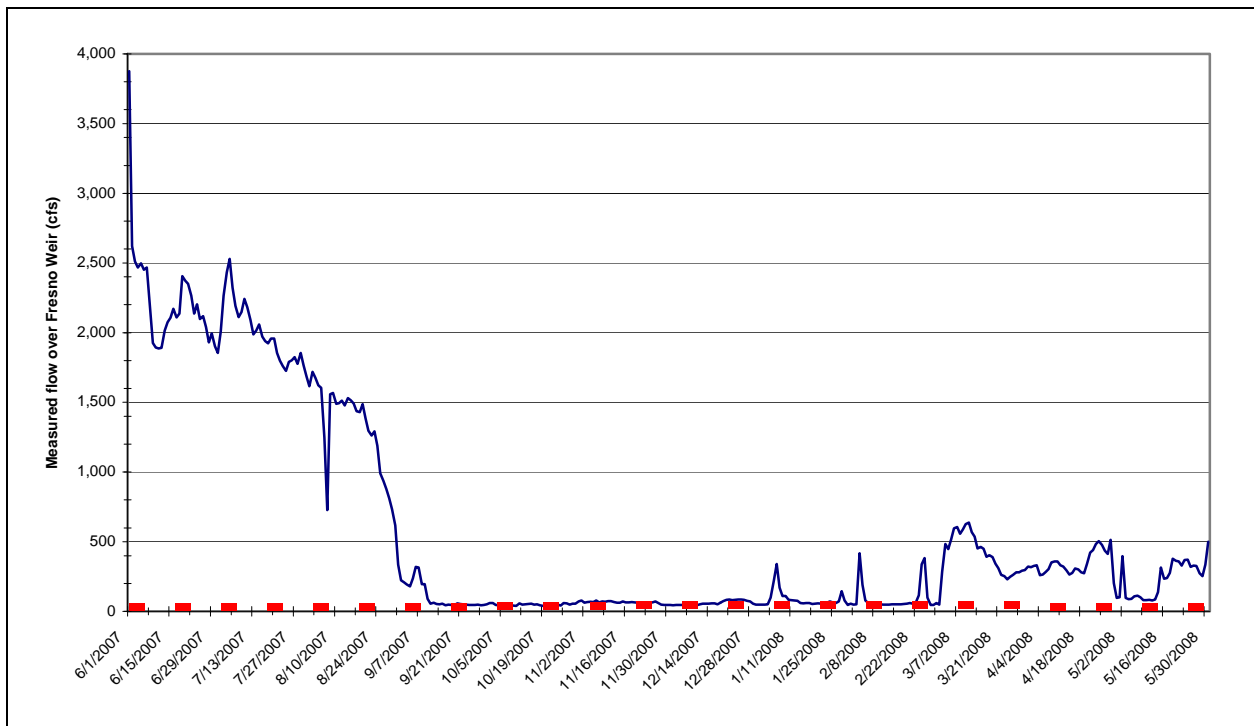


Figure 2-4. Average daily flows in the Kings River below Fresno Weir from June 2007 through May 2008. Note: -----Dashed Line represents minimum flow rate as established by Exhibit C criteria (cfs).

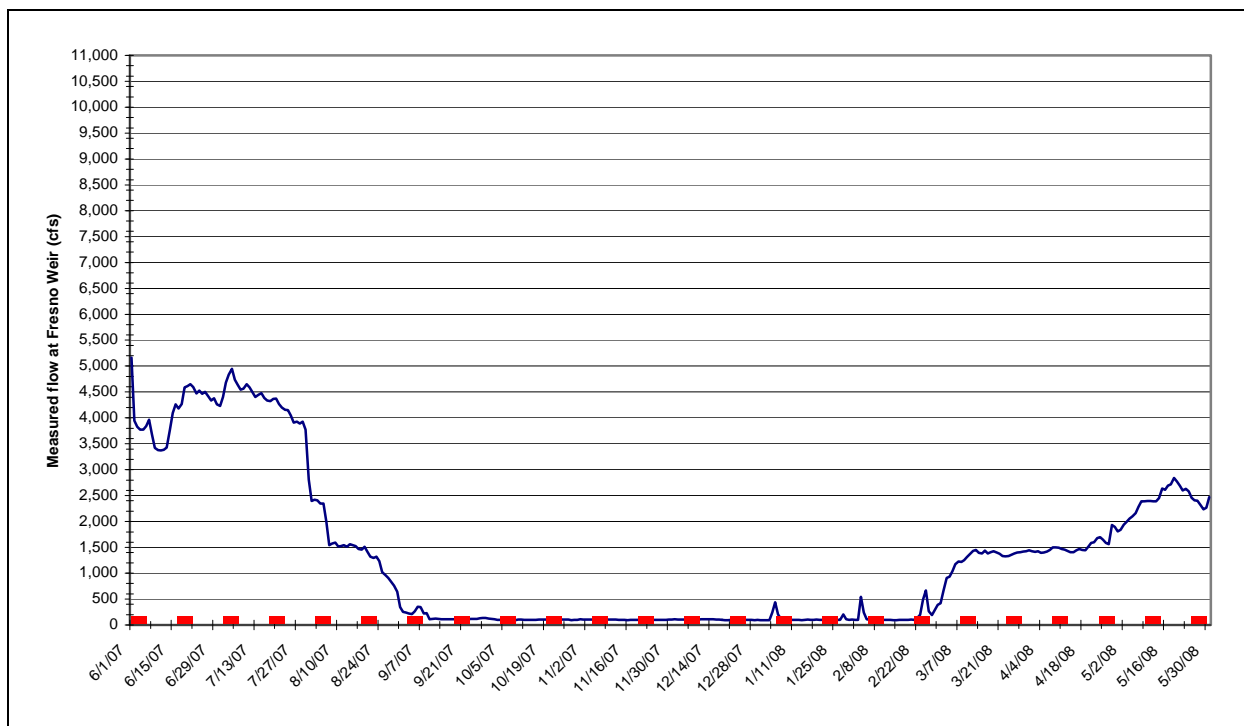


Figure 2-5. Average daily flows in the Kings River at Fresno Weir from June 2007 through May 2008.
 Note: ----Dashed Line represents minimum flow rate as established by the enhanced Exhibit C criteria (cfs).

2.4 TELEMETRY SYSTEM

During 2007-2008, KRWA continued the use of a real-time (telemetry) flow monitoring station at Fresno Weir. This system provides data that supports informed decisions on water temperature and flow management after completing the irrigation and delivery season when elevated water temperatures may affect habitat quality for trout within the lower river. The real-time telemetry water temperature monitoring system complements the ongoing temperature monitoring at fixed locations within the river (Section 3.1.2) for use in evaluating factors affecting habitat conditions and the potential health and condition of trout within the river.

2.5 TURBINE BYPASS PROJECT

The turbine bypass project was completed in March 2003. The project was developed through the U. S. Army Corps of Engineers (ACOE) Pine Flat Dam Fish and Wildlife Habitat Restoration Investigation that began in 1993. KRCD served as the local sponsor with contributions from the CDFG, KRWA, and California Department of Water Resources (DWR). The turbine bypass provides increased flexibility in operating and managing flows and water temperatures released from Pine Flat Dam. The turbine bypass is operated by KRCD.

The approximately 6-million dollar project involved constructing a conduit system to the existing penstocks to allow for low flows to bypass the power plant turbines. This allows greater flexibility in making releases at various water elevations in Pine Flat Reservoir by allowing releases through the penstocks when flows are less than the 500 to 600 cfs necessary to run the power plant. In this way, there is more flexibility given to the limited releases of colder water

made into the river from the reservoir to benefit the coldwater fishery during low-flow periods of the year. The turbine bypass is also used to increase the dissolved oxygen level in waters released from the power plant.

During the late summer and fall of 2007, the Turbine Bypass was utilized heavily for temperature and dissolved oxygen management, by blending releases between the turbine bypass and the low-level sluices from the Pine Flat Dam. Many thanks are due to the folks at the Army Corps of Engineers and the Kings River Conservation District for operating outside of their established criterion in gate and valve openings for the protection of the Kings River Fishery.

2.6 EXHIBIT C AND D FLOWS

Section 1(e) of the Framework Agreement calls for the KRWA to diligently endeavor to increase the minimum water flows in the Kings River downstream of Pine Flat Dam as set forth in Exhibit C to those levels shown in Exhibit D by October 1, 2005. The Exhibit C flow schedule presented in the Framework Agreement is summarized in Table 2-2. Exhibit C flows have been implemented and monitored since 1999.

A KRWA Exhibit D committee was formed and has met regularly to develop programs that will enable the KRWA to reach the Exhibit D flow goals while avoiding or minimizing unacceptable water supply or operational impacts to its member units. Some ideas under discussion in the KRWA Exhibit D committee include rescheduling of irrigation demands and/or the temperature control pool, groundwater recharge and water banking projects, exchange arrangements with the State Water Project (SWP), downstream surface storage projects, and member contribution of entitlement/storage.

Exhibit D flows at a rate of 250 cfs (level representing a wet hydrologic year) at Fresno Weir were released for two consecutive years in the fall and winter of 2005 and 2006. These flows were triggered by the larger than normal water-years in 2004-2005 (149% WY) and 2005-2006 (173% WY), and the KRWA Member Units voluntarily provided the Exhibit D flows in the following water-years (2006-2006 and 2006-2007).

Table 2-2. Exhibit C flows (cfs) from the Framework Agreement.

Season	Total Flow at Piedra	Minimum Flow in Dennis Cut	Minimum Flow to Fresno Weir	Water Divertable in China Slough	Required Flow Over Fresno Weir
Oct. 1 – Nov. 15	100	5	95	10	40
Nov. 16 – March 31	100	5	95	5	45
April 1 – Sept. 30	100	5	95	15	35

In December of 2006, the KRWA member units signed internal agreements that will govern Exhibit D contributions in the future. Prior to signing these agreements, the KRWA member units provided Exhibit D flows under draft agreements during the 2005-2006 and 2006-2007 water years. The TSC supports and applauds the activities of the KRWA in completing these essential agreements.

2.7 DISSEMINATION OF TEMPERATURE DATA

Experience has taught the TSC that sharing water temperature information with our stakeholders during critical or near critical periods that are stressful to trout is important. To this end, KRWA began providing weekly hydrologic and climate reports (Appendix B) to the PAG members and other interested parties several years ago. These one-page reports provide information on flows in the lower river and tributary streams as well as a summary of flow and temperature trends. This has been beneficial to everyone who has an interest in the well being of the trout population in the lower river and has resulted in much improved communications regarding these possible temperature events. These reports were issued during the summer and fall of 2007.

2.8 SUMMARY AND DISCUSSION

Hydrologic conditions and Pine Flat Reservoir operations and flows within the lower river during 2006-2007 are characterized by high seasonal variability characteristic of the Kings River watershed and water supply operations. Findings and recommendations regarding hydrology and operations include:

- Pine Flat Reservoir operations were successful in maintaining the temperature control pool in the reservoir above the minimum level specified in the Framework Agreement;
- Results of daily flow measurements below Fresno Weir from June 2007 through May 2008 resulted in 4 days in which flows did not meet Exhibit C requirements. On October 10th and October 19th, the flow over Fresno Weir was 38 cfs, when Exhibit C requirements were 40 cfs. On December 2nd and December 10th, the flow over Fresno Weir was 43 cfs, when Exhibit C requirements were 45 cfs. The two instances in October were due to pumping that occurred by farmers along the river to irrigate crops due to warm weather, and the two instances in December were due to very cold weather overnight, which resulted in additional pumping by farmers for frost protection purposes. In both cases, additional water was released as soon as the shortages were realized, to counteract the effect of the pumping, thereby increasing the flows to the respective Exhibit C criterion or above.
- A real-time telemetry system provided information on flow at Fresno Weir that is available for monitoring and managing conditions within the lower river as part of the fishery program;
- Flows measured at Fresno Weir were subject to the levels representing a dry hydrologic year of the Exhibit C flow schedule (95 cfs at Fresno Weir, for a water year less than **2,100,000** acre feet);
- Results of daily flow measurements at Fresno Weir from June 2007 through May 2008 demonstrated **100%** compliance with the instream flow requirements as outlined in the Framework Agreement;
- During the late summer and fall of 2007, the Turbine Bypass was utilized heavily for temperature and dissolved oxygen management, by blending releases between the turbine

bypass and the low-level sluices from the Pine Flat Dam. The turbine bypass provides additional flexibility in managing the cold water pool within Pine Flat Reservoir and the temperature of water released into the lower river to support suitable habitat conditions for trout as part of the FMP; and

- In December of 2006, the KRWA member units signed internal agreements that will govern Exhibit D contributions in the future. Prior to signing these agreements, the KRWA member units provided Exhibit D flows under draft agreements during the 2005-2006 and 2006-2007 water years. The TSC supports and applauds the activities of the KRWA in completing these essential agreements.

3.0

WATER QUALITY

Water quality monitoring as part of the FMP has focused principally on measurements of water temperature and dissolved oxygen concentrations that directly affect habitat quality for fish and macroinvertebrates within Pine Flat Reservoir and the lower Kings River. The TSC developed a water quality monitoring program to characterize the chemical and physical parameters at Mill Creek near the confluence with the lower Kings River, and at Fresno Weir. Results of water temperature and dissolved oxygen monitoring within the reservoir and lower river are presented below.

3.1 WATER TEMPERATURE MONITORING

Habitat quality and availability to support resident trout within the lower Kings River is dependent, to a large extent, on the suitability of seasonal water temperatures. Water temperatures within the lower Kings River are affected by a variety of environmental factors including, but not limited to, the temperature of water released from Pine Flat Reservoir, air temperature, stream flow, and the distance downstream from Pine Flat Reservoir. Given the importance of water temperature as a factor affecting habitat conditions for trout within the lower river, the FMP includes an extensive water temperature monitoring component designed to provide information on water temperature within Pine Flat Reservoir and at various locations along the lower river.

3.1.1 Reservoir

Water temperature and dissolved oxygen profile measurements for Pine Flat Reservoir have been collected by KRCD biologists on approximately a monthly basis since 1986. Measurements are taken at a monitoring location approximately 0.5 mile upstream of the dam using a Hydrolab portable water quality meter. Vertical profile measurements of both water temperature and dissolved oxygen concentrations are recorded at approximately 3-foot intervals from the surface to the bottom of the water column to characterize the limnological profile within Pine Flat Reservoir in the vicinity of the dam outlet structures.

Results of water quality monitoring have shown a characteristic seasonal pattern of thermal stratification beginning in the spring forming a reservoir hypolimnion (cold water layer near the bottom) and epilimnion (warmer water layer near the surface) increasing through the summer months. Reservoir thermal stratification continues into the fall, at which time atmospheric cooling results in fairly uniform water temperatures throughout the reservoir (reservoir destratification). Later in the fall, cold air temperatures cool the upper layer of water so that the epilimnion is colder than the hypolimnion (reservoir turnover). Results of the May 2007 reservoir profile are presented in Figure 3-1 as an example of monitoring. Results of monthly vertical reservoir temperature and dissolved oxygen profile measurements during the period May 2007 through May 2008 are summarized in Appendix C. Additional vertical profile temperature measurements, collected during previous years, are on file at KRCD.

Results of the reservoir temperature and dissolved oxygen measurements are used as part of the FMP to determine both the dissolved oxygen concentration and temperature of water released from the reservoir into the lower river. The data are also used in temperature control pool

management during the fall months after completion of the irrigation season to provide suitable habitat conditions to support trout and other fish species within Pine Flat Reservoir and the lower river. In addition to the vertical temperature profile measurements, water temperature is measured by KRCD at each of the individual outlet ports on Pine Flat Dam. Water temperature at each outlet is available on a real-time basis for use in evaluating water temperature released from the reservoir into the lower Kings River.

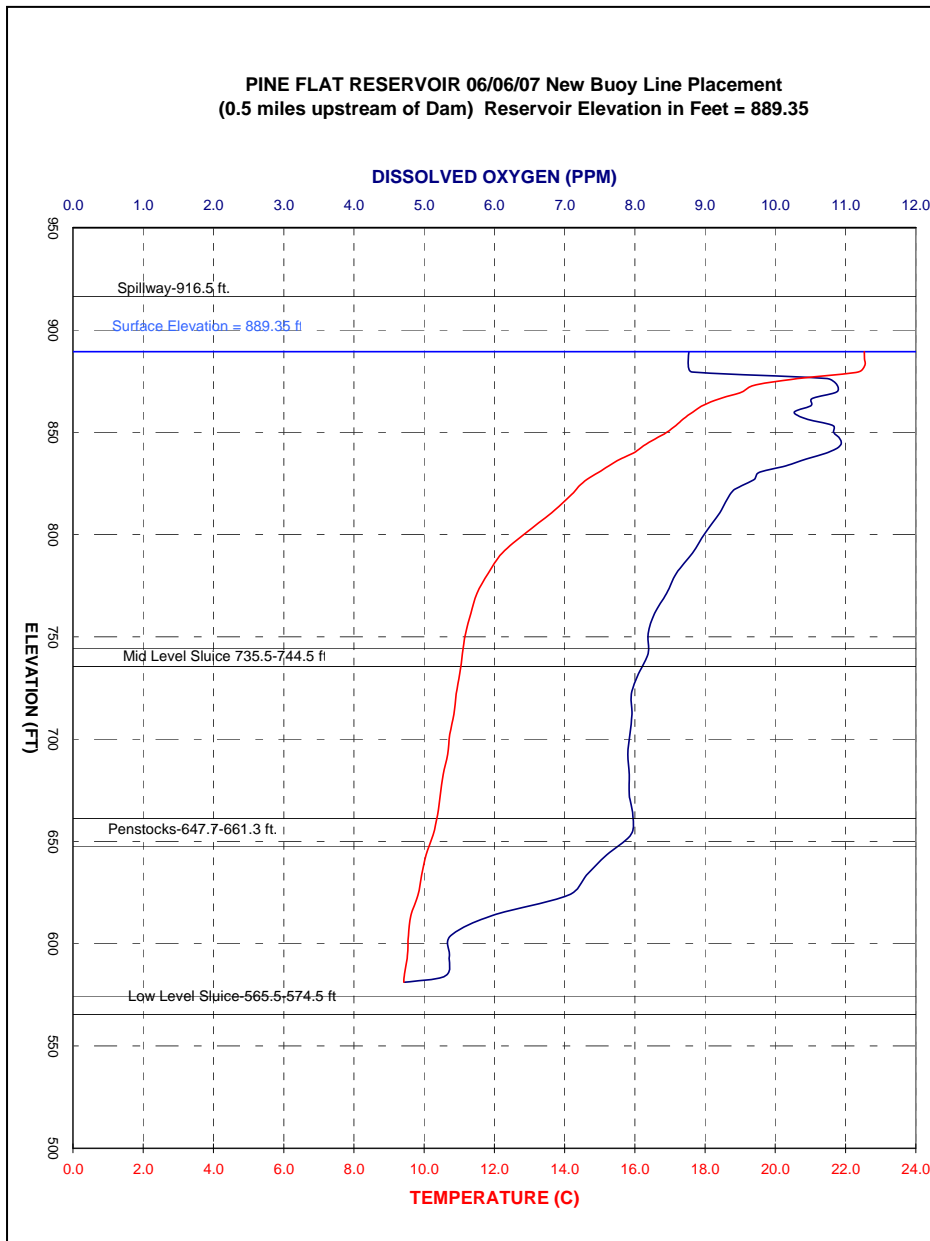


Figure 3-1. June 2007 vertical reservoir temperature and dissolved oxygen profile measurements at Pine Flat Reservoir.

3.1.2 River

Water temperature within the lower Kings River is routinely monitored at a variety of locations from Pine Flat Dam downstream to Highway 180. Permanent monitoring locations within the lower river are shown in Figure 3-2. Water temperature is recorded throughout the year at each location using a computerized temperature sensor and data recording system (Onset temperature recorders), which is routinely calibrated to laboratory standards and is accurate within $\pm 0.5^{\circ}\text{C}$.

Results of water temperature monitoring within the lower Kings River are shown, for example, at the Army Corp of Engineers Bridge (ACOE Bridge) (Figure 3-3) and Fresno Weir (Figure 3-4) for June 2007-May 2008. Results of water temperature monitoring at other locations (Avocado Side and Gould Weir Channel) within the river are included in Appendix D

Results of temperature monitoring within the river have shown a general seasonal pattern with lowest temperatures occurring during the winter and early spring, increasing during the spring and summer months, with the greatest increase in seasonal temperatures occurring during the late summer and early fall after completion of the irrigation season. Results of temperature monitoring have also shown a general gradient of temperatures with the coldest temperatures occurring typically near Pine Flat Dam and increasing as a function of distance downstream within the lower river during summer months. In addition, results of temperature monitoring have shown that the diel temperature variation (e.g., difference between the maximum and minimum daily temperature) is typically lowest immediately downstream of Pine Flat Dam with diel temperature variation increasing as a function of distance downstream within the lower river.

A substantial body of information exists on the habitat suitability and response of trout to water temperatures. A variety of factors influence habitat suitability including, but not limited to, the average and daily maximum temperature, the duration of exposure to elevated temperature, diel temperature variation, prey availability, fish condition and stress, availability of microhabitat temperature refugia, and other factors. As a result of these interacting factors specific water temperature criteria have not been identified for use in evaluating habitat conditions but rather, general guidelines have been established to assess habitat conditions within the lower river. Information from the scientific literature was used by the TSC to assess conditions within the river during the 2007-2008 study period. As a general guideline, water temperatures within the range from approximately $15\text{-}18^{\circ}\text{C}$ have been identified as providing optimal habitat conditions for trout (Moyle 2002). Habitat conditions for trout were identified as stressful as average daily temperatures approach or exceed approximately 21°C or maximum daily temperatures approach or exceed 25°C . As water temperature becomes elevated above the optimal range, quality and availability of habitat within the river to support coldwater species such as rainbow trout may decrease. As part of the FMP, water temperature data collected through the ongoing monitoring program are continuing to be analyzed and evaluated, in addition to the evaluation of alternative management strategies, after completion of the irrigation season, and prior to seasonal declining atmospheric temperatures during the fall months (Section 3.4) to help maintain suitable conditions for trout.

