KINGS RIVER FISHERIES MANAGEMENT PROGRAM
ANNUAL TECHNICAL REPORT
2010-2011

Kings River
FISHERIES MANAGEMENT PROGRAM

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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 eleven years in response to the Kings River Fisheries Management Program (FMP) Framework Agreement, which was approved on May 28, 1999, and the financial commitment extended for another ten year period on June 26, 2009. 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 2010 and May 2011 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.

Hydrologic conditions and Pine Flat Reservoir operations and flows within the lower river during 2010-2011 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 2010 through May 2011 demonstrated **100% compliance** with the instream flow requirements as outlined in the Framework Agreement, with the majority of days greatly exceeding these minimum flow requirements;

- 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 an above-average hydrologic year of the Exhibit D flow schedule (135 cfs at Fresno Weir, for a water year greater than **1,555,000** acre feet, but less than **2,100,000** acre feet);

- Results of daily flow measurements at Fresno Weir from June 2010 through May 2011 resulted in 14 days in which flows did not reach the 135 cfs target at Fresno Weir as outlined in the Framework Agreement. All 14 days were a result of contributions from Mill and Hughes Creeks during storm events, and electrofishing

efforts;

- During the late summer and fall of 2010, the Turbine Bypass was not utilized for temperature and dissolved oxygen management purposes, due to the large amount of carryover storage from the previous wet year, resulting in significant amounts of cold, oxygen rich water in the reservoir. The turbine bypass traditionally 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;

- Exhibit D flows at a rate of 250 cfs (level representing a hydrologic year greater than 2,100,000 AF) at Fresno Weir are expected to be released during the fall and winter of 2011. These flows have been triggered by the estimated 193% WY for the 2010-2011 season. The KRWA Member Units are anticipated to voluntarily provide the Exhibit D flows in the coming water-year (2011-2012);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 2010-2011 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 2010-2011 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 2010-2011; and

- Results of the 2010-2011 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 2010-2011 by the following actions:

- Applied for Streambed Alteration (1600) Permit and CEQA Permit to complete construction of the Large Woody Debris Pilot Study; and

- Received Letter of Permission as part of the FMP's 404 Permit from USACE;

The stocking of fish in State waters is the responsibility of the California Department of Fish and Game. During the 2010-2011 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 2010-2011 reporting period. Catchable size rainbow trout were also planted in Pine Flat Reservoir and Avocado Lake. A brief summary of 2010-2011 stocking includes:

- Whitlock Vibert Boxes (WVB) were used during this reporting period to hatch eyed rainbow trout eggs, inside the streamside incubators, using eggs purchased through Troutlodge Inc.;

- These incubators were stocked with 150,000 eyed rainbow trout eggs purchased from Troutlodge Inc. in December of 2010, and again in March of 2011 with 150,000 eggs during the 2010-2011 program year. Unfortunately, triploid eggs were unavailable

for purchase due to a shortage of the product, thereby halting the Incubator Effectiveness Study for the 2010-2011 program year. The eggs for the 2011-2012 program year will be triploid to help continue the Incubator Effectiveness Study.

- On December 8, 2010 and December 14, 2010 a total of 26,720 sub-catchable rainbow trout (2,200 pounds) 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;
- Stocking of regular fingerling allotments were delayed during this period and therefore were classified as sub-catchable size class at time of stocking.
- A total of 18,520 pounds of catchable sized trout (32,366 fish) were stocked in the lower Kings River during this reporting period.
- A total of 12,200 pounds (7,226 fish) of super catchable trout were stocked in the lower Kings River during this reporting period.
- No Kokanee Salmon were stocked in Pine Flat Reservoir during the 2010-2011 program year.
- The CDFG San Joaquin hatchery personnel stocked a total of 137,632 fingerling rainbow trout (736 pounds) on February 25, 2011 in Pine Flat Reservoir.
- No sub-catchable trout were planted in Pine Flat Reservoir during the reporting period;
- Between November 15, 2010 and April 13, 2011, 27,500 pounds (44,940 fish) of catchable-sized rainbow trout were planted in Pine Flat Reservoir.
- The CDFG San Joaquin Hatchery stocked a total of 2,500 pounds (1,289 fish) of super catchable trout in the Pine Flat Reservoir.
- CDFG stocked 75,020 Chinook salmon fingerlings (682 pounds) in Pine Flat Reservoir on April 23, 2011.
- In 2010-2011 reporting period, the San Joaquin Hatchery planted 6,300 pounds (9,908 fish) of catchable size rainbow trout and 1,000 pounds (510 fish) of super catchable 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 2010-2011 monitoring program have shown:

- The FMP continues to monitor trout and non-game fish populations downstream of Pine Flat Dam; and

- The eighth Annual Technical Report was released in June 2010.