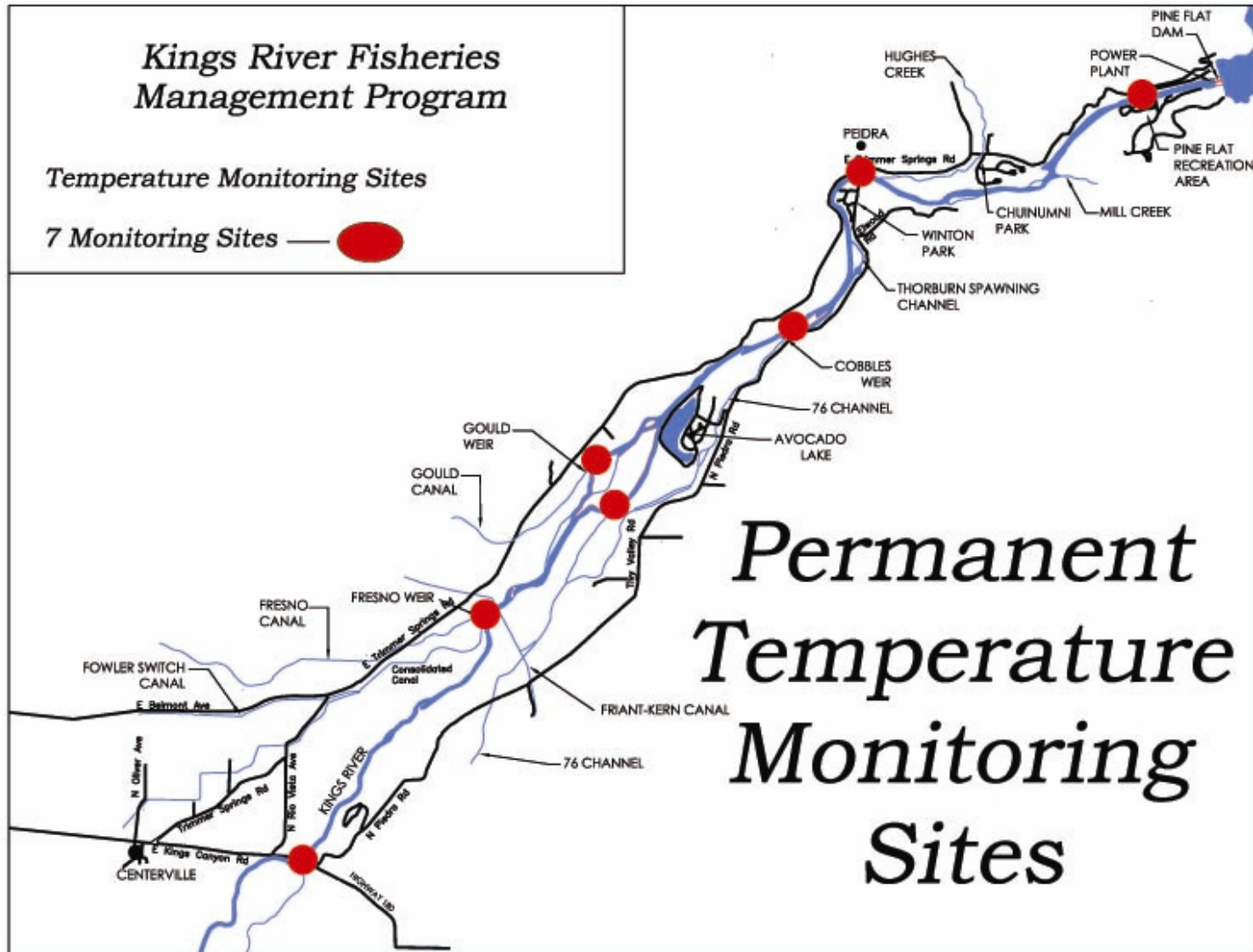


Figure 3-2. Permanent water temperature monitoring locations on the lower Kings River.

**KINGS RIVER WATER TEMPERATURE
ACOE Bridge
June 2007 to May 2008**

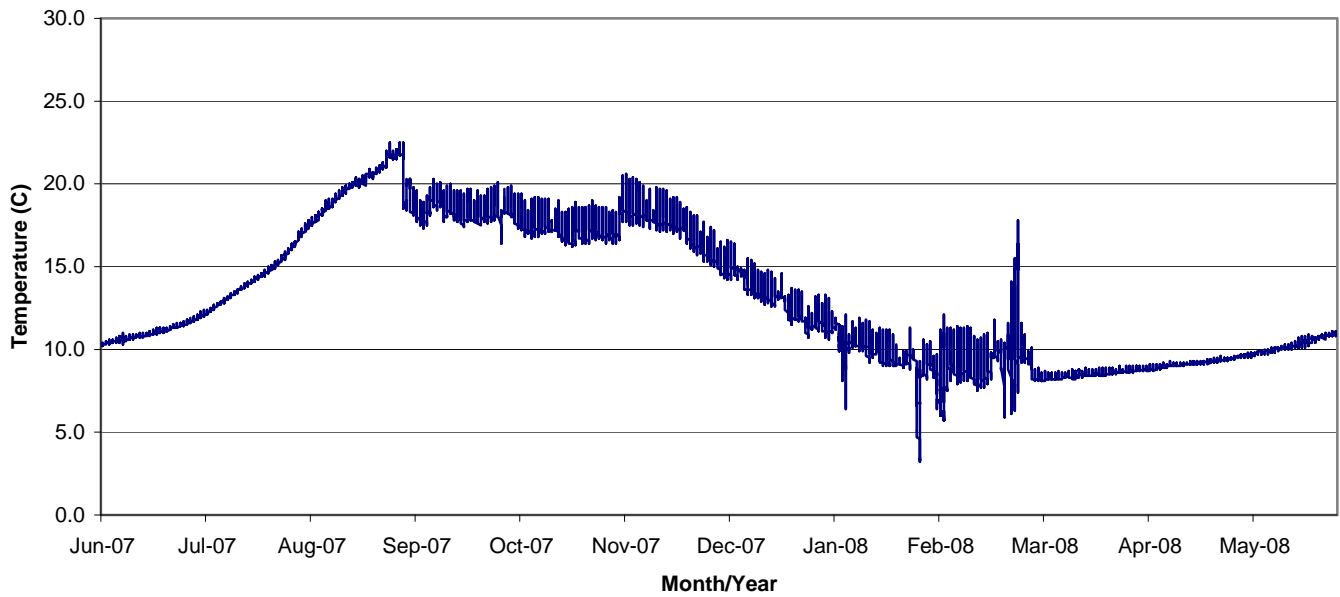


Figure 3-3. Hourly water temperature monitoring results, Army Corps of Engineers Bridge.

**KINGS RIVER WATER TEMPERATURE
Fresno Weir
June 2007 to May 2008**

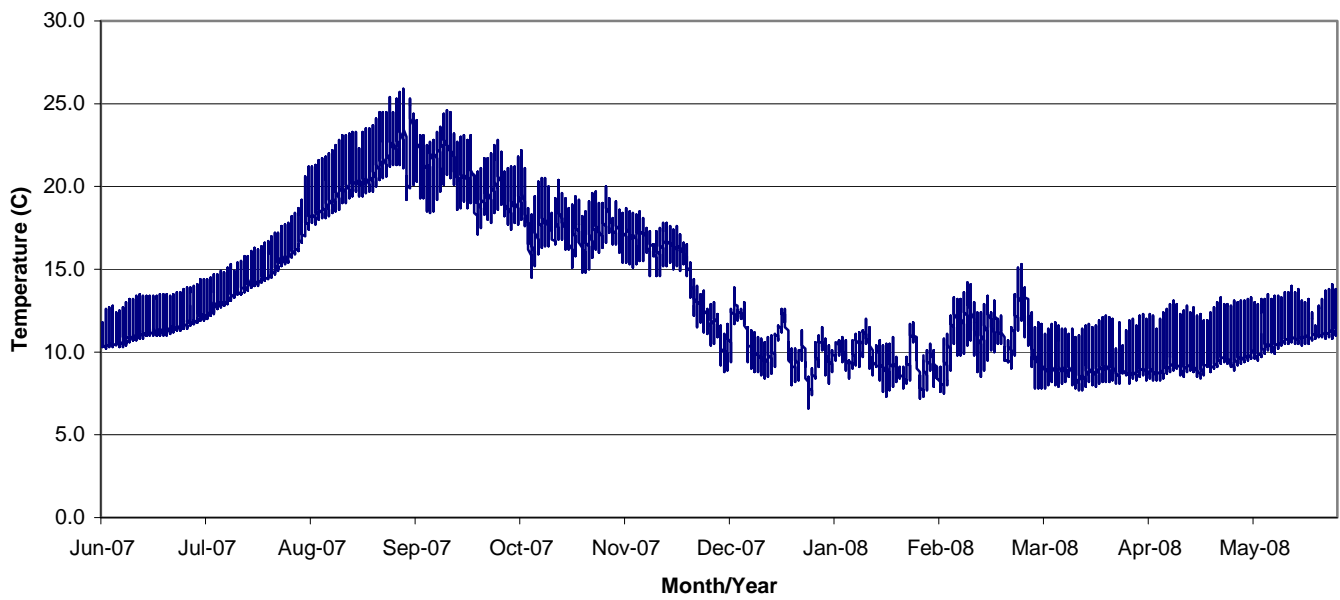


Figure 3-4. Hourly water temperature monitoring results at Fresno Weir.

Results of water temperature monitoring at the Army Corps of Engineers Bridge (Figure 3-3) showed that seasonal temperatures were generally lower than temperatures observed downstream at Fresno Weir (Figure 3-4). Water temperature throughout the reach was within the range considered to provide suitable habitat conditions for resident trout during the entire year. Water temperatures at other locations within the lower river, were also monitored (Appendix D) as part of the evaluation of habitat conditions. The TSC is continuing to investigate and evaluate water temperature conditions affecting the quality and availability of habitat within the lower river for trout during the late-summer and early-fall and the effectiveness of various management actions, including operation of the turbine bypass (Section 3.4), to provide suitable habitat conditions downstream to Fresno Weir for resident trout throughout the year.

3.2 DISSOLVED OXYGEN MONITORING

Dissolved oxygen concentrations are measured both within Pine Flat Reservoir and within the lower Kings River at the Army Corp of Engineers Bridge. Results of dissolved oxygen monitoring, conducted by KRCD, are briefly summarized below.

3.2.1 Reservoir

As briefly described above, KRCD conducts monthly monitoring within Pine Flat Reservoir to evaluate vertical profiles in both water temperature and dissolved oxygen concentrations. Results of dissolved oxygen measurements have shown a seasonal pattern, which is strongly associated with reservoir stratification; in which dissolved oxygen concentrations throughout the water column within the reservoir are typically within a suitable range for fish (7 mg/L and above) during the winter and early spring months. As the reservoir becomes thermally stratified during late spring and early summer months, a vertical distribution of dissolved oxygen concentrations becomes apparent with greater dissolved oxygen levels in the upper part of the water column (warmer epilimnion waters) and decreased dissolved oxygen concentrations in the colder waters near the bottom (hypolimnion). The hypolimnion contains very low levels of oxygen. These seasonal patterns in the vertical distribution of dissolved oxygen concentrations within Pine Flat Reservoir are typical of other reservoirs located within the Central Valley, though the actual values may differ significantly. Results of dissolved oxygen monitoring within Pine Flat Reservoir during the period May 2007 through May 2008 are shown monthly in Appendix C in combination with results of vertical water temperature profile measurements. Additional information on results of dissolved oxygen monitoring conducted within Pine Flat Reservoir is on file at KRCD.

In addition to monitoring dissolved oxygen concentrations within the reservoir, KRCD also monitors dissolved oxygen concentrations in the water released from Pine Flat Reservoir into the lower Kings River. Monitoring is conducted at the reservoir outlet elevations to determine both the minimum dissolved oxygen concentrations and potential gas supersaturation resulting from releases through the hydroelectric generator outlet works.

3.2.2 River

KRCD routinely monitors dissolved oxygen concentrations within the lower Kings River at the Army Corp of Engineers Bridge, which is located 0.6 miles downstream of Pine Flat Dam. Dissolved oxygen concentrations are measured on a continuous basis using a Hydrolab dissolved oxygen meter routinely (approximately monthly) calibrated to laboratory standards with an accuracy of ± 0.5 mg/L (Figure 3-5). As a condition of the Federal Energy Regulatory Commission (FERC) license, KRCD is required to maintain a minimum dissolved oxygen concentration at the ACOE Bridge of 7.0 mg/L for the protection of fish and other aquatic organisms inhabiting the lower Kings River when the power plant is operating. Results of dissolved oxygen measurements at the ACOE Bridge during the period from May 2007 through May 2008 are presented in Figure 3-6. Additional information on dissolved oxygen measurements within the lower Kings River is on file at KRCD. Results of these measurements have shown that dissolved oxygen concentrations within the lower Kings River are within the range considered to be suitable for various fish and macroinvertebrate species that occur in this section of the river.

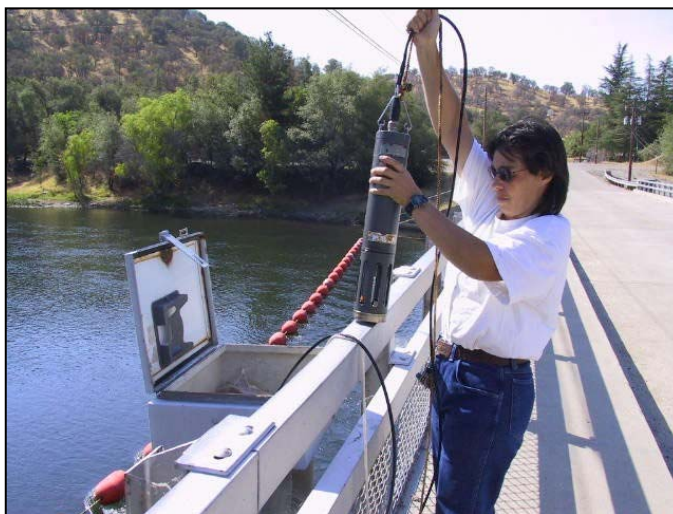


Figure 3-5. Dissolved oxygen monitoring station on the ACOE Bridge.

3.3 COMPLIANCE WITH DISSOLVED OXYGEN REQUIREMENTS

Minimum dissolved oxygen concentrations specified by the FERC license are 7.0 mg/L when the power plant is operating. During 2007-2008, KRCD met its operating and monitoring requirements, and conditions were suitable for fish throughout the period when the power plant was in operation. Results of the monitoring are presented in KRCD's report "Dissolved Oxygen Monitoring, Final Report for Calendar Year 2007" (KRCD 2008) which is on file at KRCD.

3.4 PLANNING FOR WARM WATER TEMPERATURE EVENT

One of the fundamental goals and objectives, as outlined in the Framework Agreement, is the maintenance of suitable instream habitat conditions for trout throughout the year downstream to Fresno Weir. Water temperature in the lower Kings River during the early fall, after completion of irrigation demand releases, may become elevated to a level where habitat conditions are stressful and/or unsuitable for trout. Having real-time temperature data available allows for informed decisions by managers to perform operations, as needed, for temperature maintenance of water downstream of Pine Flat Dam in an effort to maintain suitable water temperatures for coldwater species such as rainbow and brown trout. Several management strategies have been identified for addressing temperature maintenance issues including: 1) operation of the turbine bypass to maintain downstream temperatures within an acceptable range; 2) selective releases from the dam's three levels of gates, 3) short-term (pulsed) water releases from Pine Flat Reservoir, and 4) rescheduling of water deliveries to KRWA member units. These alternative

operational strategies will continue to be developed by the TSC to maintain suitable water temperature conditions during the late-summer and fall months.

Temperatures at the ACOE Bridge and Fresno Weir were consistently within the range considered to provide suitable habitat for trout (average daily temperatures less than 21°C). Water temperatures within the lower river were maintained within the range considered to be suitable for trout throughout the late-summer and fall of 2007. Temperature management during this period was achieved, in part, by modifying operations of Pine Flat Dam and the turbine bypass to allow release of cold water to the lower river through the low-level sluice gates when needed. Reservoir releases for the FMP during this period were coordinated between KRCD, KRWA and ACOE using results of real-time water temperature monitoring at Fresno Weir and other locations to manage reservoir releases to maintain suitable habitat conditions for trout. Operation of the turbine bypass, which became available for water temperature management in 2003, provided greater flexibility in managing water temperature releases from the dam to maintain suitable fish habitat in the lower river.

**PINE FLAT POWER PLANT
Dissolved Oxygen Readings Taken at ACOE Bridge**

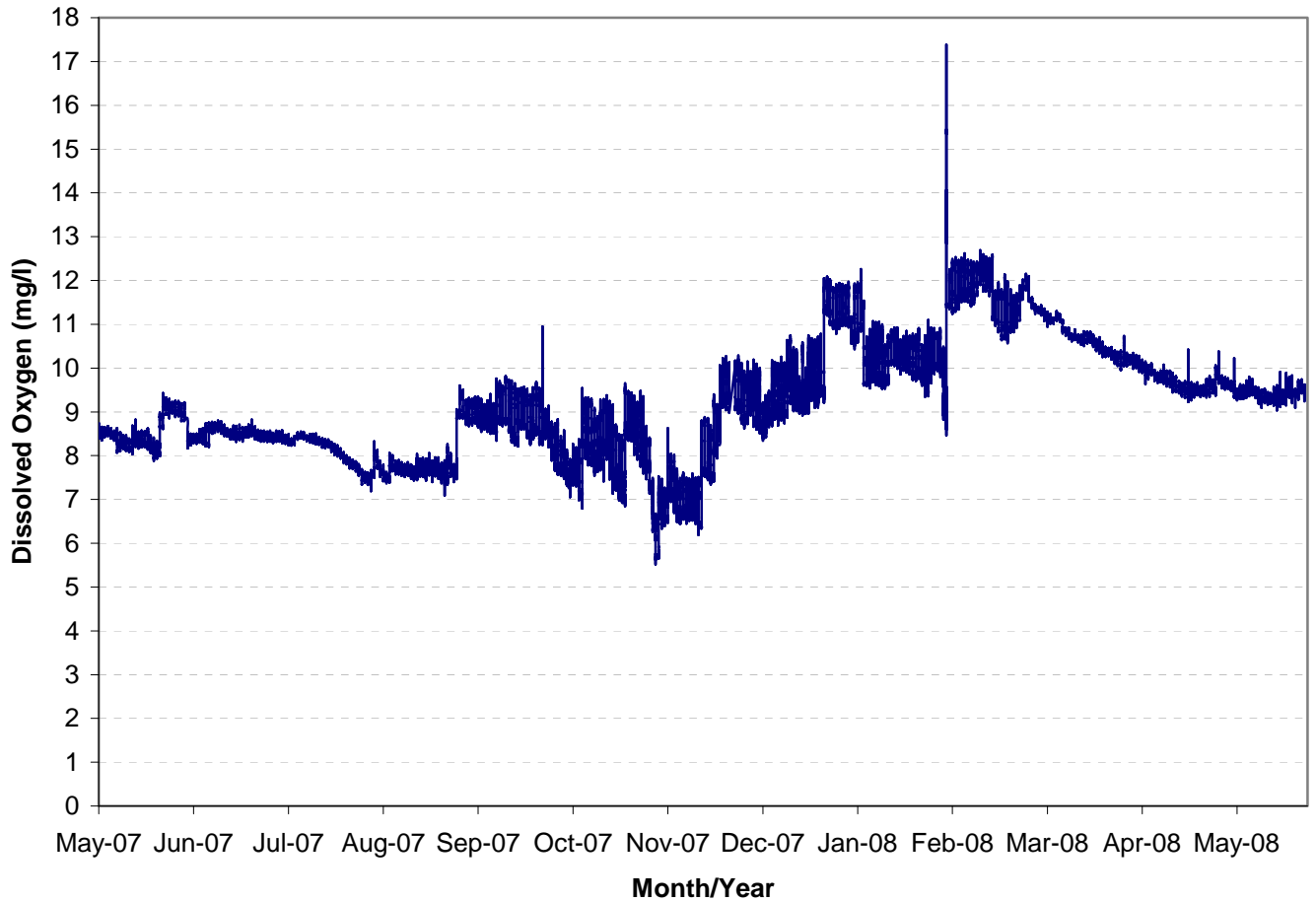


Figure 3-6. Results of dissolved oxygen measurements at the Army Corps Bridge from May 2007 through May 2008

3.5 SUMMARY AND DISCUSSION

A great deal of progress has been made with real-time temperature monitoring and the ability to regulate and manage water temperature in the lower river during critical periods. Valuable tools for managing water temperature in the lower river to protect fish habitat include cooperation from the ACOE in allowing the use of the lower sluice gates to release cold water during critical periods, and improved flexibility in managing water temperatures by using the turbine bypass.

Results of water quality monitoring within Pine Flat Reservoir and the lower Kings River during 2007-2008 have shown:

- Pine Flat Reservoir becomes stratified during late spring, summer, and fall showing a characteristic pattern of warmer water near the surface (epilimnion) and colder water with reduced dissolved oxygen concentrations near the bottom of the reservoir (hypolimnion). The reservoir destratifies in the late-fall and winter due to water temperature becoming uniform throughout the water column;
- The temperature of water released from the reservoir into the lower river can be regulated and managed, to some extent, through selective operation of different outlet works, including the turbine bypass, which initiated operations during 2003. However, the ability to manage water temperatures is limited and constrained by the availability of cold water and release points during various seasonal periods within the reservoir, hydroelectric generation, requirements for irrigation releases, and other factors;
- Aeration and mixing of water released from the reservoir have proven to be effective in maintaining suitable dissolved oxygen concentrations within the lower river during periods when the power plant was in operation. Mean monthly dissolved oxygen concentrations, as measured at the ACOE Bridge, during 2007-2008 exceeded 7.0 mg/L.
- Water temperatures within the lower river showed a seasonal pattern with the coldest temperatures occurring during the late winter and temperatures generally increasing during the summer and early fall;
- Water temperature showed a characteristic longitudinal gradient downstream of Pine Flat Dam. During summer months the coldest temperatures were located immediately downstream of the dam and temperatures generally increased with distance downstream from the dam. During the fall and winter, when atmospheric temperatures are cool, a reverse temperature gradient was observed with temperatures decreasing as a function of distance downstream from Pine Flat Dam;
- Results of temperature monitoring, and results from the fishery monitoring program, provided no evidence that either dissolved oxygen concentrations or water temperature conditions within the lower river resulted in mortality to trout or other fish species during 2007-2008;

- Results of the 2007-2008 water temperature and dissolved oxygen monitoring are being used by the TSC to refine water quality monitoring as part of the FMP and as a basis for evaluating alternative operational strategies, including operations of the turbine bypass, to address water quality issues affecting habitat conditions for trout in the future;

4.0 HABITAT ENHANCEMENT

A fundamental goal and objective of the FMP is to enhance the quality and availability of habitat for a variety of fish and macroinvertebrates within Pine Flat Reservoir and the lower Kings River. As part of the 2007-2008 FMP a variety of habitat enhancement projects were planned and/or implemented to benefit various life stages of trout, other fish species, and macroinvertebrates in the lower Kings River. A brief description of the habitat enhancement projects planned and/or implemented as part of the FMP during 2007-2008 is summarized below.

4.1 RIVER

Section 1(f) of the Framework Agreement – Funding / Projects discusses fish habitat improvements to enhance fish and wildlife resources in the lower Kings River. Habitat enhancement projects included the purchase and stockpiling of boulders and the approval and implementation of a Fishery Habitat Master Plan (June 2004).

4.1.1 Project Permitting

Permits from various state and federal agencies are required to perform work in a stream or river channel. These permits are meant to fully disclose the details of the work, identify any negative environmental impacts that might occur, and identify how these impacts will be avoided or mitigated. The FMP obtained riverwide and multi-year permits for future fish habitat enhancement projects as part of the Fishery Habitat Master Plan. Permits were obtained from the U. S. Army Corps of Engineers, Regional Water Quality Control Board, California Department of Fish and Game, and State Reclamation Board. An extension of the FMP's Clean Water Act Section 404 (Nationwide #27) permit was requested from the U.S. Army Corps of Engineers. The activities were conducted under Element C-2004-10: Riverwide Permit for Fish Habitat Projects of the 5-Year Implementation Plan.