Public education and outreach activities during 2010-2011 included:

- KRWA has developed a real-time telemetry system for monitoring water temperature and streamflow at Fresno Weir. Typically, during the summer and fall of dry hydrologic years, information developed from monitoring being conducted on the lower Kings River is 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 are typically 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. During the 2010-2011 program year, due to the wet hydrologic cycle resulting in a large amount of carryover water that was very cold and rich with dissolved oxygen, these reports were not issued;

- Due to the high flows during the spring on the Kings River, the 2011 Kings River Day event was cancelled. This event is traditionally held on an annual basis to provide valuable historical, operational, scientific and recreational opportunities to hundreds of 6th graders. 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. It is anticipated this event will be held again during the 2011-2012 program year; and

- Local groups of fisherman worked established a contract with the California Department of Fish and Game's Enforcement branch to commit additional funds for Directed Enforcement Actions targeting the Kings River Fisheries Management Zone during the 2010-2011 program year. It is the hope of the fisherman that these funds will help Fish and Game personnel in curtailing 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.

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 eleven 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 2010 and May 2011 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.

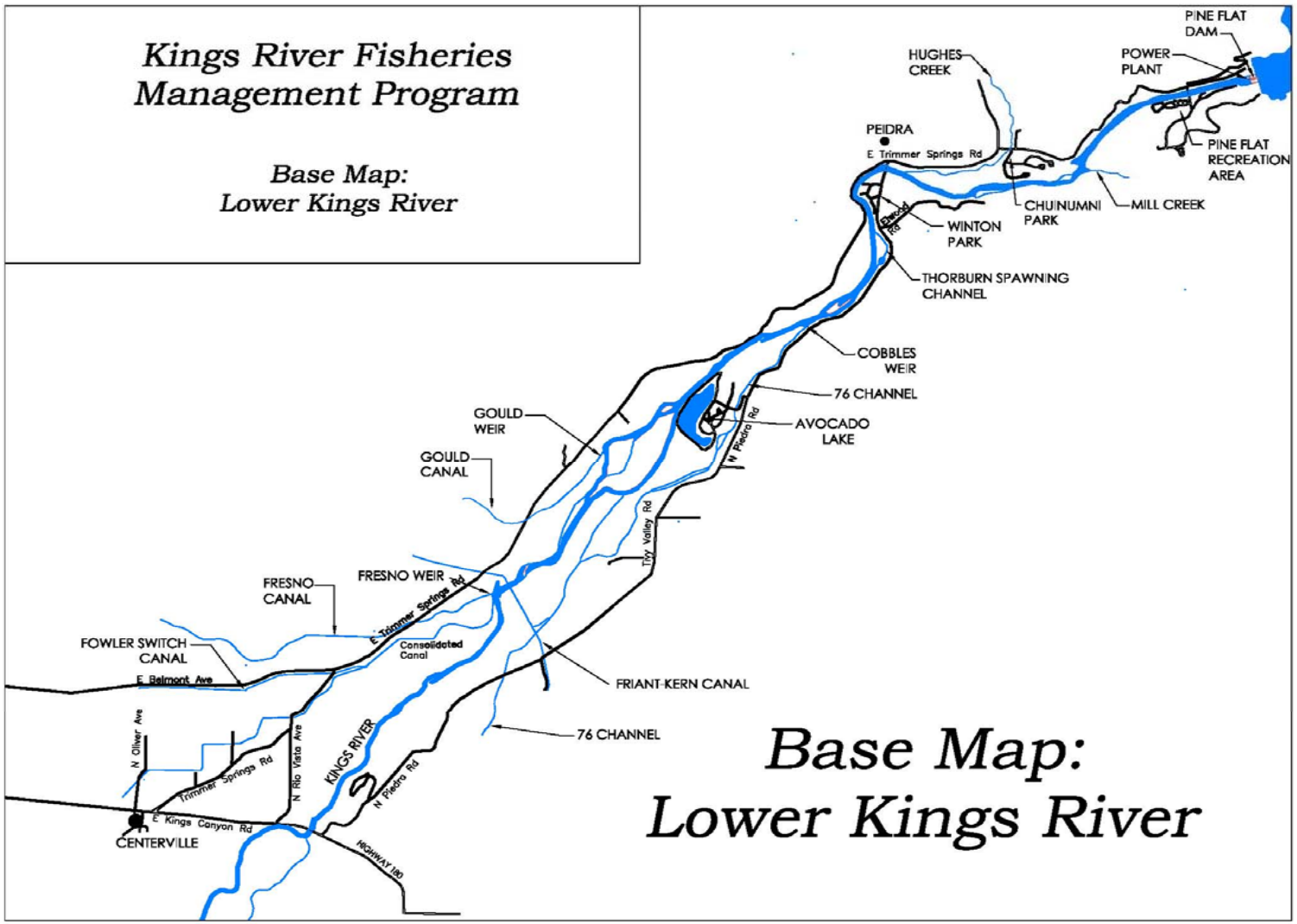

Figure 1-1. Map of the lower Kings River and key geographic locations.

The following report presents a compilation and synthesis of information regarding these habitat enhancements, trout population enhancements, and monitoring activities during 2010-2011. 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 10-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 10-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

On June 26, 2009, the parties to the Kings River Fisheries Management Program (KRFMP) agreed to and signed a 10-year financial extension of the Framework Agreement, ensuring that the enhancement efforts of the KRFMP will continue into the next ten year period. As a result of a change in the mechanism by which funds were being provided, the budgeting process had to be changed from the previous 5-Year Implementation Plan to a more grant based 10-Year Implementation Plan approach.

The Kings River Fisheries Management Program's third edition of the 10-Year Implementation Plan (for program year 2011-2012) was presented and provisionally approved by the Executive Committee at their meeting on September 7, 2011.

The ExCom met once during the 2010-2011 program year on July 20, 2010 to hear reports from the TSC and the public, and to provide direction to the TSC going forward. 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, the fifth in February of 2008, the sixth in April of 2009, and the seventh and eighth in July of 2010. This report represents the ninth in the series, and covers the program year between May 2010 and May 2011.

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 10-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, 2010 through May 31, 2011 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):