4.1.2 Gravel Placement

Previously stockpiled gravel was placed in the river behind Avocado Lake and near Winton Park. These activities were conducted under Element C-2007-1: Fishery Habitat Master Plan of the 5-Year Implementation Plan.

4.1.3 Boulder Placement

Approximately 2900 boulders were placed in the Kings River for habitat enhancement as approved in the Fishery Habitat Master Plan. The activities were conducted under Element C-2007-1: Fishery Habitat Master Plan of the 5-Year Implementation Plan.

4.1.4 Placement of Half Logs in the Thorburn Channel

No additional habitat work was completed on the Thorburn Channel during the 2007-2008 program year.

4.1.5 Lower Kings River Habitat Conservation Framework

During the program year, little activity occurred on this element. Other groups such as the Kings River Conservancy, Sierra Foothill Conservancy, and Trust for Public Lands are planning conservation projects on the Kings River. The FMP and participating agencies are engaged and cooperating with those efforts. The activities were conducted under Element N-2007-5: Lower Kings River Habitat Conservation Framework of the 5-Year Implementation Plan.



Figure 4-1. Placing boulders near Avocado Lake County Park



Figure 4-2. Logs providing cover in Thorburn Spawning Channel

4.1.6 Development of a Fisheries and Habitat Improvement Plan

The TSC has developed a Habitat Enhancement Master Plan as part of the FMP. The Master Plan provides guidance and direction for future habitat enhancement efforts (e.g., gravel and boulder projects) and serves as the basis for purchasing and stockpiling gravel and boulders to be placed in the river at strategic locations throughout the coming years.

The activities were conducted

under Element N-2007-6: Development of a Fisheries and Habitat Improvement Plan of the 5-Year Implementation Plan.

4.1.8 Development of Exhibit D Flows

Due to a very dry 2006-2007 water year (39%) Exhibit D flows were not implemented in the fall and winter of 2007. The activities were conducted under Element N-2007-1: Development of Exhibit D Flows of the 5-Year Implementation Plan.

4.1.9 Large Woody Debris Pilot Study

The literature review (Phase I) was completed by Hanson Environmental and it was determined that the pilot study (Phase II) was indeed feasible. Permits from various state and federal agencies are required to perform work in a stream or river channel. These permits are meant to fully disclose the details of the work, identify any negative environmental impacts that might occur, and identify how these impacts will be avoided or mitigated. The FMP applied for multi-year permits for the fish habitat enhancement project as part of the Fishery Habitat Master Plan. Permits were requested from the U. S. Army Corps of Engineers, Regional Water Quality Control Board, California Department of Fish and Game, and State Reclamation Board. These activities were conducted under Element C-2007-14: Reconnaissance Investigation of Large Woody Debris (LWD) on the Kings River.

4.2 PINE FLAT RESERVOIR

The major fish habitat improvement work completed during this report period occurred between Deer Creek and Island Park. The improvements consisted of a series of concrete anchors measuring about 2 ft x 6 ft by 2 ft high being placed at strategic locations in the area of the lake bottom. Aviation cable of 3/16-inch stainless steel was strung between the concrete anchors to form a grid for attaching tree and bush cover. The entire area affected by the project was approximately 100 by 400 feet.

Wire gabions filled with manzanita brush that were prepared last year were moved to a site in Sycamore Cove where they joined approximately 90 other gabions already installed as fish habitat structures.

Planting seed of both winter wheat and barley were conducted at three locations including Deer Creek and Island Park and also Edison Point near Windy gap. The growth of the grasses was very good and much enhanced by the late rains. This should be excellent habitat for warm water species of fishes.

The CDFG biologist previously assigned to this project was redirected to other projects. Personnel from the ACOE took the lead in overseeing that these projects were completed. We support and applaud the efforts of the ACOE. Supplies were purchases using FMP funds.

4.3 SUMMARY AND DISCUSSION

The FMP continued habitat enhancement efforts on the lower Kings River by the following actions:

- Applied for permits from various State and Federal Agencies to complete construction of the Large Woody Debris Pilot Study;
- Requested extension of the FMP's 404 (Nationwide #27) Permit;
- Placed remaining gravel in the river behind Avocado Lake and near Winton Park;
- Placed approximately 2900 large (3 to 6 feet in diameter) boulders in the Kings River for habitat improvement;

5.0 FISH STOCKING

The stocking of fish in State waters is the responsibility of the California Department of Fish and Game. During the 2007-2008 reporting period, Catchable and sub-catchable size rainbow trout were stocked in the Kings River between Pine Flat Dam and Fresno Weir. Due to a lack of availability, no trout eggs were supplied to the program by the CDFG for incubation and hatching in the lower river during the 2007-2008 reporting period. Catchable size rainbow trout were also planted in Pine Flat Reservoir and Avocado Lake. A brief description of the fish stocking activities is presented below.

5.1 RIVER

5.1.1 Whitlock-Vibert Boxes

Section G(1)(j) of the Framework Agreement “Stocking Program” discusses trout stocking in the lower Kings River. Trout egg planting is conducted to increase trout numbers by augmenting the naturally spawned population of rainbow trout. Planting of trout eggs is a fast, efficient, and inexpensive way to increase recruitment of juvenile fish in the river.

Whitlock Vibert Boxes (WVB) were not used during this reporting period to hatch eyed rainbow trout eggs, inside the streamside incubators, as there were no trout eggs available from CDFG during this period.

5.1.2 Streamside Incubators

The streamside incubators consisted initially of refrigerators that had been modified to hatch trout eggs. Beginning in 2003, permanent streamside incubators were constructed to replace the refrigerators. The incubators consist of a concrete vault that contains a tank constructed of plywood and fiberglass. A 0.75 horse power pump supplies water from the river that flows through the tank, over the charged WVBs, and back into the river (Figure 5-1).

The upper streamside incubator is located downstream of Pine Flat Recreation Area. The lower incubator is located at the lower end of the Thorburn Spawning and Rearing Channel adjacent to the river. These incubators were not used during the 2007-2008 program year due to the lack of availability of trout eggs. The unfortunate lack of availability of trout eggs during the 2007-2008 program year led to the development of a new element in the 2008-2009 5-Year Plan to purchase trout eggs on a temporary basis until availability from CDFG improves. This will at least provide the program with the capability of stocking the incubators for the 2008-2009 program year, and into the future if deemed necessary.



Figure 5-1. Streamside incubator with thousands of rainbow trout fry

5.1.3 Rainbow Trout Stocking

Trout stocking is the responsibility of the CDFG and occurs at no cost to the FMP.

5.1.3.1 Sub-Catchable Size Rainbow Trout

During the 2007-2008 program year, 2,000 pounds of sub-catchable rainbow trout (4-6 inches in length), representing over 25,000 fish, were stocked in the lower Kings River as part of the put-and-grow program.

The strain of trout utilized were the offspring of Eagle Lake rainbow trout

from Eagle Lake in northern California. Eggs are taken from female Eagle Lake trout as they ascend a tributary creek to spawn. They were fertilized by males also collected during the spawning run, and the eggs held in the hatchery for later distribution. San Joaquin Hatchery personnel stocked the small trout at Winton and Choinumni Parks. These fish were provided by the CDFG at no cost to the FMP.

5.1.3.2 Fingerling Rainbow Trout

During the 2007-2008 program year, there were no Rainbow trout fingerlings planted in the lower river. There currently is no annual allotment for Rainbow Trout fingerlings on the Kings River.

5.1.3.3 Catchable-Sized Rainbow Trout

The current annual allotment for the Kings River below Pine Flat is 18,000 pounds of catchable trout. However, a total of 19,665 pounds of catchable sized trout (31,123 fish) were stocked in the lower Kings River during this reporting period. Beginning in December 2005, CDFG implemented a "Trophy Trout" program on the Kings River. During the 2007-2008 program year, an additional 8,115 pounds of trophy trout (2,131 fish) were planted in the put-and-take and catch-and-release sections. Normally, catchable trout (2 fish per pound) are stocked either once or twice per week during the non-irrigation period (roughly October through March) and once each week during the irrigation season when flows are high. The trophy trout in the program averaged over 4 pounds each overall, with the larger fish weighing over 6 pounds during the December through March period (Figure 5-2).



Figure 5-2. Trout averaging 4 pounds each were stocked by CDFG from December through March.

5.1.4 Trout Relocation to the Lower Kings River

In 2004-2005, an element to relocate wild rainbow trout from the upper Kings River watershed to the lower Kings River was developed. Some preliminary planning and discussions were conducted for this element. This element may be implemented in the future. The activities were conducted under Element N-2004-8: Trout Relocation to the Lower Kings River of the 5-Year Implementation Plan. However, no work occurred during 2007-2008 reporting period.

5.2 RESERVOIR

5.2.1 Kokanee Salmon

During the 2007-2008 Program Year, 871 pounds of Kokanee Salmon Fingerlings (72,692 fish) were planted in Pine Flat Reservoir.

5.2.2 Fingerling Rainbow Trout

During the 2007-2008 program year, there were no Rainbow trout fingerlings planted in the Pine Flat Reservoir. There currently is no annual allotment for Rainbow Trout fingerlings in Pine Flat.

5.2.3 Sub-Catchable Sized Rainbow Trout

No sub-catchable trout were planted in Pine Flat Reservoir during the reporting period.

5.2.4 Catchable-Sized Rainbow Trout

The current annual allotment for Pine Flat Reservoir is 22,000 pounds for the calendar year. Between 11/1/2007 and 3/5/2008, 26,700 pounds (44,900 trout) were planted in Pine Flat Reservoir. The catchable trout averaged around ½ pound each (2 fish/pound) at the time they were stocked in the reservoir (load averages ranged 1.4 to 2.4 fish/pound).

5.2.5 Chinook Salmon

The most recent planting of Chinook salmon fingerling was 5/19/2008, which was 75,072 fingerlings weighing 782 pounds.

5.2.6. Avocado Lake

Avocado Lake is a Fresno County Park located adjacent to the lower Kings River. The lake site served as a source of rock and gravel for the construction of Pine Flat Dam. The lake is a popular recreational site and supports thousands of angler hours each year. The annual allotment delivered during the winter months is 6,000 pounds. In 2007-2008 reporting period, the San Joaquin Hatchery planted 6,975 pounds (10,866 trout) of catchable size rainbow trout in Avocado Lake.

5.3 SUMMARY AND DISCUSSION

- Whitlock Vibert Boxes (WVB) were not used during this reporting period to hatch eyed rainbow trout eggs, inside the streamside incubators, as there were no trout eggs available from CDFG during this period;
- These incubators were not used during the 2007-2008 program year due to the lack of availability of trout eggs. The unfortunate lack of availability of trout eggs during the 2007-2008 program year led to the development of a new element in the 2008-2009 5-Year Plan to purchase trout eggs on a temporary basis until availability from CDFG improves;
- During the 2007-2008 program year, 2,000 pounds of sub-catchable rainbow trout (4-6 inches in length), representing over 25,000 fish, were stocked in the lower Kings River as part of the put-and-grow program. These fish were provided by the CDFG at no cost to the FMP;
- During the 2007-2008 program year, there were no Rainbow trout fingerlings planted in the lower river;
- A total of 19,665 pounds of catchable sized trout (31,123 fish) were stocked in the lower Kings River during this reporting period. During the 2007-2008 program year, an additional 8,115 pounds of trophy trout (2,131 fish) were planted in the put-and-take and catch-and-release sections. Normally, catchable trout (2 fish per pound) are stocked either once or twice per week during the non-irrigation period (roughly October through March) and once each week during the irrigation season when flows are high. The trophy trout in the program averaged over 4 pounds each overall, with the larger fish weighing over 6 pounds during the December through March period;
- No sub-catchable trout were planted in Pine Flat Reservoir during the reporting period;
- Between 11/1/2007 and 3/5/2008, 26,700 pounds (44,900 trout) were planted in Pine Flat Reservoir. The catchable trout averaged around ½ pound each (2 fish/pound) at the time they were stocked in the reservoir (load averages ranged 1.4 to 2.4 fish/pound);

- During the 2007-2008 Program Year, 871 pounds of Kokanee Salmon Fingerlings (72,692 fish) were planted in Pine Flat Reservoir;
- The most recent planting of Chinook salmon fingerling was 5/19/2008, which was 75,072 fingerlings weighing 782 pounds; and
- In 2007-2008 reporting period, the San Joaquin Hatchery planted 6,975 pounds (10,866 trout) of catchable size rainbow trout in Avocado Lake.

6.0 MONITORING

Section G (1)(k) of the Framework Agreement “Development of Criteria/Monitoring” calls for the agencies to carry out a monitoring program to determine the effects of various elements of the FMP and the overall status of the fishery. One objective of the FMP is to establish a comprehensive monitoring program that is to provide the agencies and the public with a gauge with which to evaluate the status of the fishery and the relative merits of any particular project.

6.1 RIVER

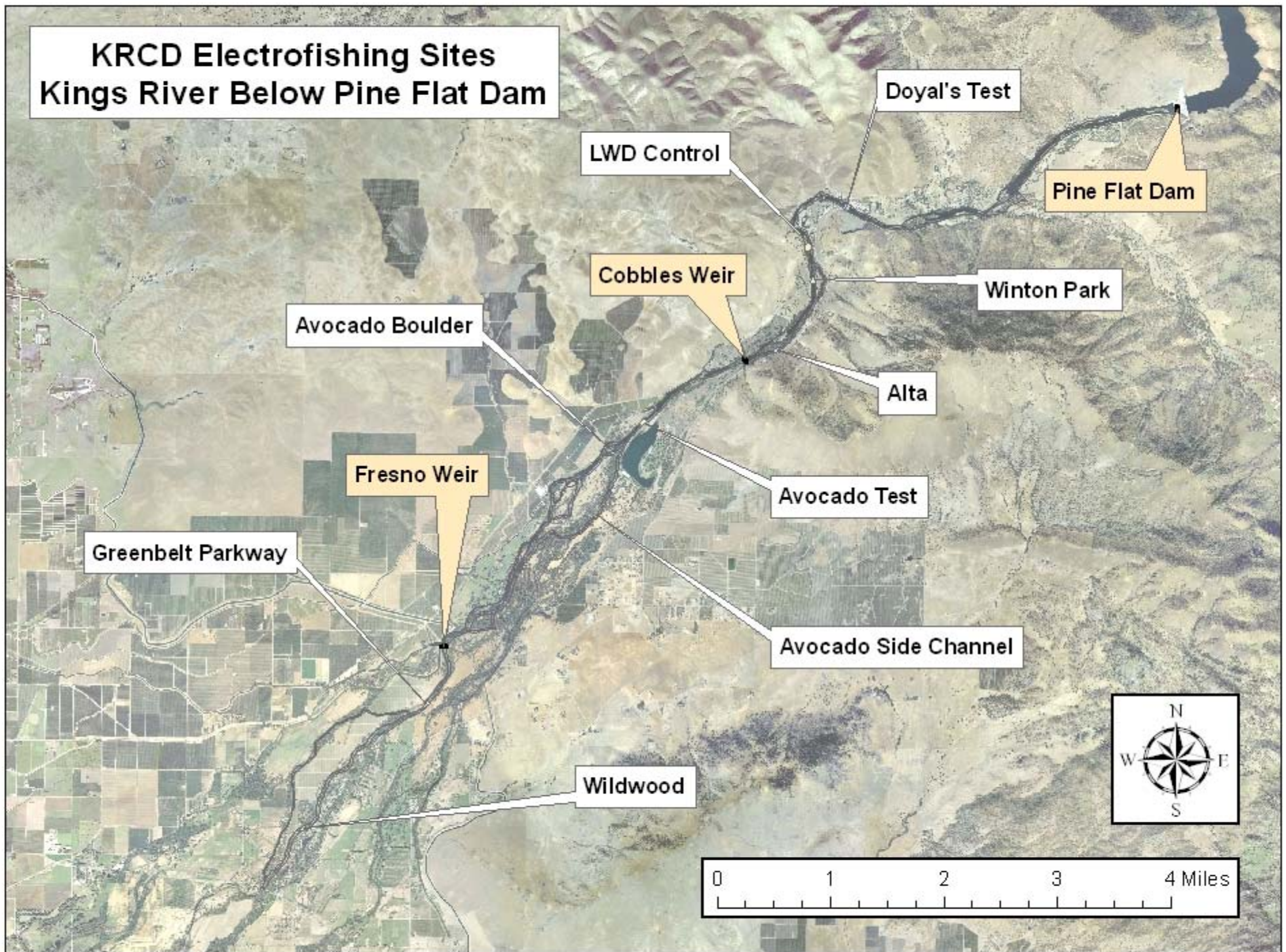
6.1.1 Annual Fish Population Surveys

Long-term annual baseline trout fisheries monitoring within the lower Kings River is being conducted as part of the FMP to determine (1) juvenile trout abundance and distribution; (2) adult trout abundance and distribution; (3) reproductive success, growth, and survival; (4) over-wintering survival, size and age structure of the population; and (5) assess the abundance and condition of the fish community inhabiting the lower Kings River.

The 5-Year Plan proposed that electrofishing surveys would be conducted two times per year during (1) spring (prior to initiation of the major irrigation releases) and (2) fall (at the completion of the irrigation season). During the 2007-2008 study period, electrofishing surveys were conducted two times, in November, 2007, and February, 2008. Electrofishing is performed at sampling sites within each of the three management reaches of the lower Kings River (Figure 6-1). Surveys are conducted at the same sampling sites each year for use in establishing an abundance index, and for determining trends in abundance of trout and other fish species. Three additional sites were sampled during the program year. Two sites were sampled to study the change in species composition and abundance during the non-irrigation demand period. A third site was sampled to establish species composition and abundance of a control site for the Large Woody Debris Project (discussed in the Habitat Enhancement Section 4.1.9)

Sampling is conducted using a block net on the upper end and lower end of the sample reach and backpack electrofishers. Electrofishing surveys have been conducted over a period of 24 years (since 1983) in the Kings River by KRCD and CDFG biologists. The number of sites sampled has been expanded over the years. To the extent possible, sampling methods and the sampling locations utilized in previous surveys by KRCD have been incorporated as part of the electrofishing monitoring program to allow comparison of current results with previous monitoring. In 2007, the FMP began to use the multi-pass depletion technique. This allowed for a more rigorous sampling and provided a more complete assessment of the species composition and abundance found in the sample site. Data collected during the survey include species and number of fish as well as length and weights. This data can then be used to determine trends in the populations and condition of the trout as well as other non-game species.

The nine sampling sites were reduced to 300 feet in length and were sampled using backpack electrofishers in November 2007 (Figure 6-1). A final report is available in the KRCD library. The Doyals’ Test site and Alta Test site were resampled again in February 2008. A final report is available in the KRCD library.



Crews consisting of 15 to 24 people and five to seven electrofishers were used to conduct the sampling. Low numbers of resident rainbow trout were caught at eight of the nine sites. The Avocado Test site produced 19 resident rainbow trout, the highest of all of the sites. As in past years, the most abundant fish were the Sacramento sucker (*Catostomus occidentalis*) and sculpin (*Cottus spp.*).

6.1.2 Macroinvertebrate Study

In November 2007 and February 2008, KRCD staff collected insect samples from six sites on the lower Kings River. Samples were collected according to CDFG's California Stream Bioassessment Procedure modified for low gradient channels. Additional instructions for bifurcated channels and channels immediately below impoundments were followed. Results from the 2006 and Spring 2007 data were received from the CDFG Bioassessment Laboratory, however, a final report was not available at this time. The activities were conducted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.1.3 Fish Tracking Study

78 radio transmitters were implanted into study fish and 77 study fish were subsequently released into the lower Kings River for study. To date, more than 8 million data points have been collected. Mobile tracking continued year round, augmented by weekly float tracking in pontoon boats during higher flows. The activities were conducted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.1.4 Pine Flat Reservoir and Lower Kings River Fish Population Study

While funds were budgeted for this element, no activity occurred and funds will be carried over to the next program year. Funds were budgeted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.1.5 Bio Mass Estimate

While funds were budgeted for this element, no activity occurred and funds will be carried over to the next program year. Funds were budgeted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.1.6 Electroshocking Survey (Raft)

While funds were budgeted for this element, no activity occurred and funds will be carried over to the next program year. Raft testing and repairs are planned in the future. Funds were budgeted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.1.7 Incubator Effectiveness Study

Due to an excessively high mortality rate caused by a water pump problem, the incubator Effectiveness Study was not performed. Funds were budgeted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.1.8 Dennis Cut Telemetry Installation

A stilling well and telemetry system were installed at the Dennis Cut headworks. These activities were conducted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.1.9 Water Quality Sampling (River)

Sampling included monthly measurements for general parameters such as temperature, pH, conductivity, turbidity, alkalinity, and hardness. Results of the sampling show good water quality conditions for trout and other fishes. Water quality monitoring will continue in the future according to the Water Quality Monitoring Report. This report is available at the KRCD offices, or on the Fisheries Management Program's website, currently hosted by KRCD at <http://www.krcd.org>. The activities were conducted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.1.10 Real-Time Monitoring

While funds were budgeted for this element, no activity occurred and funds will be carried over to the next program year. No special monitoring events occurred that required the use of the funds. The funds were budgeted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.1.11 Fish Tag Purchase

An additional 80 transmitters (20 large, 60 small) were purchased during the program year for a total cost of \$19,820.00. The total expenditure for telemetry tracking materials was \$20,120.00. The funds were budgeted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.1.12 Annual Technical Report

The fifth Annual Technical Report was published and distributed by the FMP in November 2007. The report covered activities for program year 2006-2007 and its 5-Year Implementation Plan. The report was reviewed and approved by the PAG and ExCom. The activities were conducted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

6.2 RESERVOIR

6.2.1 Bass Tournament Results

The results of organized angling events are a cost effective means of monitoring the overall condition of the warmwater fishery (see 2002-2003 Annual Technical Report for details and references). The CDFG summarizes results of tournament records on an annual basis. The available information is summarized in Table 6-3.

For the 2007-2008 program year, a complete data set is available for 40 permitted bass tournaments held at Pine Flat Reservoir. The number of participants was 1,413 and the average size of bass returned for Weigh-In was 1.34 pounds.

Table 6-1. Summary of results of organized bass angling tournaments held at Pine Flat Reservoir.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
No. Tournaments	31	16	25	29	33	32	23	32	40
No. Anglers	862	367	702	820	890	841	658	1,000	1,413
Total Hrs. Fished	7,012	3,454	6,428	7,067	7,807	7,304	5,279	7,940	11,133
Total No. Bass	1,495	811	1,680	2096	2136	1,634	1,505	2,315	3,091
Total Weight (lbs.)	1,750	1,245	3,108	3,593.5	3,289.1	2,385	2,570	3,199	4,153
Hrs fished/angler	8.13	9.41	9.16	8.62	8.77	8.68	8.02	7.93	7.89
Avg. per bass (lbs)	1.17	1.54	1.85	1.71	1.54	1.46	1.71	1.38	1.34

In previous Annual Technical Reports, a value for Catch per Hour was given in the table above. This data was erroneously included, as the values representing Catch per Hour misrepresented the true experience of the anglers in these tournaments. In any given tournament, an angler may only report a maximum catch of 5 bass, and in fact the angler is attempting to keep the largest 5 bass possible to win the tournament. Additional bass that may have been caught and subsequently released by anglers are not reported. Therefore, the figures presented in previous Annual Technical Reports were likely to have under-represented the true Catch per Hour value each angler experienced.

6.2.2 Pine Flat Reservoir Fish Population

No electrofishing, gill netting, or sub-sampling of bass tournaments occurred during this reporting period.

6.3 SUMMARY AND DISCUSSION

As part of the FMP habitat and fishery monitoring has been conducted within the lower river and Pine Flat Reservoir. Results of the 2007-2008 monitoring program have shown:

- During the 2007-2008 study period, the FMP began to use the multi-pass depletion technique in performing the annual electrofishing surveys. This allowed for a more rigorous sampling and provided a more complete assessment of the species composition and abundance found in the sample site. Data collected during the survey include species and number of fish as well as length and weights. This data can then be used to determine trends in the populations and condition of the trout as well as other non-game species;

- During the 2007-2008 study period, electrofishing surveys were conducted two times, in November, 2007, and February, 2008;
- Nine sites were sampled using backpack electrofishers in November 2007 (Figure 6-1). The Doyals' Test site and Alta Test site were resampled again in February 2008. A final report is available in the KRCD library;
- In November 2007 and February 2008, KRCD staff collected insect samples from six sites on the lower Kings River;
- Transmitters were implanted and 2 groups of tagged fish were released in the Kings River for study;
- The fifth annual Technical Report was completed in November 2007;
- The 2006-2007 Water Quality Monitoring Report was produced and presented to the Public Advisory Group for review. It is due to be presented to the ExCom at the October 2008 meeting; and
- There were 40 permitted bass tournaments with complete data sets at Pine Flat Reservoir during the 2007-2008 program year. The number of participants was 1,413 and the average size of bass returned for Weigh-In was 1.34 pounds.

7.0 PUBLIC EDUCATION AND OUTREACH

7.1 News Releases and Newsletters

An issue of Kings River Fisheries News newsletter was published and distributed in the early Fall of 2007 with the assistance of the Public Advisory Group. The activities were conducted under Element C-2007-4: Public Education of the 5-Year Implementation Plan.

7.2 Summer Hydrology and Temperature Report

KRWA has developed a real-time telemetry system for monitoring water temperature and streamflow at Fresno Weir. During the summer and fall of 2004 information developed from monitoring being conducted on the lower Kings River was compiled in weekly reports and distributed by KRWA to members of the PAG and other interested parties to provide current information on environmental conditions occurring within the lower river that would affect habitat quality for trout. Weekly reports were distributed electronically to inform managers and other interested parties regarding conditions currently occurring within the lower river. The water temperature and flow monitoring and reporting provided a valuable tool for disseminating real-time information. The TSC has recommended that the real-time monitoring and dissemination of weekly reports, when appropriate, be continued as part of the FMP. In addition, the TSC recommends that information on current conditions occurring within the lower Kings River be developed in a format compatible with posting on an Internet based web page that would be accessible to the public. The activities were conducted under Element C-2007-5: Monitoring of the 5-Year Implementation Plan.

7.3 Web Page Development

The PAG has developed and is operating a web page to inform the public, fishing groups, and government agencies about the FMP. The web page also presents angling opportunities and information related to the Kings River. This website is viewable at <http://www.kingsriverfisheries.org>. The activities were conducted under Element C-2007-4: Public Education of the 5-Year Implementation Plan.

7.3.5 Ad-Hoc Group on Public Outreach

An Ad-Hoc committee as approved by the Ex-Com began meeting in April of 2007 on development of public outreach materials for the Fisheries Management Program. The activities were conducted under Element C-2007-4: Public Education of the 5-Year Implementation Plan.

7.4 Educational Tours & Clean-up: Thorburn Spawning and Rearing Channel

During the program year, several educational tours were conducted at the Thorburn Spawning and Rearing Channel.

7.5 Kings River Day 2008

The PAG worked extensively with the 2008 Kings River Day event, to provide valuable historical, operational, scientific and recreational opportunities to hundreds of 6th graders. The event was successfully held on May 16, 2008. This annual event has become an important part of the outreach function of the PAG, and comments from students, teachers, and administrators have been very positive.

7.6 Directed Enforcement

Local groups of fisherman committed additional funds for a Directed Enforcement Action targeting the Kings River Fisheries Management Zone by the California Department of Fish and Game during the 2007-2008 program year. On March 15, 2008, this Directed Enforcement Action resulted in 26 citations and 20 warnings, along with 178 public contacts by Fish and Game personnel in an effort to curtail illegal fishing activities in the Fisheries Management Zone. These activities were officially outside of the Kings River Fisheries Management Program, but the FMP does thank Fish and Game for the additional efforts.

8.0 OUTSTANDING ELEMENTS

With limited exception, efforts on elements from previous years and the 2005-2006 5-Year Implementation Plan were not conducted during the program year or are ongoing. Some elements may be carried over to the next program year. Below is a brief summary of those elements.

Study of Pool Habitat and Constructed Deep Water Habitat Pilot Project (C-2007-15). - Implementation of this element did not occur during the program year. Funds will be carried over to the next program year.

Phytoplankton and Nutrient Resource Study (N-2007-9). -Little activity occurred for this element during the program year. This is an important element that the TSC plans to research and address in the future.

9.0 MAINTENANCE ACTIVITIES

9.1 Thorburn Channel Maintenance

Spraying of weeds, brushing, and tree trimming took place along the roadway and nature trail. The headgate was checked every one to two weeks and accumulated debris was removed. The k-rail was checked for beaver dam-building activities and dams were removed. The activities were conducted under Element M-2008-1: Thorburn Channel Maintenance of the 5-Year Implementation Plan.

9.2 Streamside Incubator Operation and Maintenance

A new stainless steel intake screen was installed on the lower incubator near the Thorburn's Spawning Channel. The pump diaphragm was also replaced in the lower incubator. The activities were conducted under Element M-2008-2: Streamside Incubator Operation and Maintenance of the 5-Year Implementation Plan.

10.0 DEVELOPMENT OF 5-YEAR PLAN

Section G(1) of the Framework Agreement includes elements addressing adaptive management (Section 1b); stream temperature monitoring (Section 1d); funding for habitat enhancement projects (Section 1f); enforcement, education, and awareness program (Section 1i); stocking program (Section 1j); development of criteria/monitoring (Section 1k); and access (Section 1p). The 5-Year Plan helps to provide guidance, prioritize activities and the allocation of expenditures, and coordinate among the parties to facilitate efficient implementation of these elements of the Framework Agreement.

A 5-Year Plan was developed during this reporting period (May 2007 to May 2008). This was the seventh annual modification to the 5-Year Plan since the signing of the Framework Agreement on May 28, 1999. Development of the 5-year work plan is based on a consideration of (1) specific requirements identified within the Framework Agreement; (2) results of previous fisheries and water quality monitoring; and (3) prioritization of habitat restoration activities based upon limiting factors analyses. The 5-Year Plans: (1) provide a project management structure for reviewing and prioritizing proposed habitat enhancement activities, fish stocking, and other elements of the Framework Agreement; (2) identify the objectives and methods to be used to assess the overall response of trout and other species for use in evaluating achievement of the Kings River aquatic resource goals as identified in Section 1a of the Framework Agreement; and (3) provide a framework for the experimental design and evaluation of specific enhancement activities (e.g., enhancement projects funded under the Framework Agreement, fish stocking and supplementation, pulse flows for temperature management, etc.) within the context of the overall goals and activities being implemented through the Framework Agreement. Results of monitoring and evaluation activities serve, in part, as the basis for the adaptive management element of the Framework Agreement (Section 1b) and for identifying changes in program priorities, or the allocation of resources from one program element to another. The 5-Year Plan is a “living plan” that is reviewed by the TSC, PAG and ExCom on an annual basis throughout the 10-year period of the agreement and revised as projects and elements of the program are implemented and as new scientific information becomes available.

11.0 REFERENCES

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APPENDIX A

Summary of Daily Hydrologic Data for Pine Flat and the Kings River
(on following pages)

Provisional data, storage in acre-feet, other data in cubic feet per second.

Date	Pine Flat Storage Acre-feet	Flow at Piedra cfs	Pre Project Piedra cfs	Measured Flows Below Fresno Weir cfs
6/1/07	691523	5465	2254	3876
6/2/07	686715	4232	1990	2621
6/3/07	681782	4094	1790	2510
6/4/07	677154	4022	1859	2468
6/5/07	672258	4051	1737	2496
6/6/07	667192	4002	1585	2450
6/7/07	661488	4016	1364	2467
6/8/07	656185	3760	1051	2211
6/9/07	650997	3469	1026	1926
6/10/07	645832	3449	916	1894
6/11/07	640920	3436	1023	1887
6/12/07	636027	3426	1051	1891
6/13/07	630879	3581	1048	2014
6/14/07	625570	3855	1159	2075
6/15/07	619604	4172	1204	2106
6/16/07	613395	4334	1201	2172
6/17/07	607085	4266	1162	2110
6/18/07	600407	4298	1011	2136
6/19/07	593011	4689	996	2404
6/20/07	585312	4749	941	2374
6/21/07	577357	4784	856	2349
6/22/07	569764	4721	811	2265
6/23/07	562093	4586	754	2136
6/24/07	554091	4644	627	2203
6/25/07	546743	4574	636	2097
6/26/07	539023	4602	601	2118
6/27/07	530983	4524	518	2041
6/28/07	523254	4439	533	1930
6/29/07	515336	4507	466	1994
6/30/07	507521	4407	453	1902
7/1/07	500093	4370	438	1855
7/2/07	492116	4540	419	2005
7/3/07	483645	4842	405	2264
7/4/07	475170	5028	389	2433
7/5/07	466263	5116	376	2528
7/6/07	457869	4895	369	2322
7/7/07	449709	4761	360	2191
7/8/07	441776	4682	349	2112
7/9/07	434218	4688	342	2149
7/10/07	425903	4780	334	2241
7/11/07	417671	4732	336	2182
7/12/07	409669	4642	327	2091

Provisional data, storage in acre-feet, other data in cubic feet per second.

Date	Pine Flat Storage Acre-feet	Flow at Piedra cfs	Pre Project Piedra cfs	Measured Flows Below Fresno Weir cfs
7/13/07	402147	4537	322	1987
7/14/07	394409	4557	311	2014
7/15/07	386714	4603	304	2058
7/16/07	378990	4509	311	1971
7/17/07	371453	4465	313	1939
7/18/07	363684	4461	294	1924
7/19/07	355352	4516	294	1958
7/20/07	347525	4522	279	1957
7/21/07	339989	4416	265	1854
7/22/07	332177	4347	252	1800
7/23/07	325273	4308	244	1761
7/24/07	317866	4311	244	1725
7/25/07	310072	4387	264	1791
7/26/07	302348	4404	290	1802
7/27/07	294851	4424	299	1824
7/28/07	287392	4386	301	1777
7/29/07	279341	4438	291	1855
7/30/07	272034	4280	276	1765
7/31/07	266613	3334	261	1687
8/1/07	262120	2772	336	1616
8/2/07	257638	2857	329	1718
8/3/07	253055	2812	322	1675
8/4/07	248431	2760	311	1623
8/5/07	243991	2724	300	1604
8/6/07	240038	2365	290	1245
8/7/07	236943	1881	279	728
8/8/07	234116	1846	270	1559
8/9/07	231199	1852	257	1567
8/10/07	228678	1776	232	1490
8/11/07	226200	1777	217	1493
8/12/07	223628	1795	206	1513
8/13/07	220940	1764	198	1477
8/14/07	218163	1822	191	1530
8/15/07	215458	1825	182	1514
8/16/07	213108	1814	176	1491
8/17/07	210281	1761	173	1437
8/18/07	207756	1754	168	1429
8/19/07	205145	1809	163	1487
8/20/07	202882	1708	159	1386
8/21/07	200656	1617	154	1297
8/22/07	198569	1574	147	1263
8/23/07	196394	1605	141	1293

Provisional data, storage in acre-feet, other data in cubic feet per second.

Date	Pine Flat Storage Acre-feet	Flow at Piedra cfs	Pre Project Piedra cfs	Measured Flows Below Fresno Weir cfs
8/24/07	194108	1501	138	1189
8/25/07	192525	1296	136	991
8/26/07	190950	1231	132	936
8/27/07	189479	1168	132	879
8/28/07	188356	1083	154	813
8/29/07	187528	990	229	733
8/30/07	186702	867	236	618
8/31/07	186580	581	267	334
9/1/07	186993	459	239	223
9/2/07	187333	425	235	208
9/3/07	187576	386	219	193
9/4/07	187966	362	208	178
9/5/07	187942	419	201	236
9/6/07	187723	506	192	319
9/7/07	187553	506	182	315
9/8/07	187260	402	173	195
9/9/07	186823	403	166	196
9/10/07	186993	276	160	90
9/11/07	186945	292	158	56
9/12/07	186799	303	154	61
9/13/07	186678	297	149	52
9/14/07	186775	291	145	50
9/15/07	186921	272	140	55
9/16/07	186799	262	136	44
9/17/07	186653	269	132	49
9/18/07	186508	264	130	46
9/19/07	186290	261	128	44
9/20/07	186096	258	125	58
9/21/07	185853	251	129	52
9/22/07	185805	253	145	51
9/23/07	185756	253	171	49
9/24/07	185733	252	175	46
9/25/07	185708	257	168	45
9/26/07	185950	266	160	45
9/27/07	185902	271	156	48
9/28/07	185684	272	153	44
9/29/07	185611	272	150	47
9/30/07	185418	260	150	51
10/1/07	185442	220	130	60
10/2/07	185684	205	125	59
10/3/07	185926	198	122	46
10/4/07	186193	199	118	43

Provisional data, storage in acre-feet, other data in cubic feet per second.

Date	Pine Flat Storage Acre-feet	Flow at Piedra cfs	Pre Project Piedra cfs	Measured Flows Below Fresno Weir cfs
10/5/07	186168	202	119	43
10/6/07	186144	202	131	48
10/7/07	186241	201	137	49
10/8/07	186435	201	166	46
10/9/07	186605	198	161	41
10/10/07	186678	204	156	38
10/11/07	186896	209	154	58
10/12/07	186896	196	160	49
10/13/07	186945	195	174	50
10/14/07	187090	182	181	53
10/15/07	187212	170	183	55
10/16/07	187260	169	177	48
10/17/07	187285	173	175	51
10/18/07	187382	166	175	44
10/19/07	187504	183	173	38
10/20/07	187723	187	168	45
10/21/07	187893	184	164	46
10/22/07	188015	177	162	42
10/23/07	188210	185	158	43
10/24/07	188625	190	153	48
10/25/07	188966	183	149	41
10/26/07	189235	175	140	60
10/27/07	189333	160	133	58
10/28/07	189309	151	133	48
10/29/07	189773	156	146	56
10/30/07	190116	149	176	56
10/31/07	190288	122	181	72
11/1/07	190509	111	175	78
11/2/07	190999	107	168	63
11/3/07	191172	110	163	67
11/4/07	191639	111	158	69
11/5/07	191884	111	152	67
11/6/07	192131	111	143	78
11/7/07	192575	111	140	64
11/8/07	192945	111	138	70
11/9/07	193142	111	138	69
11/10/07	193340	111	138	73
11/11/07	193489	111	147	74
11/12/07	193761	109	192	67
11/13/07	194083	104	191	62
11/14/07	194504	103	180	62
11/15/07	194802	106	174	70

Provisional data, storage in acre-feet, other data in cubic feet per second.

Date	Pine Flat Storage Acre-feet	Flow at Piedra cfs	Pre Project Piedra cfs	Measured Flows Below Fresno Weir cfs
11/16/07	195025	100	172	64
11/17/07	195224	102	168	64
11/18/07	195498	101	165	67
11/19/07	195696	101	161	64
11/20/07	195796	101	158	63
11/21/07	196194	101	158	62
11/22/07	196319	101	152	64
11/23/07	196519	101	149	64
11/24/07	196718	101	144	65
11/25/07	196918	101	138	65
11/26/07	197418	101	142	70
11/27/07	197592	101	141	59
11/28/07	197893	101	137	48
11/29/07	198344	101	136	47
11/30/07	198945	107	136	47
12/1/07	199523	107	136	45
12/2/07	199876	114	128	43
12/3/07	200127	112	125	47
12/4/07	200530	107	125	45
12/5/07	200984	107	128	45
12/6/07	201514	107	144	49
12/7/07	202248	107	284	49
12/8/07	202831	107	252	48
12/9/07	203287	107	208	45
12/10/07	203770	112	197	43
12/11/07	204380	116	201	51
12/12/07	204661	116	198	54
12/13/07	204941	114	197	56
12/14/07	205452	118	194	55
12/15/07	206014	117	194	57
12/16/07	206423	110	198	58
12/17/07	207114	107	193	50
12/18/07	208321	105	642	61
12/19/07	209558	101	580	74
12/20/07	210307	101	365	83
12/21/07	211187	101	342	84
12/22/07	211497	101	283	80
12/23/07	211991	101	300	82
12/24/07	212536	101	339	84
12/25/07	213134	101	361	85
12/26/07	213655	101	341	83
12/27/07	214203	101	326	76

Provisional data, storage in acre-feet, other data in cubic feet per second.

Date	Pine Flat Storage Acre-feet	Flow at Piedra cfs	Pre Project Piedra cfs	Measured Flows Below Fresno Weir cfs
12/28/07	214934	101	324	71
12/29/07	215327	101	307	56
12/30/07	215772	101	297	49
12/31/07	216244	101	291	48
1/1/08	216874	101	288	49
1/2/08	217426	101	270	49
1/3/08	218137	101	261	50
1/4/08	223388	249	2841	98
1/5/08	230384	451	4427	221
1/6/08	234390	209	2213	340
1/7/08	236118	120	899	170
1/8/08	237742	115	808	110
1/9/08	239151	116	733	110
1/10/08	240565	118	710	83
1/11/08	241815	123	650	80
1/12/08	243069	131	710	78
1/13/08	244523	134	657	75
1/14/08	245897	139	553	60
1/15/08	247219	148	555	57
1/16/08	248459	152	490	60
1/17/08	249901	148	458	60
1/18/08	251376	143	489	53
1/19/08	252514	149	457	56
1/20/08	253398	146	406	58
1/21/08	254597	143	419	54
1/22/08	255198	142	440	52
1/23/08	255772	143	433	63
1/24/08	256754	137	510	72
1/25/08	257811	138	349	64
1/26/08	258589	138	381	60
1/27/08	260177	141	1001	71
1/28/08	263603	247	1748	145
1/29/08	265647	150	842	78
1/30/08	267317	151	764	47
1/31/08	268992	153	704	56
2/1/08	270880	148	781	49
2/2/08	272479	149	758	50
2/3/08	276436	600	2602	417
2/4/08	278861	293	1221	191
2/5/08	281268	162	1020	79
2/6/08	283261	143	836	59
2/7/08	285049	145	861	54

Provisional data, storage in acre-feet, other data in cubic feet per second.

Date	Pine Flat Storage Acre-feet	Flow at Piedra cfs	Pre Project Piedra cfs	Measured Flows Below Fresno Weir cfs
2/8/08	286965	138	875	52
2/9/08	288521	138	858	51
2/10/08	289959	139	851	51
2/11/08	291892	140	864	49
2/12/08	293739	142	889	49
2/13/08	295284	142	924	49
2/14/08	296956	141	901	51
2/15/08	298634	141	809	50
2/16/08	299818	149	783	50
2/17/08	301035	148	779	51
2/18/08	302442	147	757	52
2/19/08	304262	149	779	56
2/20/08	306465	153	1035	59
2/21/08	308520	151	1021	54
2/22/08	312712	180	1999	60
2/23/08	316325	248	1839	114
2/24/08	325240	547	4992	338
2/25/08	331749	723	3855	383
2/26/08	335872	317	2290	99
2/27/08	339522	242	1940	47
2/28/08	342726	341	1830	45
2/29/08	345843	443	1909	60
3/1/08	348570	468	1829	49
3/2/08	350665	711	1810	284
3/3/08	352054	963	1522	484
3/4/08	353378	983	1497	448
3/5/08	354433	1095	1409	516
3/6/08	355182	1238	1379	596
3/7/08	355761	1301	1342	606
3/8/08	355966	1291	1326	558
3/9/08	356272	1340	1381	588
3/10/08	356477	1409	1412	626
3/11/08	356716	1481	1589	637
3/12/08	356853	1575	1755	570
3/13/08	357468	1625	2131	536
3/14/08	358529	1595	2164	453
3/15/08	358871	1602	1663	463
3/16/08	358666	1678	1538	449
3/17/08	357879	1635	1253	392
3/18/08	357024	1665	1257	404
3/19/08	356170	1701	1369	389
3/20/08	355420	1693	1454	342

Provisional data, storage in acre-feet, other data in cubic feet per second.

Date	Pine Flat Storage Acre-feet	Flow at Piedra cfs	Pre Project Piedra cfs	Measured Flows Below Fresno Weir cfs
3/21/08	354807	1663	1487	310
3/22/08	354330	1618	1546	262
3/23/08	354024	1614	1703	252
3/24/08	354024	1624	1901	229
3/25/08	354092	1664	2029	247
3/26/08	354364	1693	2217	261
3/27/08	354841	1711	2303	279
3/28/08	355250	1715	2257	281
3/29/08	355556	1729	2192	292
3/30/08	355897	1734	2207	296
3/31/08	355727	1755	1852	321
4/1/08	355454	1726	1744	316
4/2/08	355113	1709	1672	327
4/3/08	354670	1715	1646	330
4/4/08	354467	1689	1782	260
4/5/08	354501	1694	1964	265
4/6/08	354772	1713	2033	283
4/7/08	355386	1753	2194	303
4/8/08	355863	1820	2058	350
4/9/08	356136	1823	1882	357
4/10/08	356170	1815	1791	359
4/11/08	356751	1790	2213	330
4/12/08	358083	1781	2809	321
4/13/08	360483	1757	3545	294
4/14/08	363787	1735	4203	265
4/15/08	367627	1743	4439	276
4/16/08	370512	1782	3710	308
4/17/08	373304	1814	3824	301
4/18/08	376668	1798	4150	279
4/19/08	379660	1793	3846	274
4/20/08	382134	1858	3584	339
4/21/08	383728	1933	3139	422
4/22/08	385219	1949	2958	440
4/23/08	386607	2031	3000	484
4/24/08	387925	2056	3058	505
4/25/08	389567	2001	3137	478
4/26/08	392253	1930	4021	437
4/27/08	396679	1889	5318	413
4/28/08	401929	2270	6321	513
4/29/08	408569	2231	7098	202
4/30/08	415192	2138	6597	96
5/1/08	419824	2176	5377	100

Provisional data, storage in acre-feet, other data in cubic feet per second.