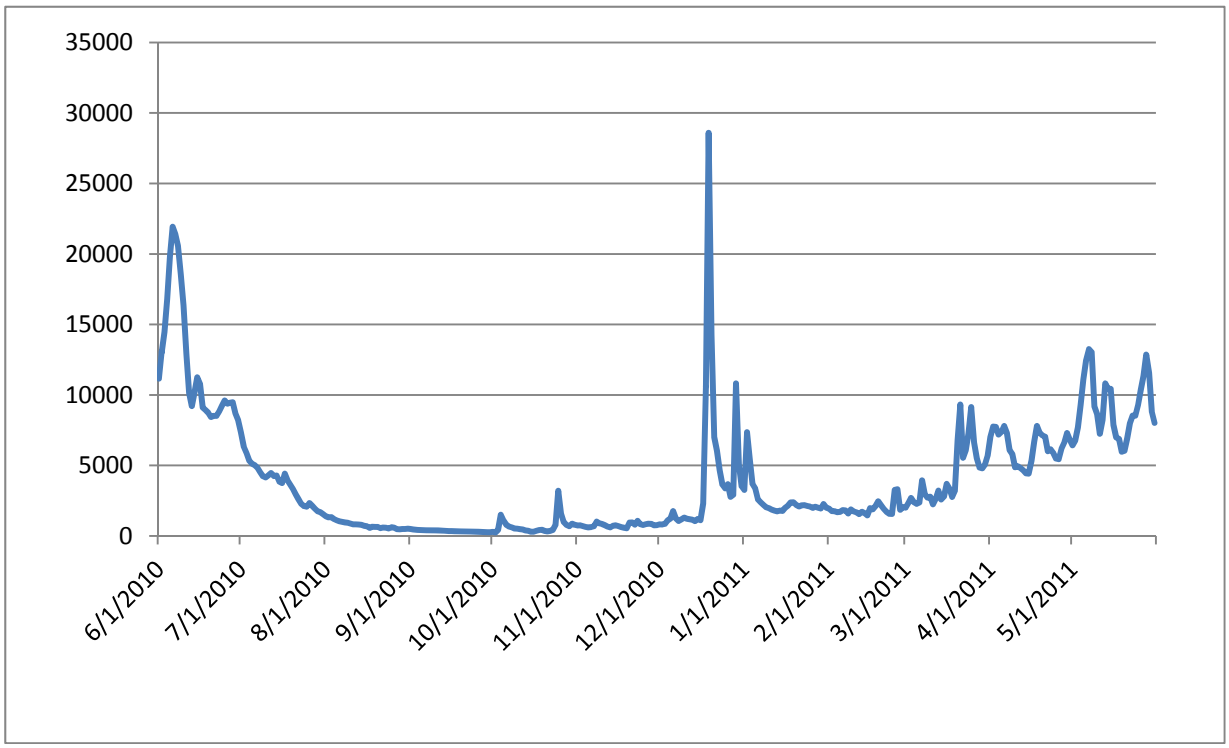

Figure 2-1. Daily inflow into Pine Flat Reservoir in cfs between June 1, 2010 and May 31, 2011.

2.2 RESERVOIR STORAGE

Daily reservoir water storage volume and water surface elevation in Pine Flat Reservoir from June 2010 through May 2011 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 2011.

Period	Annual Runoff (TAF)	Percent Water Year
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	1,216	74%
October 2008 - September 2009	1,348	79%
October 2009 – September 2010	2,062	121%
October 2010 - September 2011	3,318	193%

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 2010 through May 2011 ranged from 136 to 9,484 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 2010 through May 2011 demonstrated **100% compliance** with the instream flow requirements as outlined in the Framework Agreement, with the majority of days greatly exceeding these minimum flow requirements. These results are shown in Figure 2-4.

Flows measured at Fresno Weir were subject to the levels representing an above-average hydrologic year of the Exhibit D flow schedule (135 cfs at Fresno Weir, for a water year greater than **1,555,000** acre feet, but 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 2010 through May 2011 resulted in 14 days in which flows did not reach the 135 cfs target at Fresno Weir as outlined in the Framework Agreement. Five of these days occurred during Electrofishing Activities, which require flows to be lowered for safety purposes during the monitoring activities (November 15-19, 2010). The other nine days all occurred in December,

when storm events wreaked havoc operationally on the river. When a storm event occurs in which large flows occur in Mill and Hughes Creeks, which are uncontrolled creeks downstream of Pine Flat Dam, these flows often meet or exceed the requirements of irrigation demand and Exhibit C minimum flows.

However, when the creeks recede, as they often do very quickly after a storm event passes, releases from Pine Flat Dam are again increased to meet the downstream demands and minimum Exhibit D requirements. Occasionally, these real-time adjustments can result in a delay which doesn't allow for the flow in the river to fully recover. In all cases, corrective actions were taken, and the flow at Fresno Weir was restored to 135 cfs or above. The nine dates in which flows did not meet the targets were December 1-4, 8-10, 14, 16 of 2010. In all cases, the flow at Fresno Weir was measured at 133 or 134 cfs, or 2 or 1 cfs short of the 135 cfs Exhibit D Target. These results are shown in Figure 2-5.

While the 2010-2011 program year did have 14 days of flows that were below the instream flow requirement at Fresno Weir, there were 12 days in which the Exhibit D targets at Fresno Weir were reached exactly. In every single instance other than these 26 days, the flow requirements at Fresno Weir were exceeded, meaning that the flow was at 136 cfs or more for every other day during the low flow period. Information on daily water releases from Pine Flat Reservoir and daily flows at Fresno Weir are summarized in Appendix A.