Date	Pine Flat Storage Acre-feet	Flow at Piedra cfs	Pre Project Piedra cfs	Measured Flows Below Fresno Weir cfs
5/2/08	423996	2283	5431	398
5/3/08	428302	2334	5617	97
5/4/08	432329	2395	5474	88
5/5/08	435504	2458	5069	89
5/6/08	438387	2531	5007	107
5/7/08	442081	2652	5899	112
5/8/08	446289	2757	6076	101
5/9/08	450209	2759	6092	80
5/10/08	454341	2774	6143	80
5/11/08	458997	2792	6703	82
5/12/08	464109	2785	6897	79
5/13/08	467794	2785	5857	84
5/14/08	471297	2848	5949	138
5/15/08	476677	3220	7992	314
5/16/08	484925	3378	9750	233
5/17/08	494457	3576	10608	238
5/18/08	504575	3685	11163	275
5/19/08	515088	3815	11384	378
5/20/08	525170	3864	11426	362
5/21/08	533208	3812	9436	358
5/22/08	536575	3718	6563	328
5/23/08	537250	3784	4962	370
5/24/08	536786	3758	4256	372
5/25/08	536323	3612	3975	319
5/26/08	535521	3546	3837	328
5/27/08	534721	3539	3712	327
5/28/08	533754	3435	3436	272
5/29/08	532577	3358	3189	253
5/30/08	531025	3371	3251	334

APPENDIX B

Hydrologic and Climate Summary Reports for 2007-2008 Program Year
(on following pages)

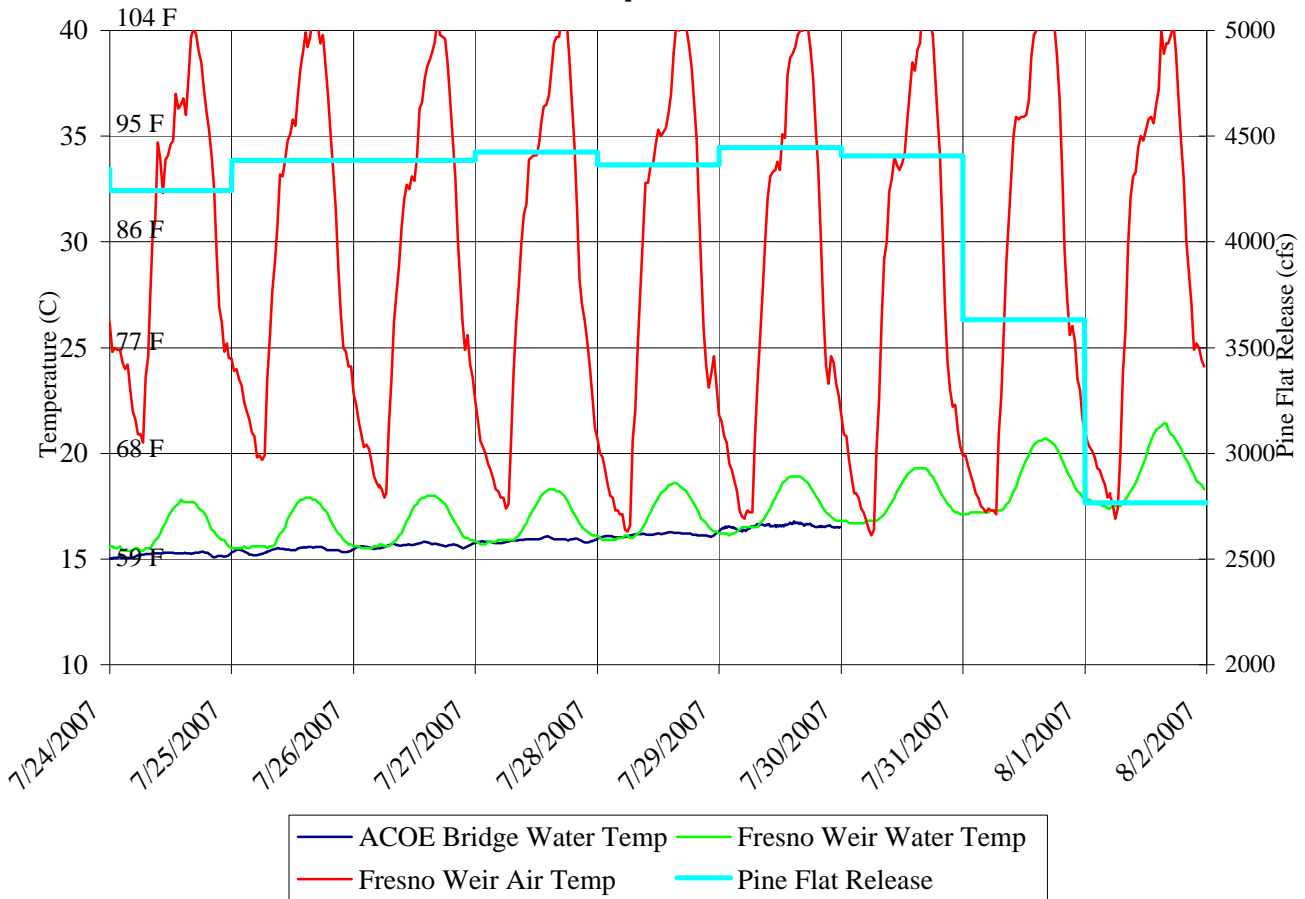
Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

Provisional Data - Subject to Revision
8/2/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Mill & Hughes Creeks	0	NA	8/2/2007	KRWA
Piedra	2,782 cfs	100 cfs	8/2/2007	KRWA
Dennis Cut	100 cfs	5 cfs	8/2/2007	KRWA
At Fresno Weir	1,657 cfs	95 cfs	8/2/2007	KRWA
Over Fresno Weir	1,617 cfs	35 cfs	8/2/2007	KRWA

Pine Flat		Date			
Storage	260,699 af	8/2/2007	0700	ACOE	
Elevation	781.96 ft	8/2/2007	0700	ACOE	
Release	2,782 cfs	8/2/2007	0700	KRCD	
Release Temperature	63.57 F	17.54 C	8/2/2007	0700	KRCD
Avg. Fresno Weir Water Temp	66.20 F	19.00 C	8/2/2007		

Flow and Temperature Trends



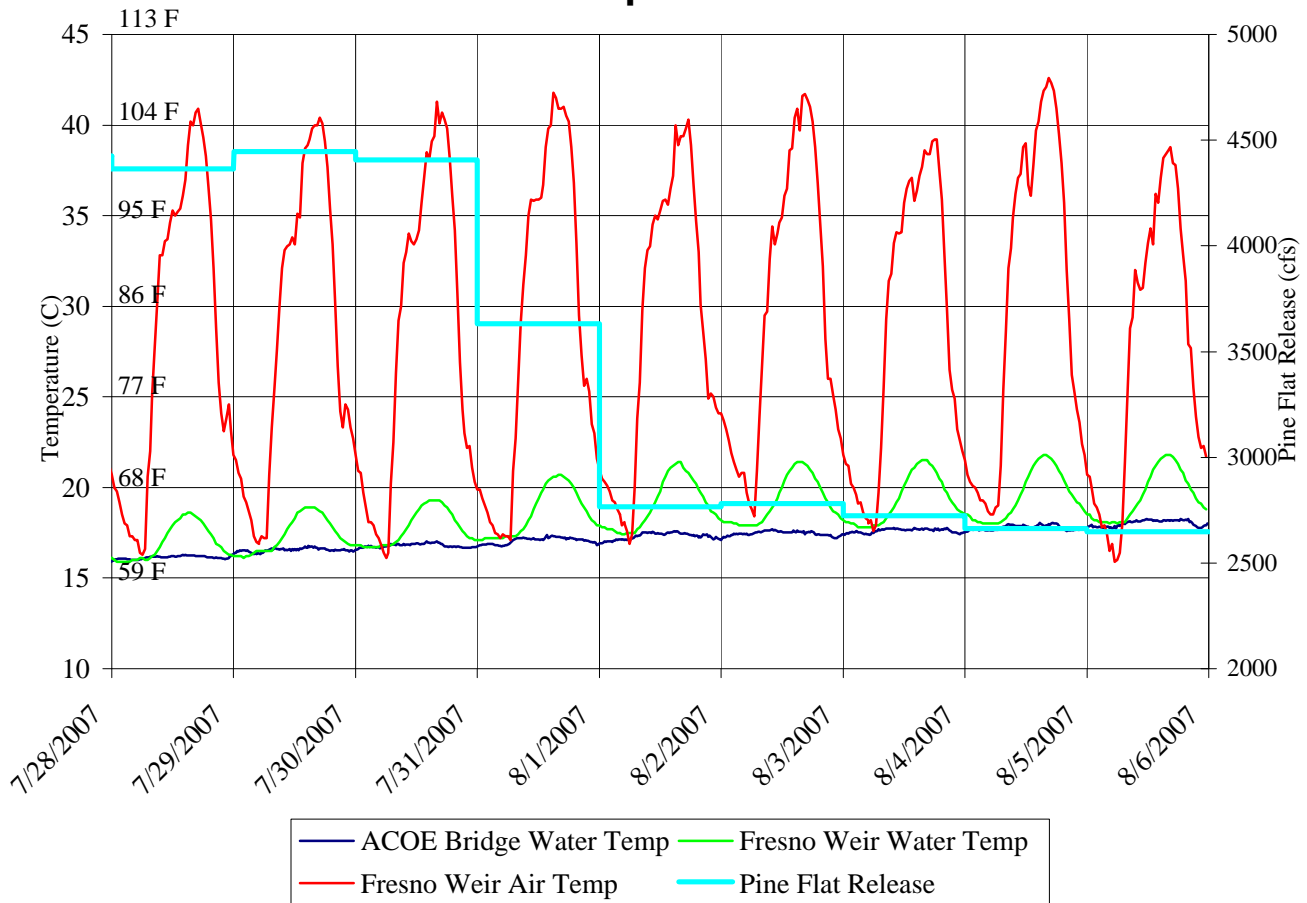
Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

Provisional Data - Subject to Revision
8/6/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Mill & Hughes Creeks	0	NA	8/6/2007	KRWA
Piedra	2,648 cfs	100 cfs	8/6/2007	KRWA
Dennis Cut	100 cfs	5 cfs	8/6/2007	KRWA
At Fresno Weir	1,608 cfs	95 cfs	8/6/2007	KRWA
Over Fresno Weir	1,578 cfs	35 cfs	8/6/2007	KRWA

Pine Flat		Date			
Storage	242,679 af	8/6/2007	0700	ACOE	
Elevation	775.62 ft	8/6/2007	0700	ACOE	
Release	2,648 cfs	8/6/2007	0700	KRCD	
Release Temperature	64.45 F	18.03 C	8/6/2007	0700	KRCD
Avg. Fresno Weir Water Temp	67.17 F	19.54 C	8/6/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

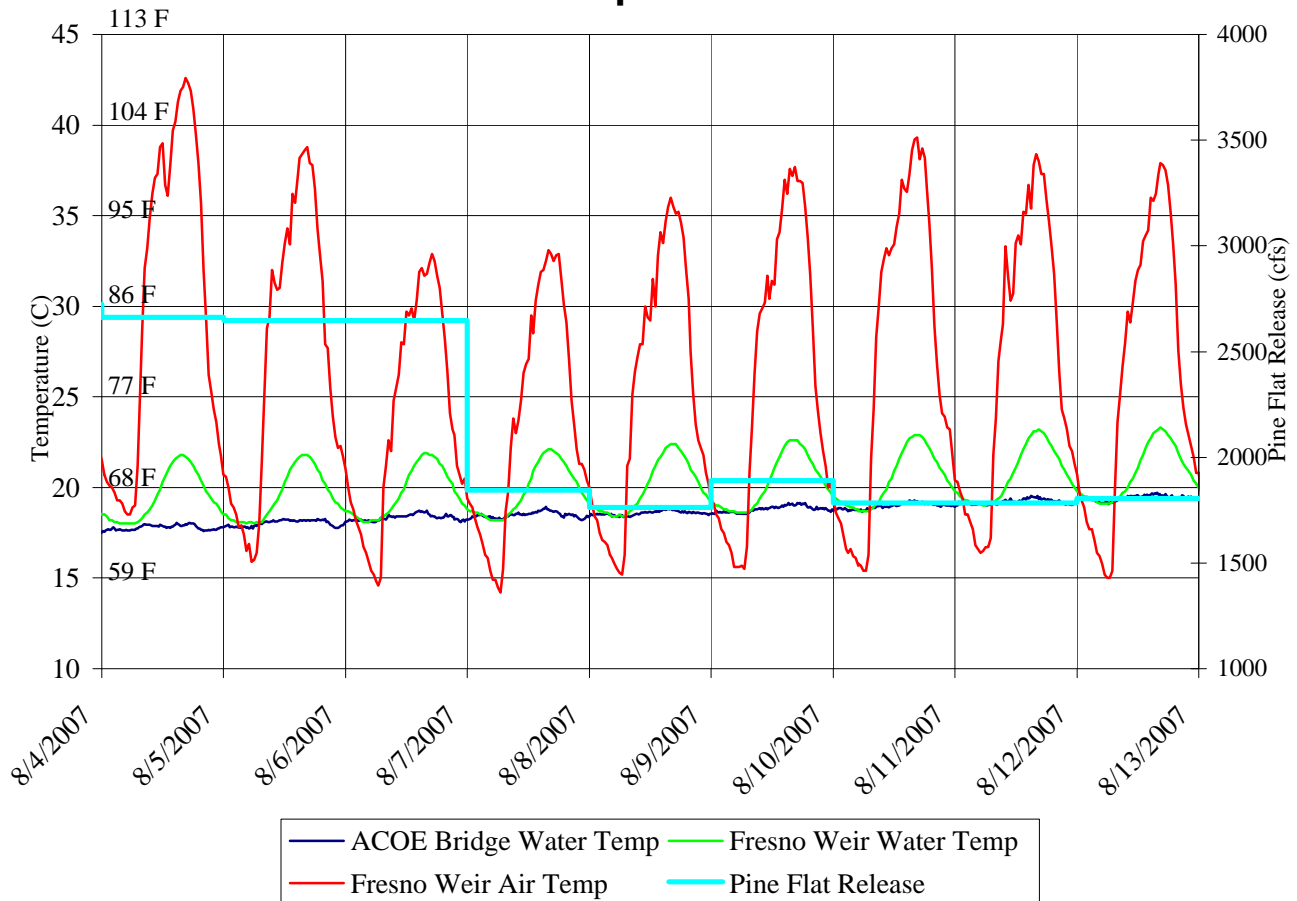
Provisional Data - Subject to Revision

8/13/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Mill & Hughes Creeks	0	NA	8/13/2007	KRWA
Piedra	1,752 cfs	100 cfs	8/13/2007	KRWA
Dennis Cut	100 cfs	5 cfs	8/13/2007	KRWA
At Fresno Weir	1,492 cfs	95 cfs	8/13/2007	KRWA
Over Fresno Weir	1,462 cfs	35 cfs	8/13/2007	KRWA

Pine Flat		Date		
Storage	222,775 af	8/13/2007	0700	ACOE
Elevation	768.32 ft	8/13/2007	0700	ACOE
Release	1,752 cfs	8/13/2007	0700	KRCD
Release Temperature	66.87 F	19.37 C	8/13/2007	0700
Avg. Fresno Weir Water Temp	69.42 F	20.79 C	8/13/2007	

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

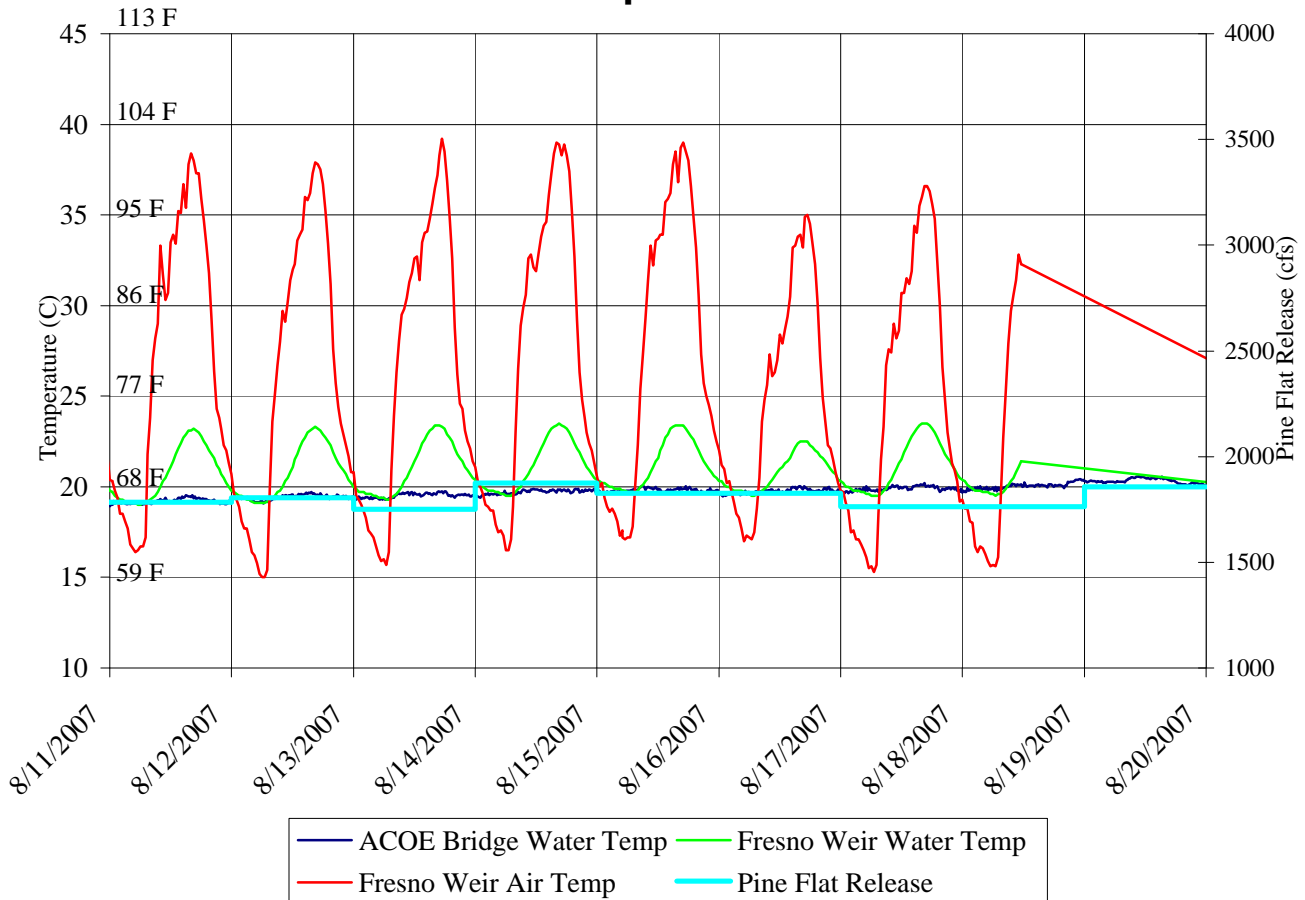
Provisional Data - Subject to Revision

8/20/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	143 cfs	NA cfs	8/20/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	8/20/2007	KRWA
Piedra	1,721 cfs	100 cfs	8/20/2007	KRWA
Dennis Cut	100 cfs	5 cfs	8/20/2007	KRWA
At Fresno Weir	1,451 cfs	95 cfs	8/20/2007	KRWA
Over Fresno Weir	1,421 cfs	35 cfs	8/20/2007	KRWA

Pine Flat			Date		
Storage	204,406 af		8/20/2007	0700	ACOE
Elevation	761.27 ft		8/20/2007	0700	ACOE
Release	1,721 cfs		8/20/2007	0700	KRCD
Release Temperature	68.9 F	20.5 C	8/20/2007	0700	KRCD
Avg. Fresno Weir Water Temp	70.9 F	21.6 C	8/20/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

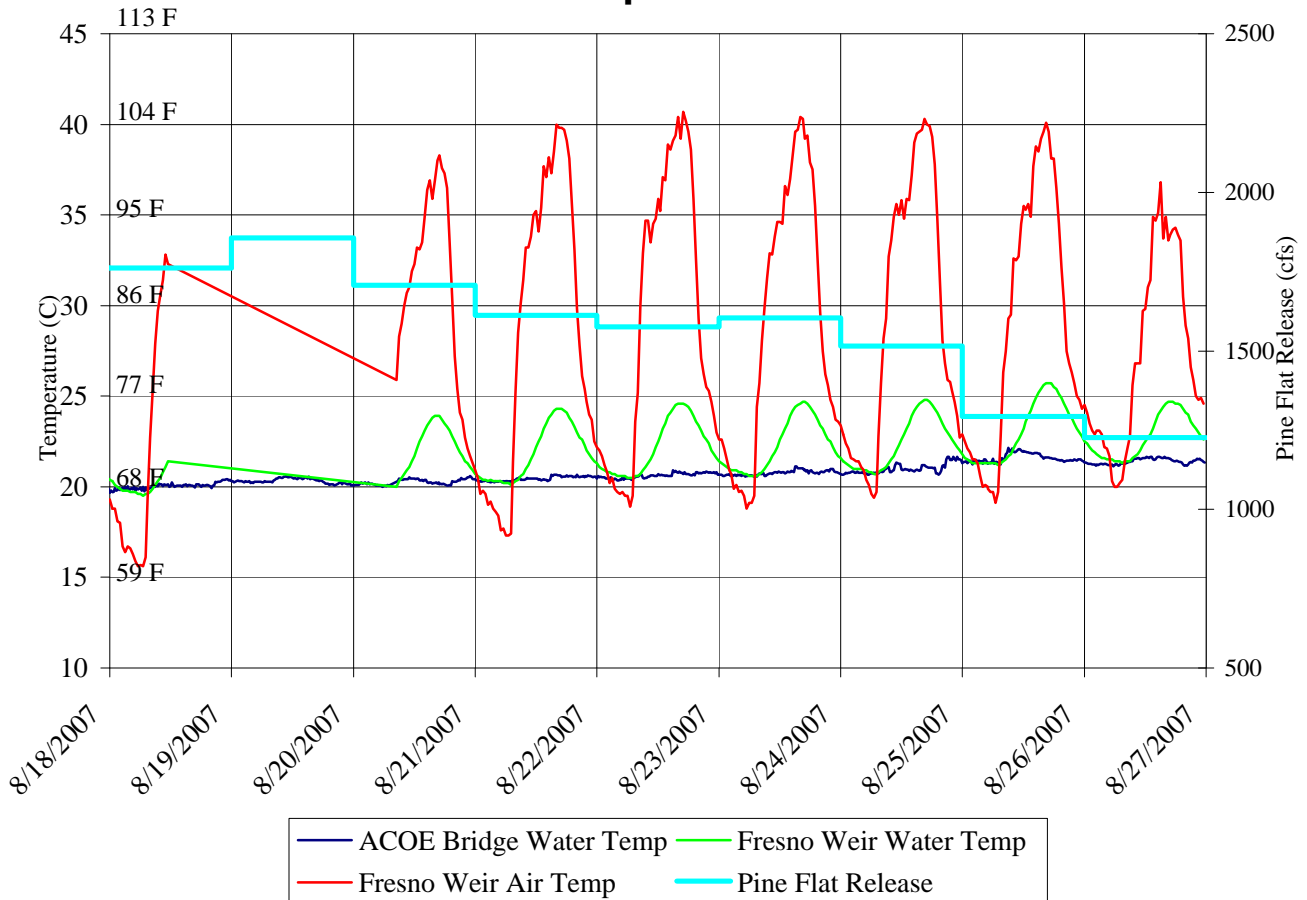
Provisional Data - Subject to Revision

8/27/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	119 cfs	NA cfs	8/27/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	8/27/2007	KRWA
Piedra	1,165 cfs	100 cfs	8/27/2007	KRWA
Dennis Cut	100 cfs	5 cfs	8/27/2007	KRWA
At Fresno Weir	895 cfs	95 cfs	8/27/2007	KRWA
Over Fresno Weir	865 cfs	35 cfs	8/27/2007	KRWA