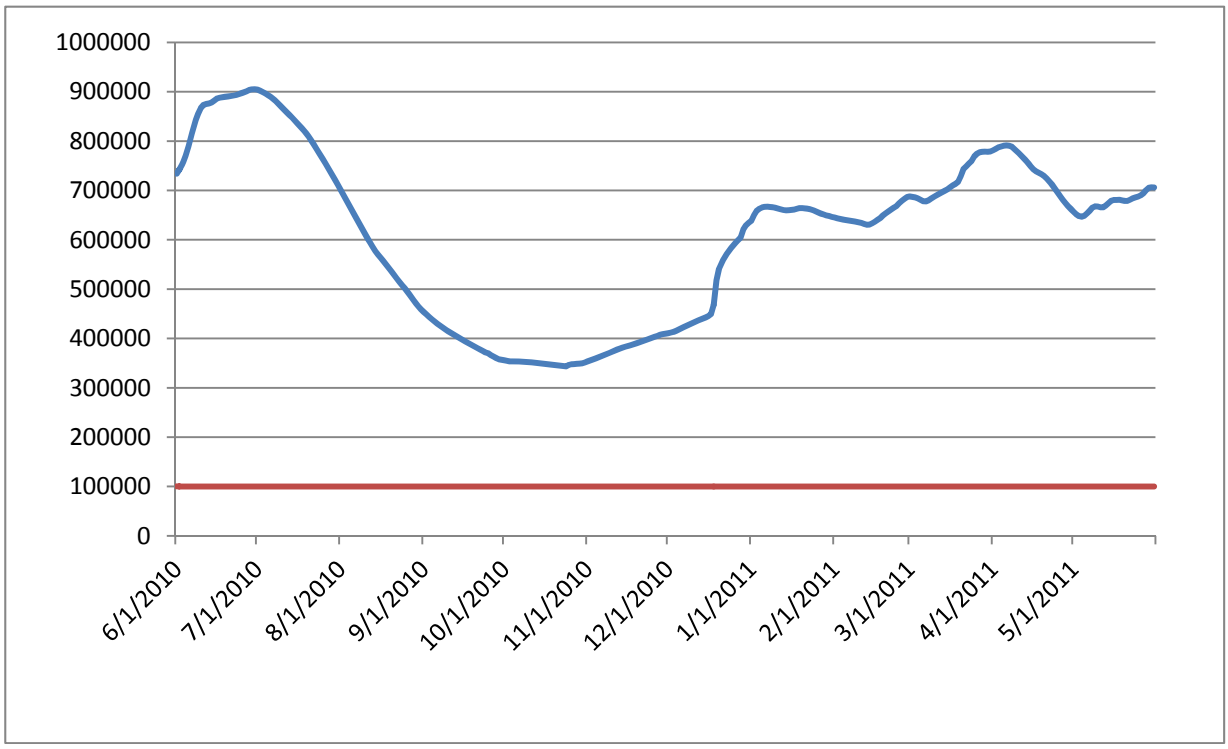

Figure 2-2. Daily storage volume in Pine Flat Reservoir from June 2010 to May 2011.
Note: ----- Storage values in acre-feet volumes. Red Line indicates Temperature Control Pool of 100,000 acre-feet.