Pine Flat			Date		
Storage	190,950 af		8/27/2007	0700	ACOE
Elevation	755.89 ft		8/27/2007	0700	ACOE
Release	1,165 cfs		8/27/2007	0700	KRCD
Release Temperature	70.2 F	21.2 C	8/27/2007	0700	KRCD
Avg. Fresno Weir Water Temp	73.0 F	22.8 C	8/27/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

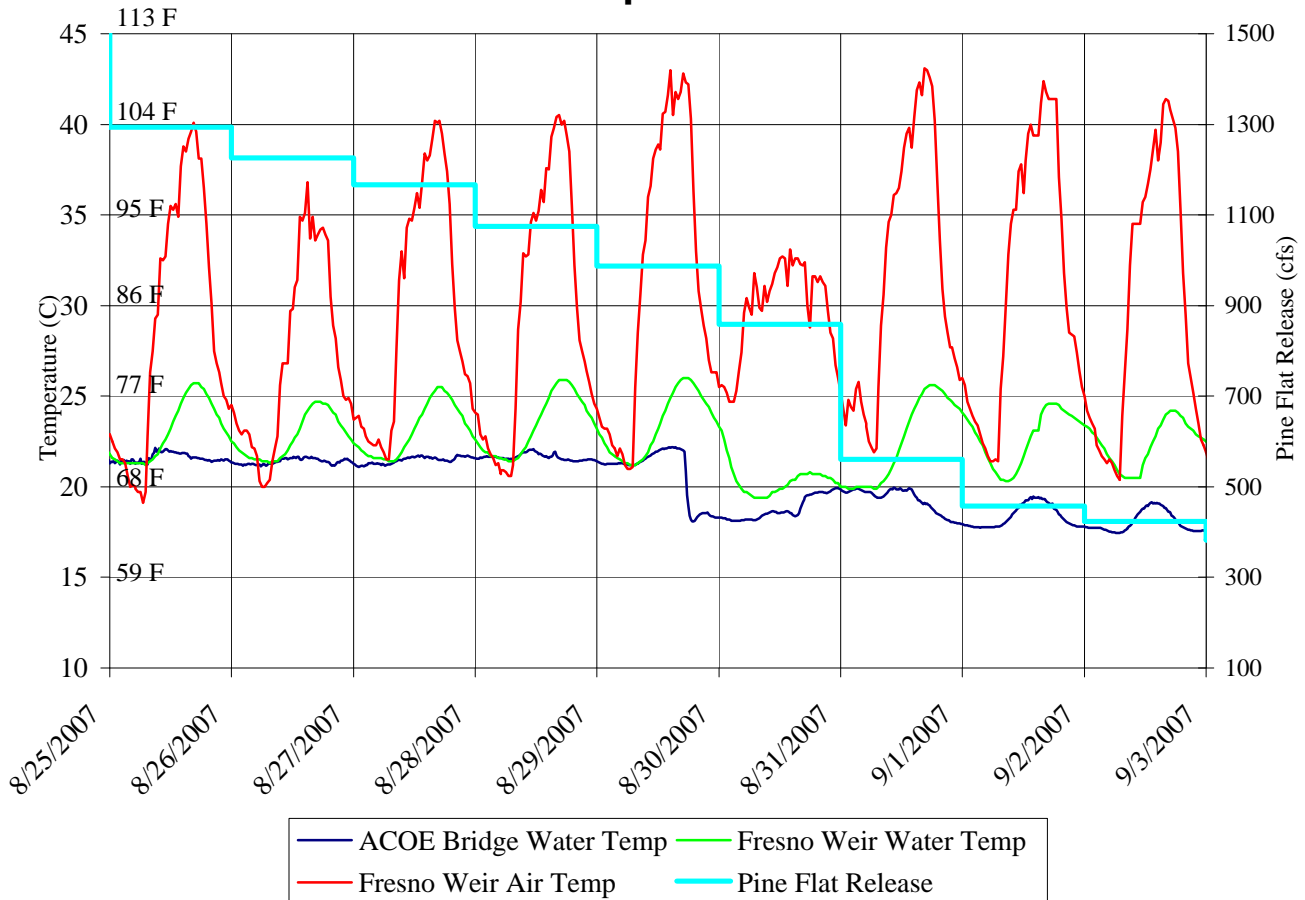
Provisional Data - Subject to Revision

9/4/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	250 cfs	NA cfs	9/3/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	9/3/2007	KRWA
Piedra	370 cfs	100 cfs	9/3/2007	KRWA
Dennis Cut	65 cfs	5 cfs	9/3/2007	KRWA
At Fresno Weir	185 cfs	95 cfs	9/3/2007	KRWA
Over Fresno Weir	130 cfs	35 cfs	9/3/2007	KRWA

Pine Flat			Date		
Storage	187,576 af		9/3/2007	0700	ACOE
Elevation	754.51 ft		9/3/2007	0700	ACOE
Release	370 cfs		9/3/2007	0700	KRCD
Release Temperature	62.6 F	17.0 C	9/3/2007	0700	KRCD
Avg. Fresno Weir Water Temp	70.9 F	21.6 C	9/3/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

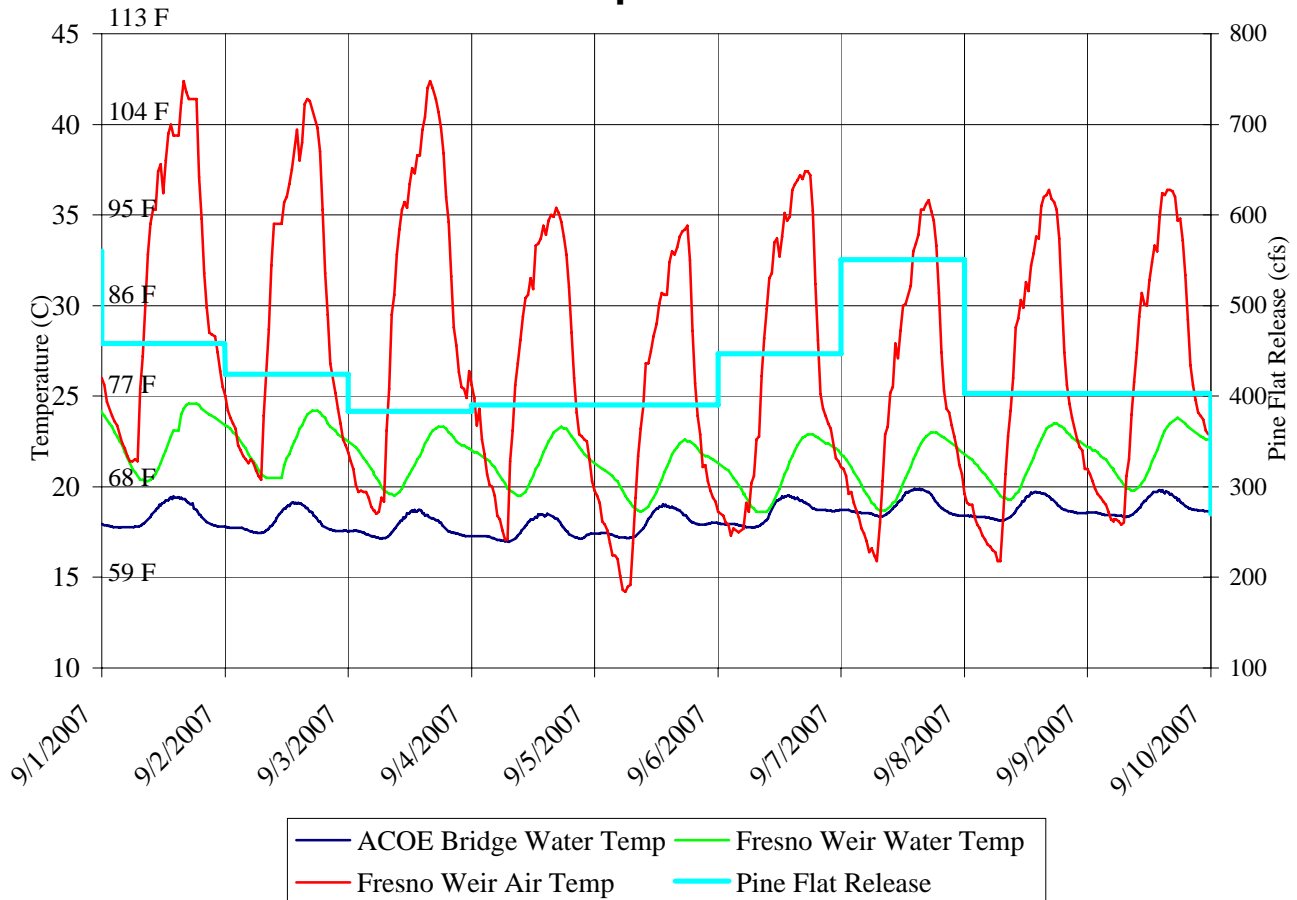
Provisional Data - Subject to Revision

9/10/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	191 cfs	NA cfs	9/10/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	9/10/2007	KRWA
Piedra	270 cfs	100 cfs	9/10/2007	KRWA
Dennis Cut	55 cfs	5 cfs	9/10/2007	KRWA
At Fresno Weir	120 cfs	95 cfs	9/10/2007	KRWA
Over Fresno Weir	60 cfs	35 cfs	9/10/2007	KRWA

Pine Flat			Date		
Storage	186,993 af		9/10/2007	0700	ACOE
Elevation	754.27 ft		9/10/2007	0700	ACOE
Release	270 cfs		9/10/2007	0700	KRCD
Release Temperature	63.5 F	17.5 C	9/10/2007	0700	KRCD
Avg. Fresno Weir Water Temp	71.2 F	21.8 C	9/10/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

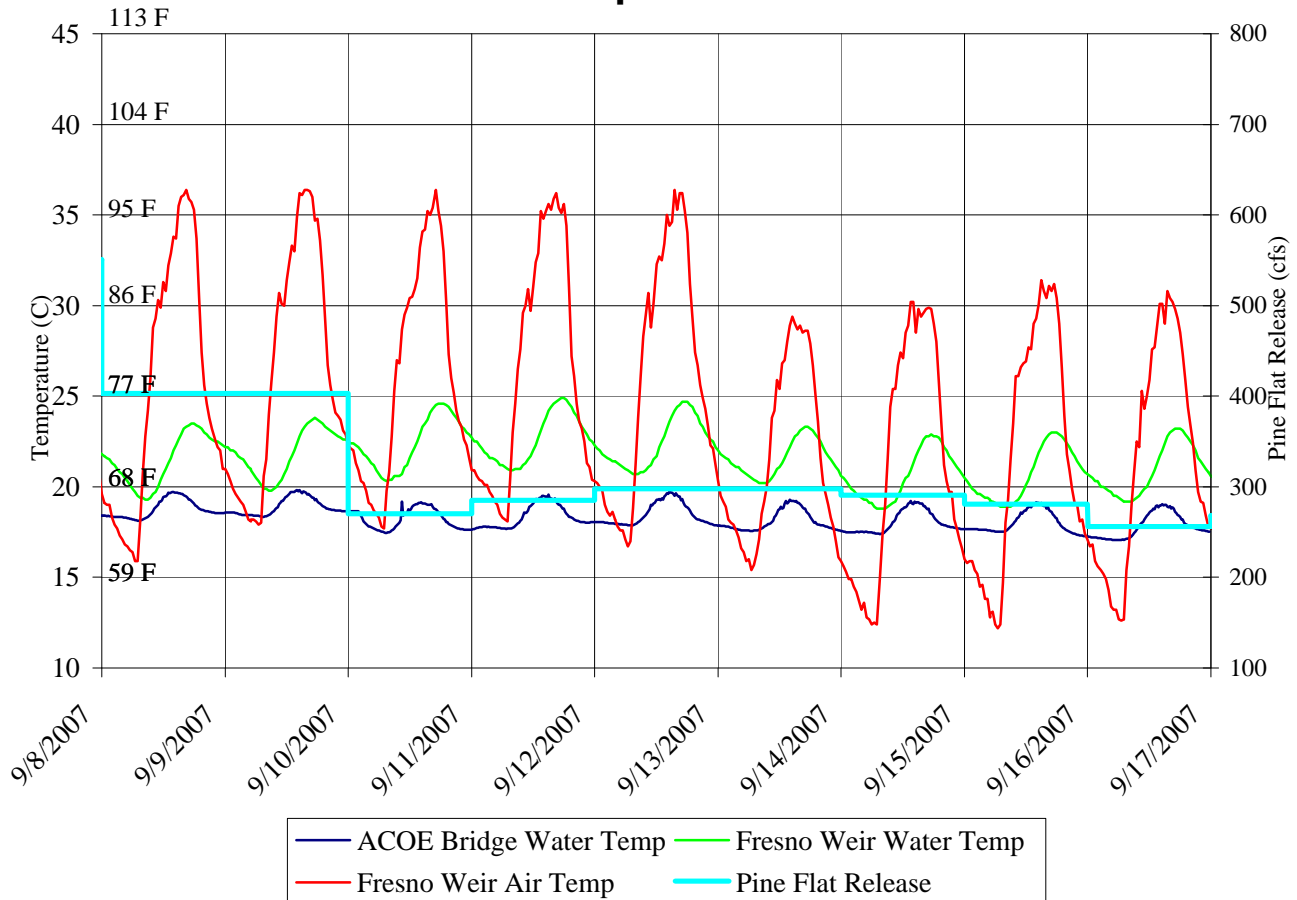
Provisional Data - Subject to Revision

9/17/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	157 cfs	NA cfs	9/17/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	9/17/2007	KRWA
Piedra	269 cfs	100 cfs	9/17/2007	KRWA
Dennis Cut	60 cfs	5 cfs	9/17/2007	KRWA
At Fresno Weir	104 cfs	95 cfs	9/17/2007	KRWA
Over Fresno Weir	54 cfs	35 cfs	9/17/2007	KRWA

Pine Flat			Date		
Storage	186,653 af		9/17/2007	0700	ACOE
Elevation	754.13 ft		9/17/2007	0700	ACOE
Release	269 cfs		9/17/2007	0700	KRCD
Release Temperature	63.3 F	17.4 C	9/17/2007	0700	KRCD
Avg. Fresno Weir Water Temp	69.3 F	20.7 C	9/17/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

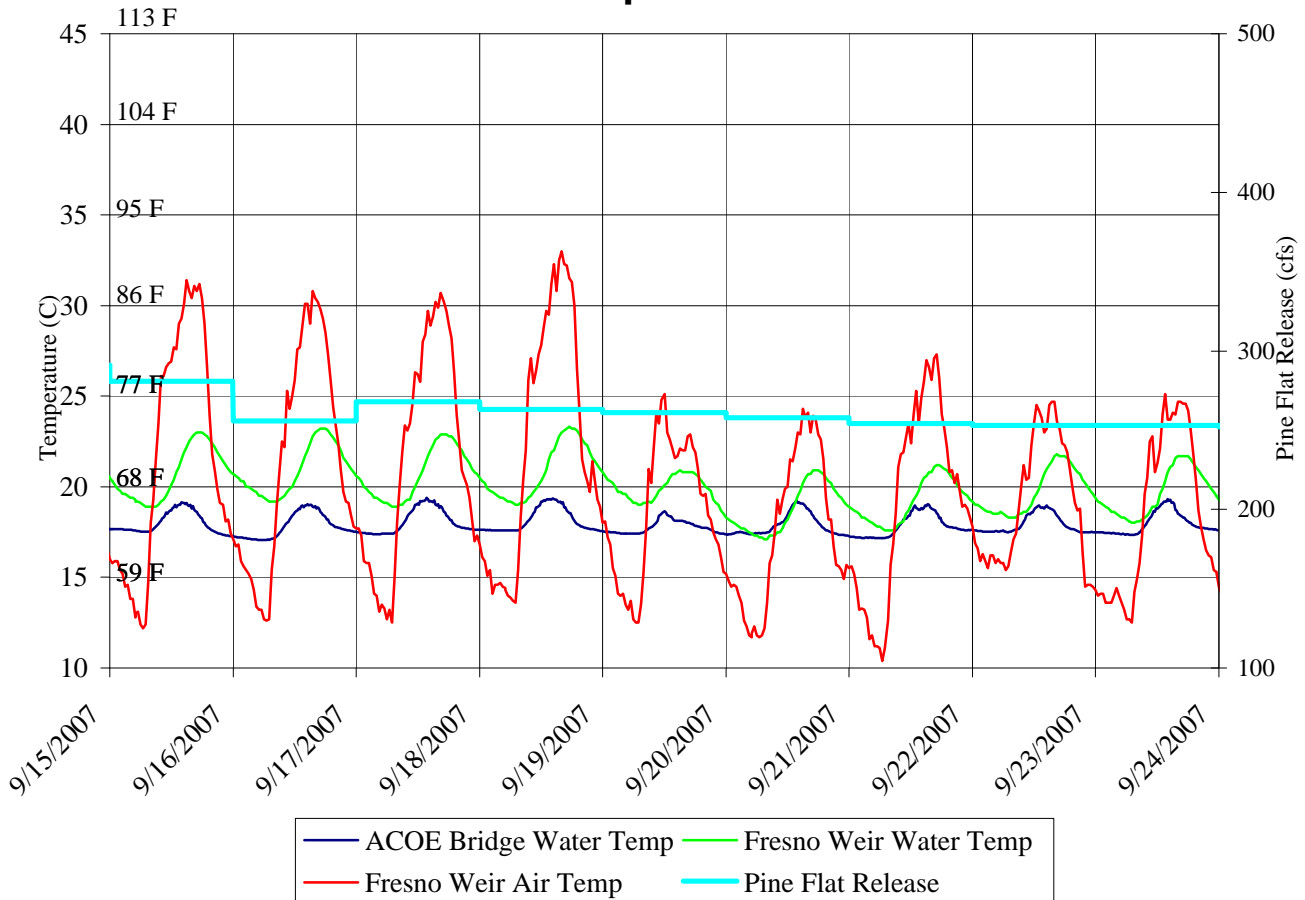
Provisional Data - Subject to Revision

9/24/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	210 cfs	NA cfs	9/24/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	9/24/2007	KRWA
Piedra	252 cfs	100 cfs	9/24/2007	KRWA
Dennis Cut	55 cfs	5 cfs	9/24/2007	KRWA
At Fresno Weir	102 cfs	95 cfs	9/24/2007	KRWA
Over Fresno Weir	47 cfs	35 cfs	9/24/2007	KRWA

Pine Flat			Date		
Storage	185,733 af		9/24/2007	0700	ACOE
Elevation	753.75 ft		9/24/2007	0700	ACOE
Release	252 cfs		9/24/2007	0700	KRCD
Release Temperature	63.5 F	17.5 C	9/24/2007	0700	KRCD
Avg. Fresno Weir Water Temp	67.6 F	19.8 C	9/24/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

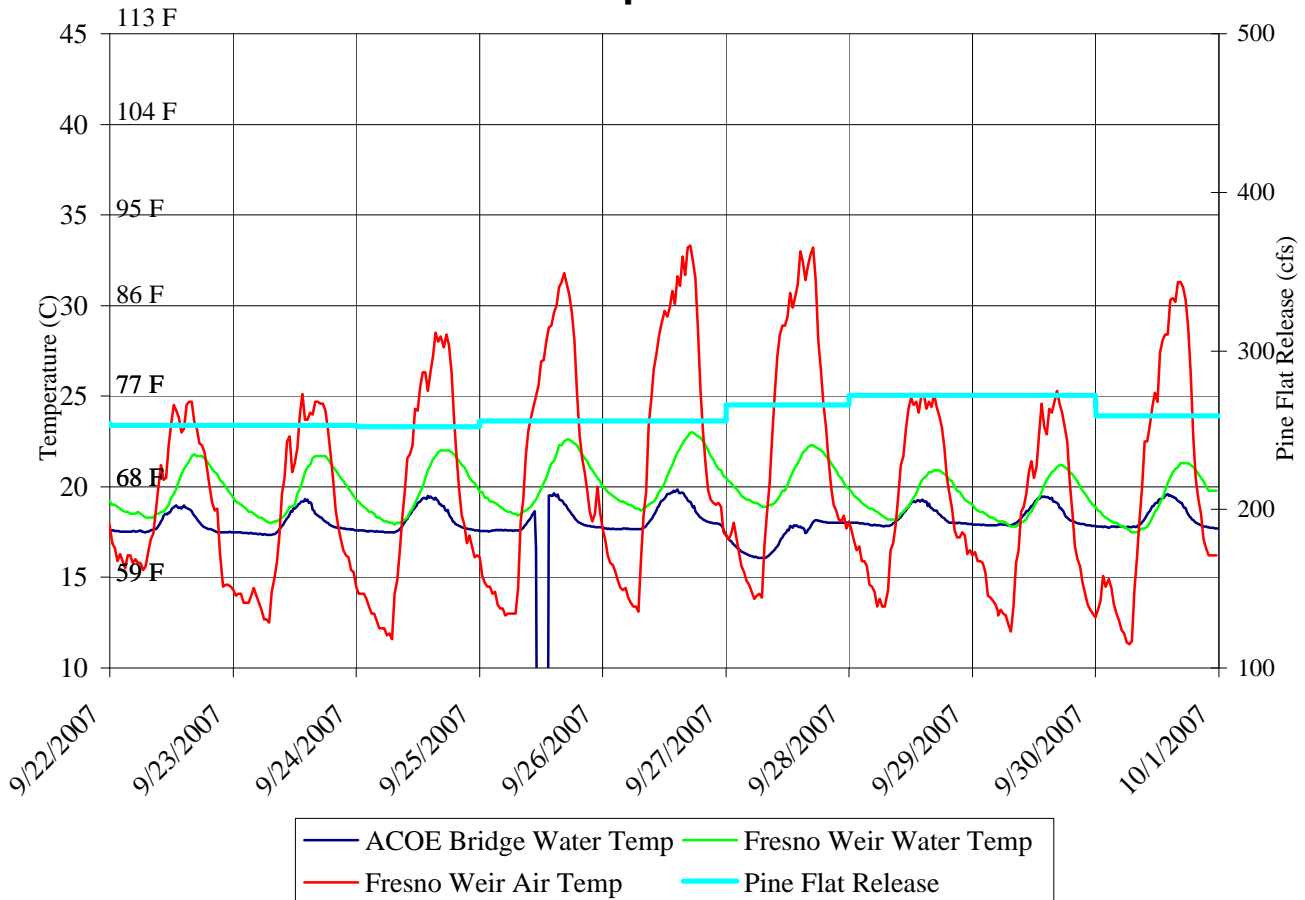
Provisional Data - Subject to Revision

10/1/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	170 cfs	NA cfs	10/1/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	10/1/2007	KRWA
Piedra	219 cfs	100 cfs	10/1/2007	KRWA
Dennis Cut	50 cfs	5 cfs	10/1/2007	KRWA
At Fresno Weir	104 cfs	95 cfs	10/1/2007	KRWA
Over Fresno Weir	49 cfs	35 cfs	10/1/2007	KRWA

Pine Flat			Date		
Storage	185,418 af		10/1/2007	0700	ACOE
Elevation	753.62 ft		10/1/2007	0700	ACOE
Release	219 cfs		10/1/2007	0700	KRCD
Release Temperature	63.1 F	17.3 C	10/1/2007	0700	KRCD
Avg. Fresno Weir Water Temp	66.6 F	19.2 C	10/1/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

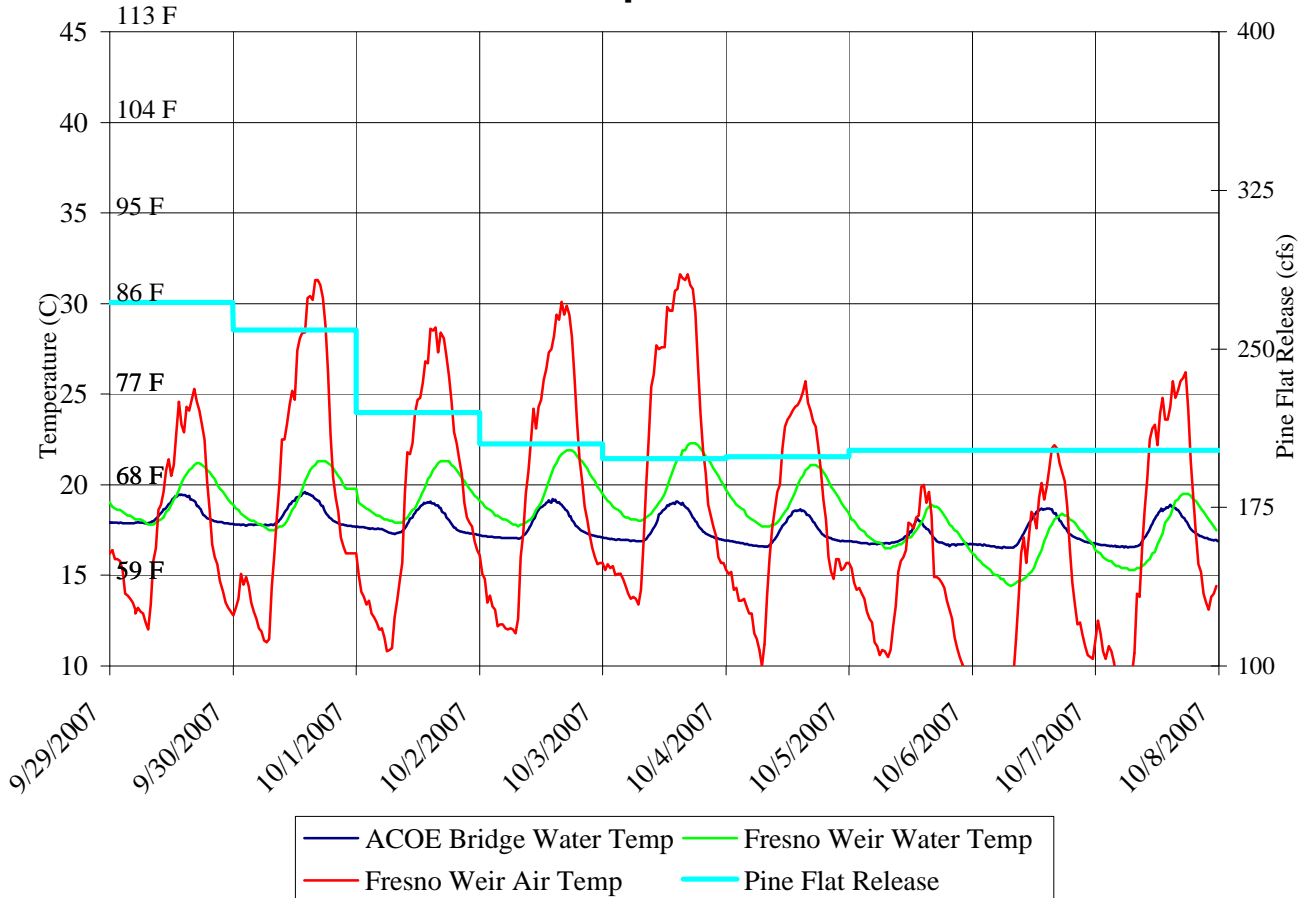
Provisional Data - Subject to Revision

10/8/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	178 cfs	NA cfs	10/8/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	10/8/2007	KRWA
Piedra	201 cfs	100 cfs	10/8/2007	KRWA
Dennis Cut	55 cfs	5 cfs	10/8/2007	KRWA
At Fresno Weir	96 cfs	95 cfs	10/8/2007	KRWA
Over Fresno Weir	41 cfs	40 cfs	10/8/2007	KRWA

Pine Flat			Date		
Storage	186,435 af		10/8/2007	0700	ACOE
Elevation	754.04 ft		10/8/2007	0700	ACOE
Release	201 cfs		10/8/2007	0700	KRCD
Release Temperature	61.9 F	16.6 C	10/8/2007	0700	KRCD
Avg. Fresno Weir Water Temp	62.8 F	17.1 C	10/8/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

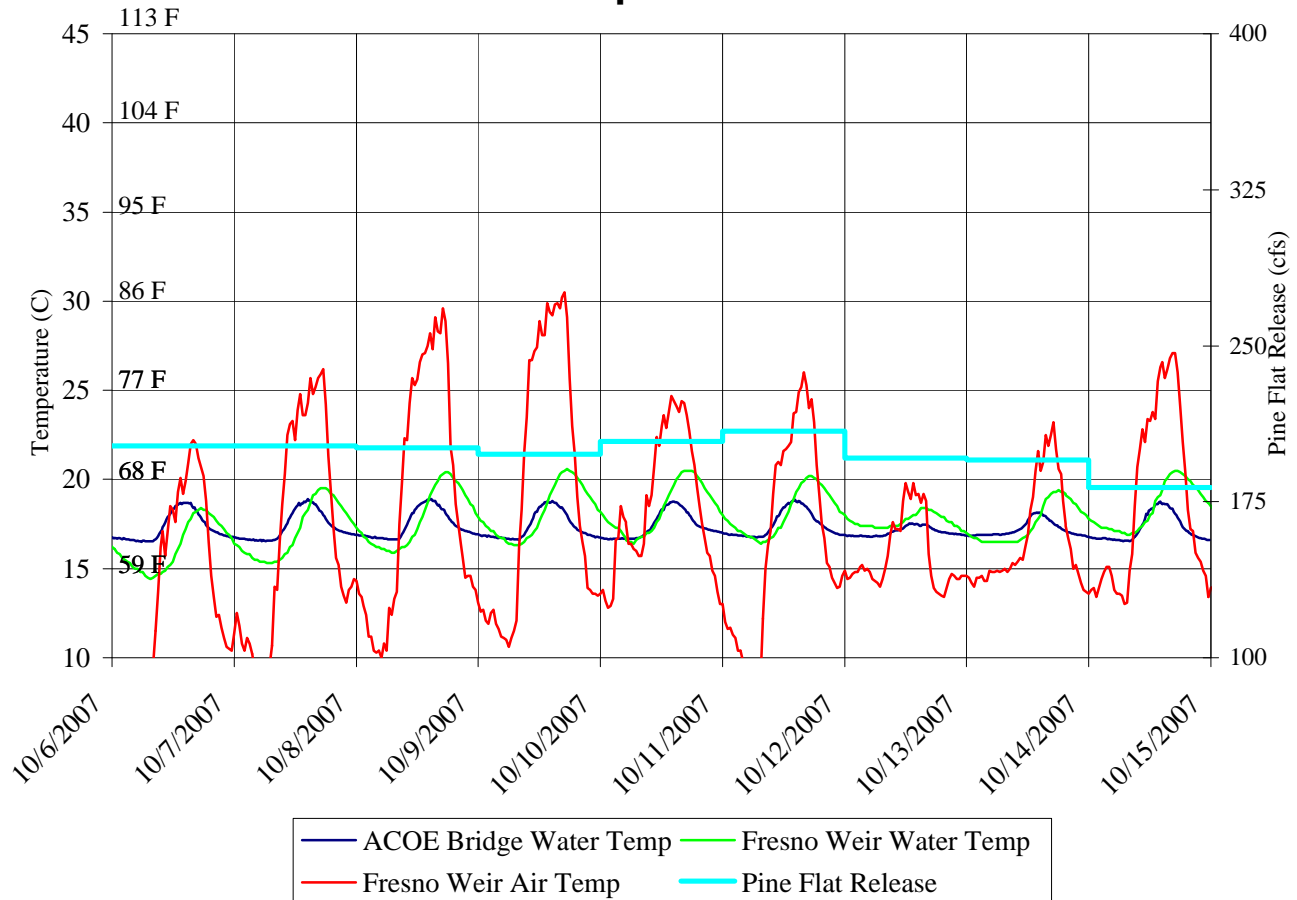
Provisional Data - Subject to Revision

10/15/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	197 cfs	NA cfs	10/15/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	10/15/2007	KRWA
Piedra	170 cfs	100 cfs	10/15/2007	KRWA
Dennis Cut	25 cfs	5 cfs	10/15/2007	KRWA
At Fresno Weir	95 cfs	95 cfs	10/15/2007	KRWA
Over Fresno Weir	40 cfs	40 cfs	10/15/2007	KRWA

Pine Flat			Date		
Storage	187,212 af		10/15/2007	0700	ACOE
Elevation	754.37 ft		10/15/2007	0700	ACOE
Release	170 cfs		10/15/2007	0700	KRCD
Release Temperature	61.3 F	16.3 C	10/15/2007	0700	KRCD
Avg. Fresno Weir Water Temp	64.6 F	18.1 C	10/15/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

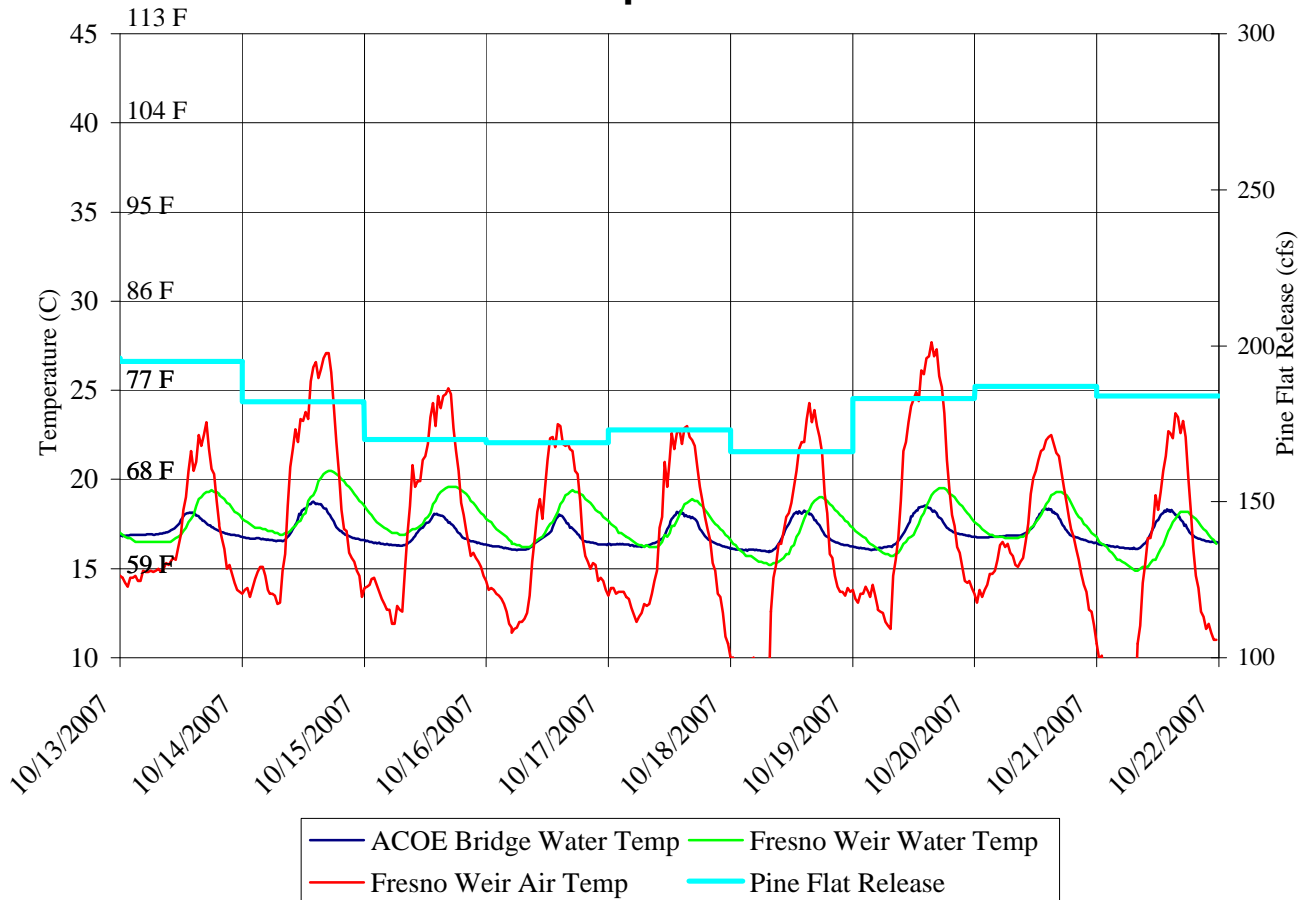
Provisional Data - Subject to Revision

10/22/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	176 cfs	NA cfs	10/22/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	10/22/2007	KRWA
Piedra	184 cfs	100 cfs	10/22/2007	KRWA
Dennis Cut	15 cfs	5 cfs	10/22/2007	KRWA
At Fresno Weir	99 cfs	95 cfs	10/22/2007	KRWA
Over Fresno Weir	44 cfs	40 cfs	10/22/2007	KRWA

Pine Flat			Date		
Storage	187,893 af		10/22/2007	0700	ACOE
Elevation	754.64 ft		10/22/2007	0700	ACOE
Release	184 cfs		10/22/2007	0700	KRCD
Release Temperature	61.2 F	16.2 C	10/22/2007	0700	KRCD
Avg. Fresno Weir Water Temp	61.5 F	16.4 C	10/22/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

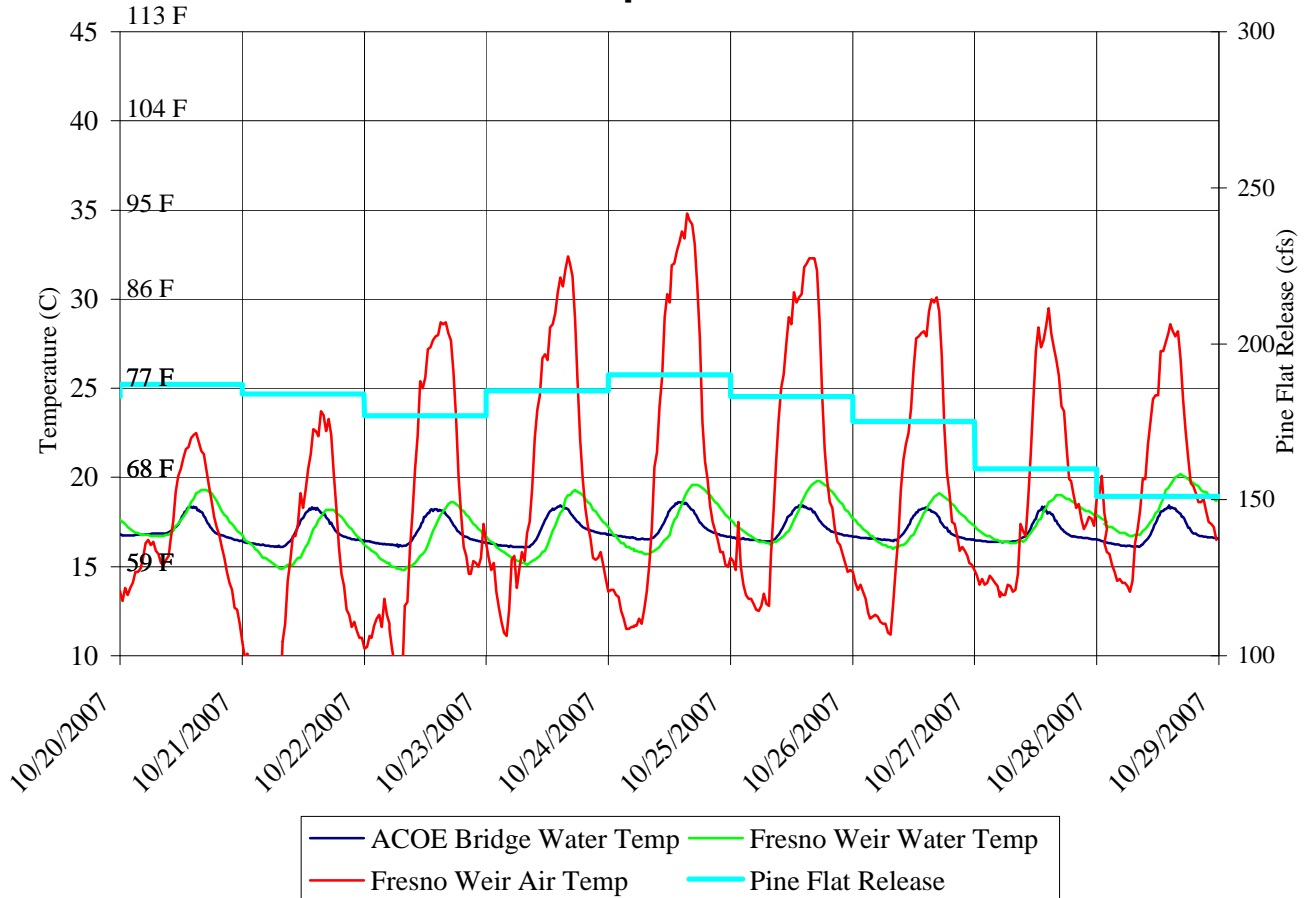
Provisional Data - Subject to Revision

10/29/2007

Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	156 cfs	NA cfs	10/29/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	10/29/2007	KRWA
Piedra	151 cfs	100 cfs	10/29/2007	KRWA
Dennis Cut	5 cfs	5 cfs	10/29/2007	KRWA
At Fresno Weir	101 cfs	95 cfs	10/29/2007	KRWA
Over Fresno Weir	51 cfs	40 cfs	10/29/2007	KRWA

Pine Flat			Date		
Storage	189,309 af		10/29/2007	0700	ACOE
Elevation	755.22 ft		10/29/2007	0700	ACOE
Release	151 cfs		10/29/2007	0700	KRCD
Release Temperature	61.3 F	16.3 C	10/29/2007	0700	KRCD
Avg. Fresno Weir Water Temp	64.9 F	18.3 C	10/29/2007		