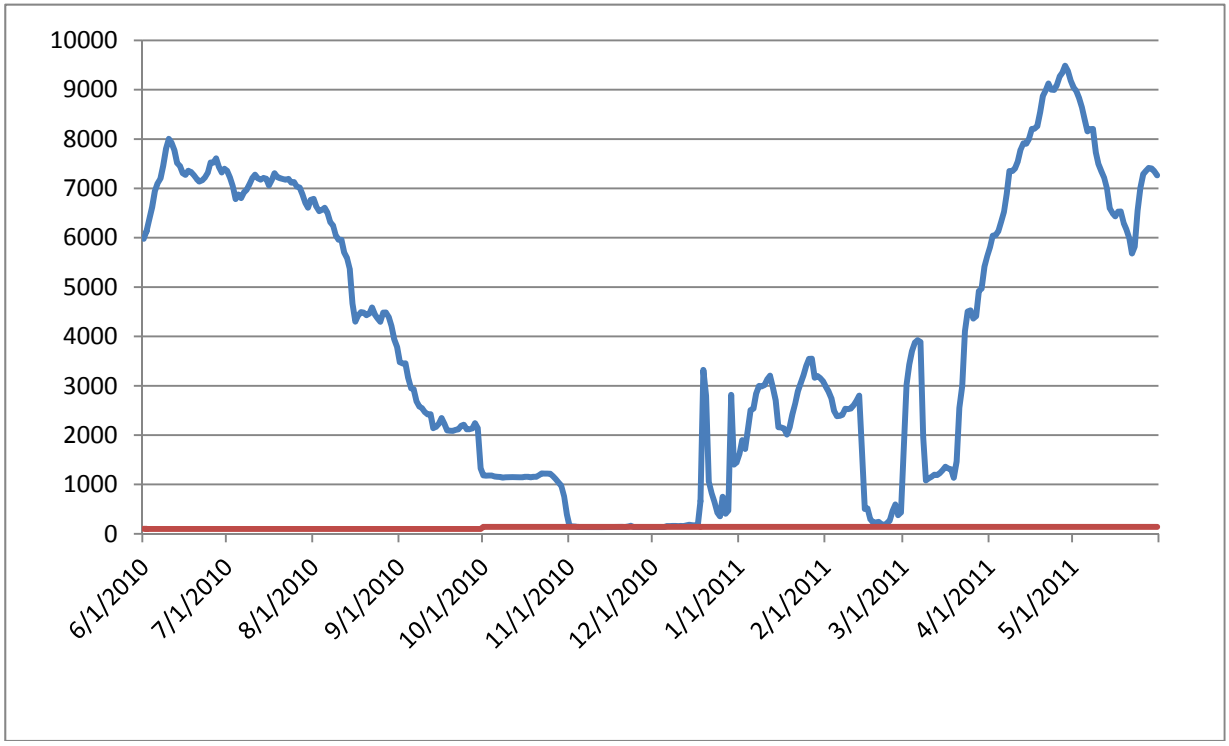

Figure 2-3. Average daily water releases from Pine Flat Reservoir to the lower Kings River between June 2010 and May 2011. Note: ----- Releases represented as flow rate in cfs. Red Line represents minimum flow rate as established by Exhibit C and D criterion (cfs).