Flow and Temperature Trends



Kings River Fisheries Management Program Hydrologic and Climatic Summary Report

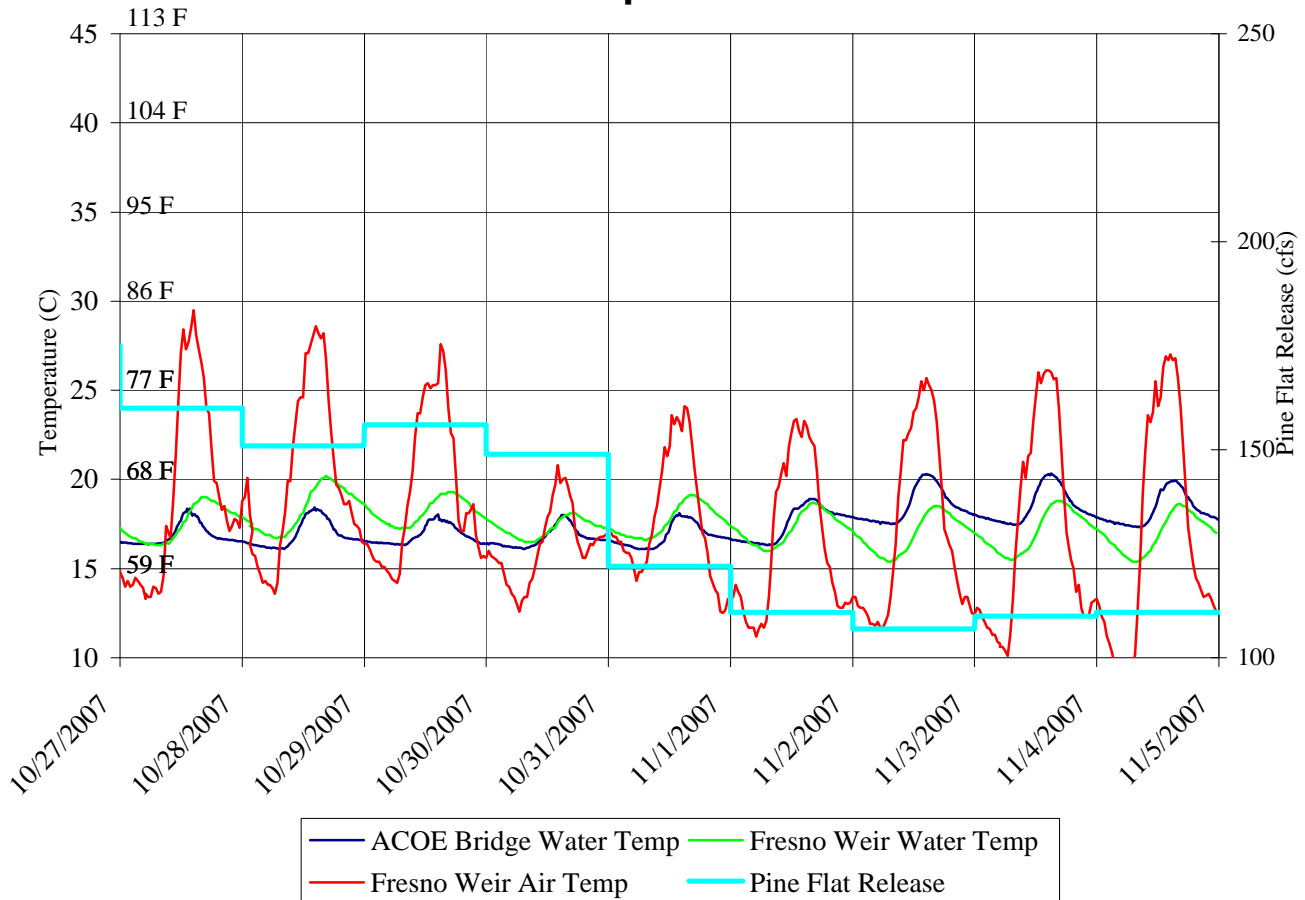
Provisional Data - Subject to Revision

11/5/2007

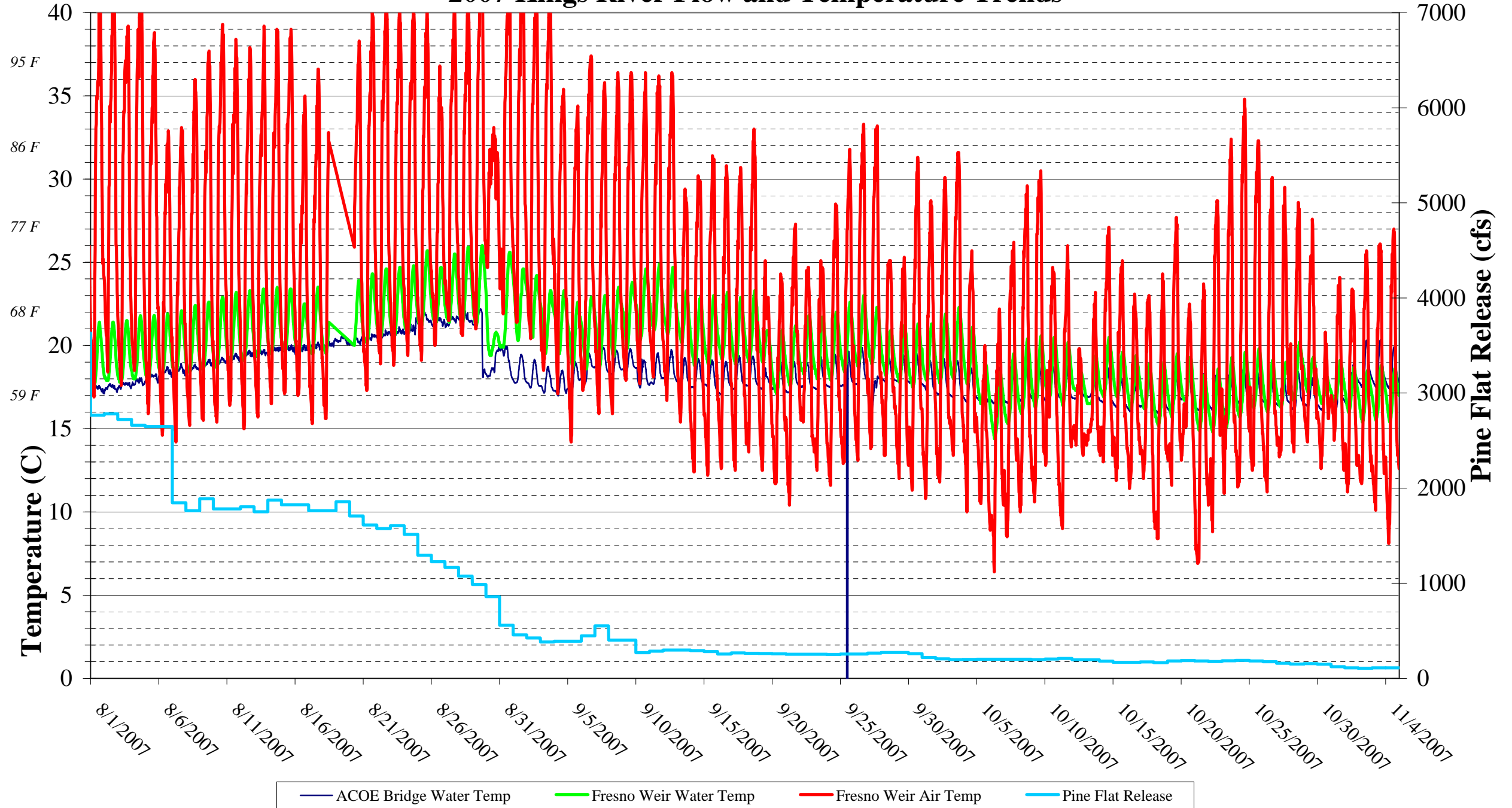
Flow Rates	Actual	Exhibit "C" Criteria	Date	
Kings River Below North Fork	169 cfs	NA cfs	11/5/2007	ACOE
Mill & Hughes Creeks	0 cfs	NA cfs	11/5/2007	KRWA
Piedra	111 cfs	100 cfs	11/5/2007	KRWA
Dennis Cut	5 cfs	5 cfs	11/5/2007	KRWA
At Fresno Weir	96 cfs	95 cfs	11/5/2007	KRWA
Over Fresno Weir	86 cfs	40 cfs	11/5/2007	KRWA

Pine Flat			Date		
Storage	191,884 af		11/5/2007	0700	ACOE
Elevation	756.27 ft		11/5/2007	0700	ACOE
Release	111 cfs		11/5/2007	0700	KRCD
Release Temperature	63.1 F	17.3 C	11/5/2007	0700	KRCD
Avg. Fresno Weir Water Temp	62.6 F	17.0 C	11/5/2007		

Flow and Temperature Trends



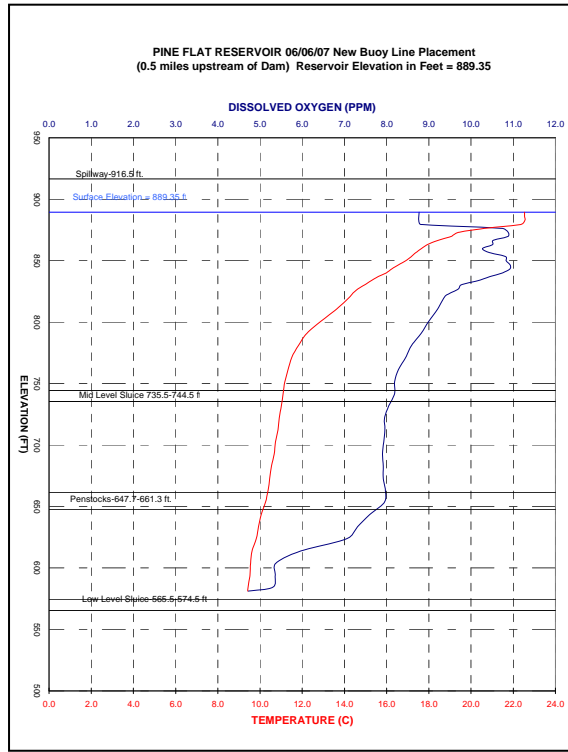
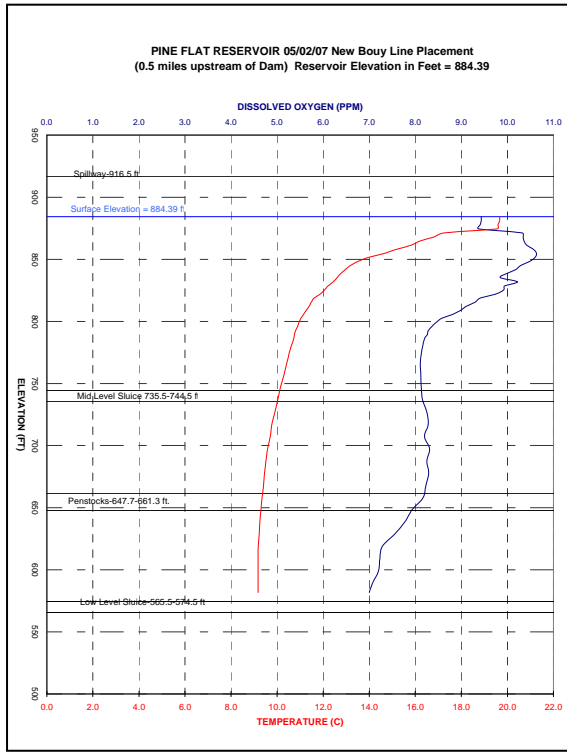
2007 Kings River Flow and Temperature Trends

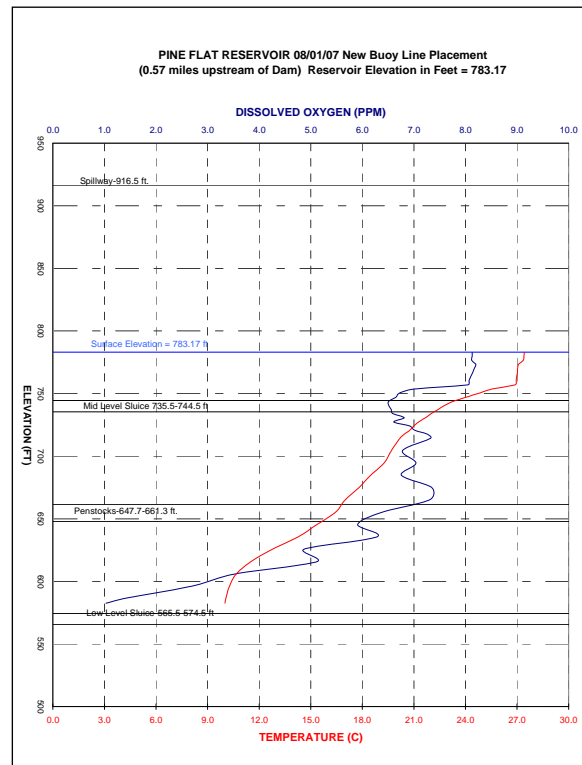
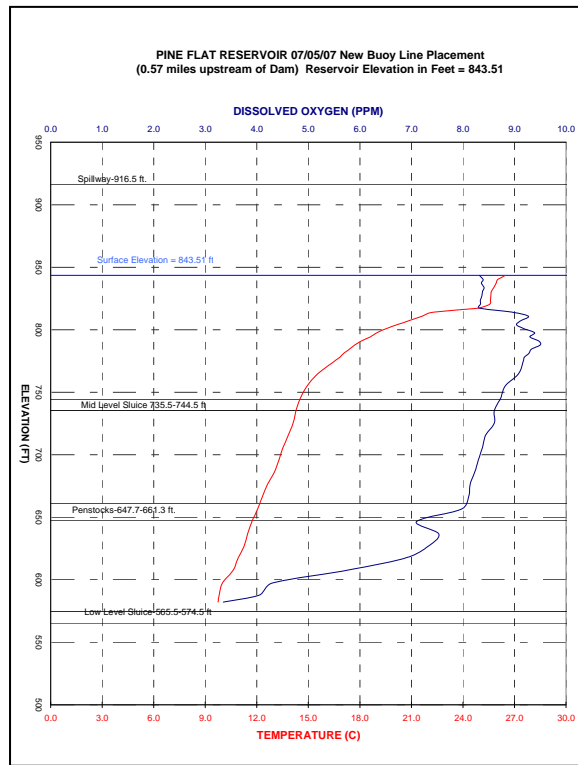


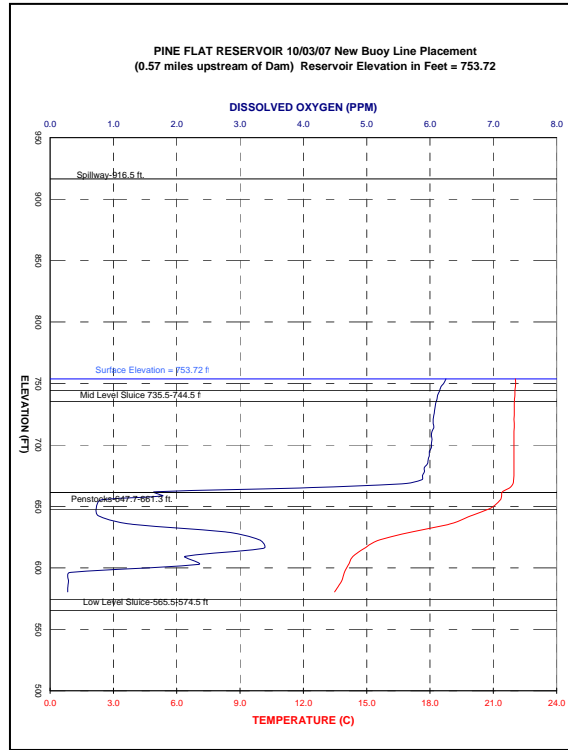
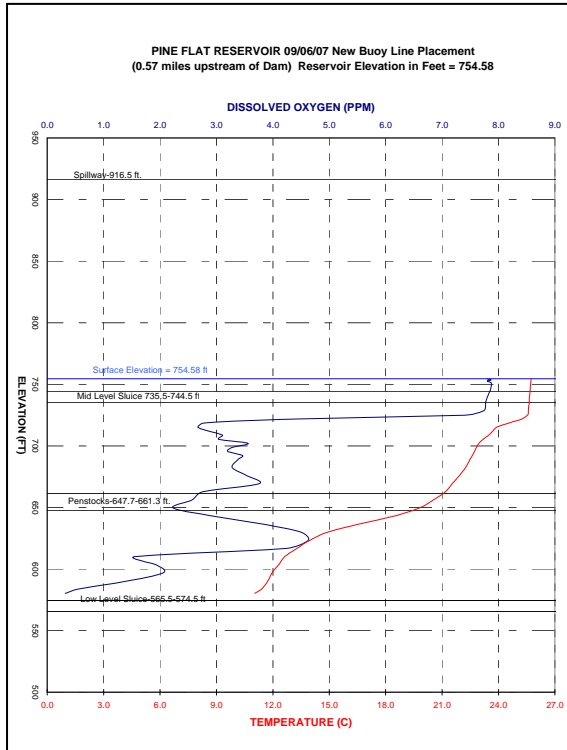
— ACOE Bridge Water Temp — Fresno Weir Water Temp — Fresno Weir Air Temp — Pine Flat Release

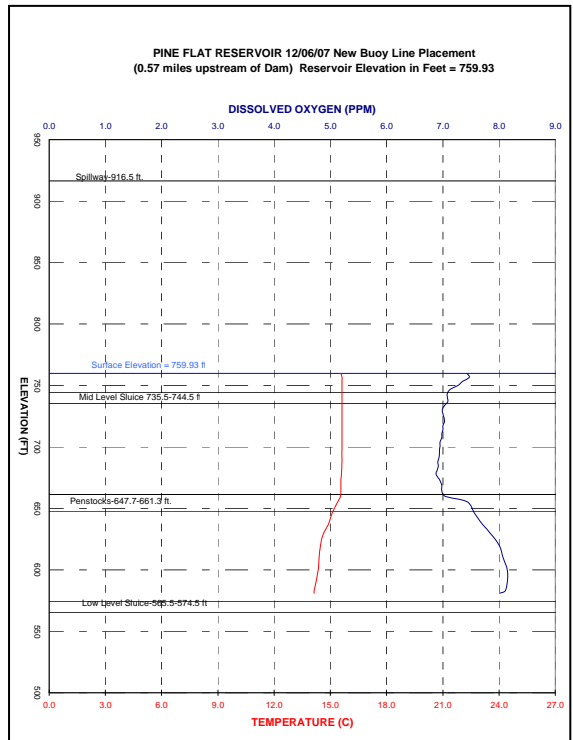
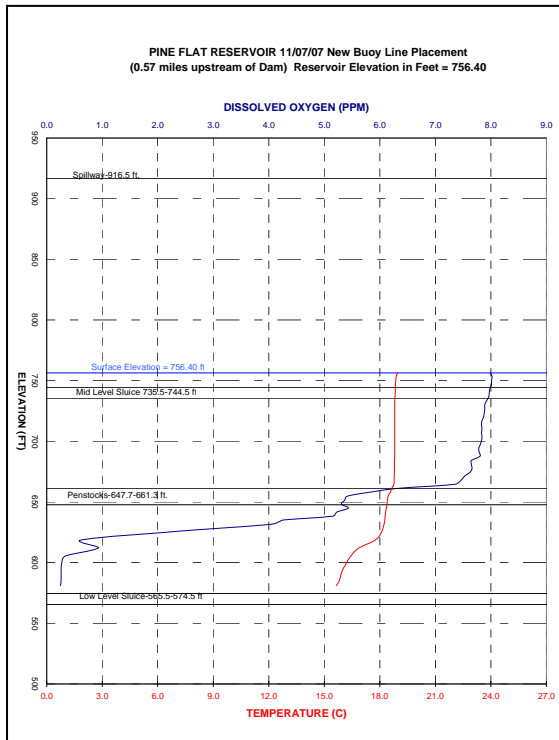
APPENDIX C

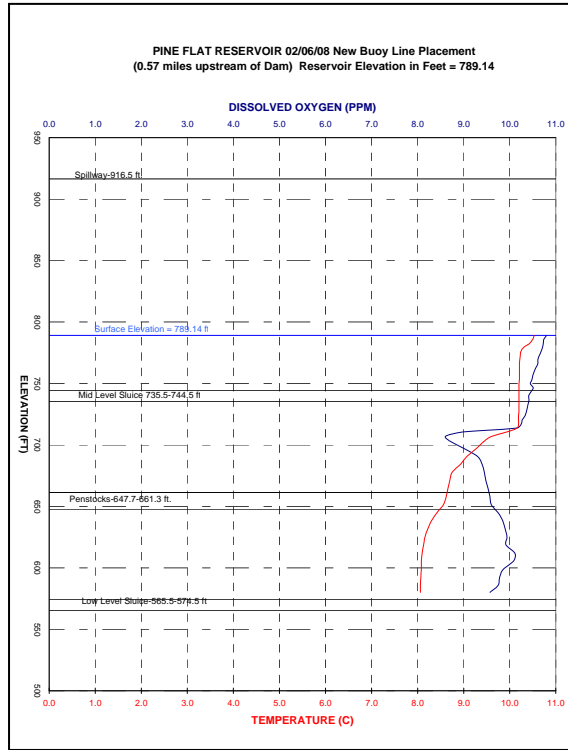
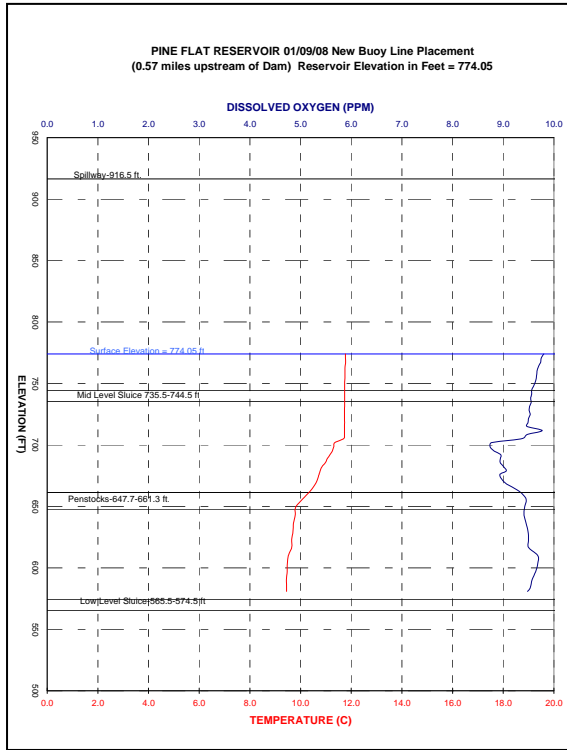
Pine Flat Reservoir Temperature and Dissolved Oxygen Profiles from May 2007 through
May 2008 (on following pages)

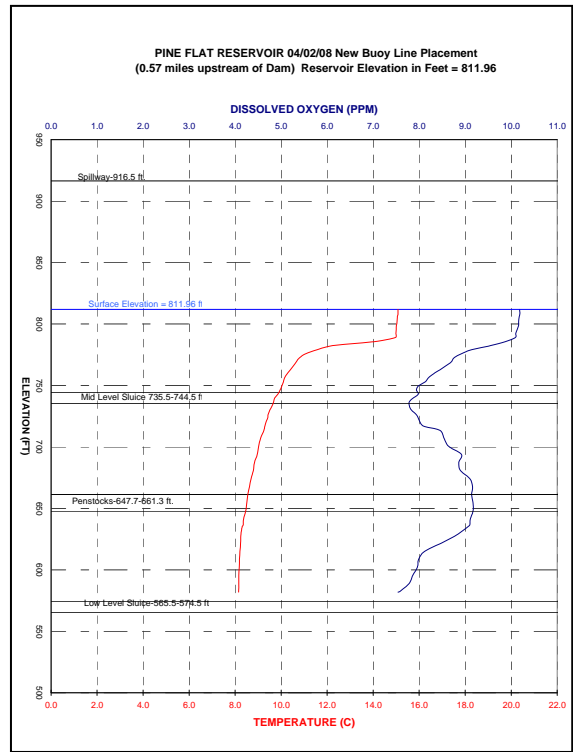
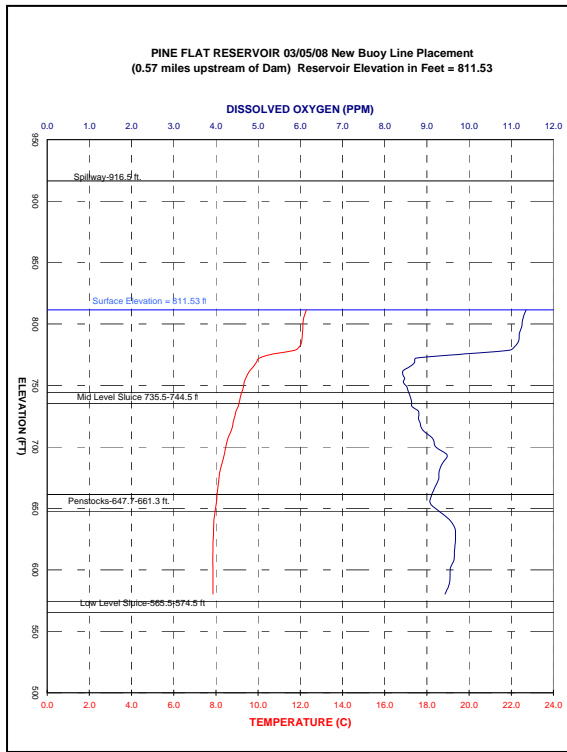


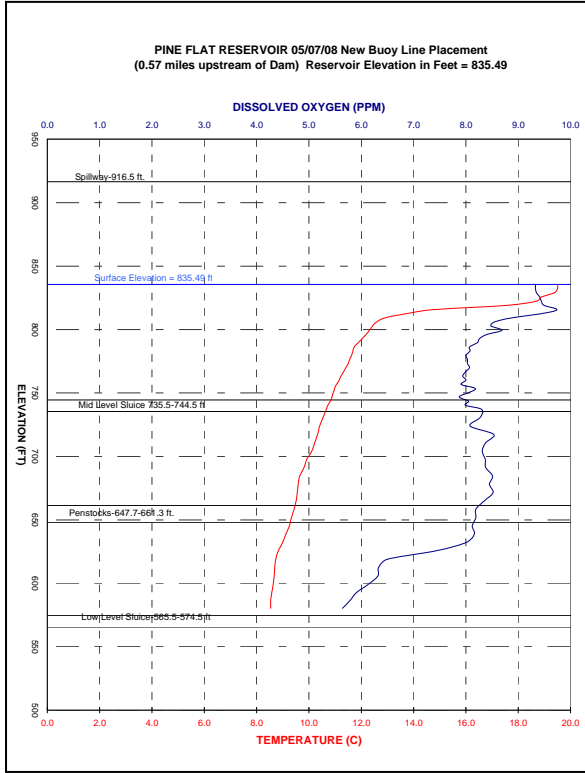












APPENDIX D

Results of Water Temperature Monitoring at Gould Weir
(on following page)

**KINGS RIVER WATER TEMPERATURE
Gould Weir
May 2007 - May 2008**