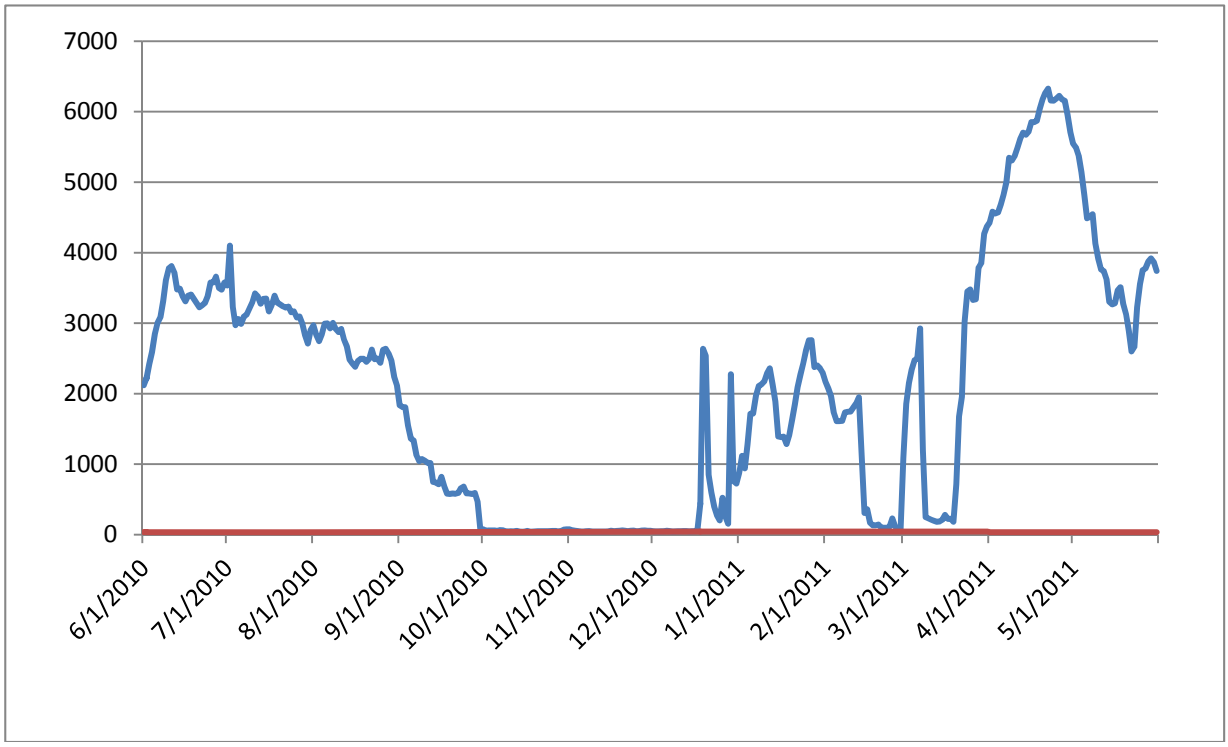

Figure 2-4. Average daily flows in the Kings River below Fresno Weir from June 2010 through May 2011. Note: ----- Flow rate represented in cfs. Red Line represents minimum flow rate as established by Exhibit C criteria (cfs).

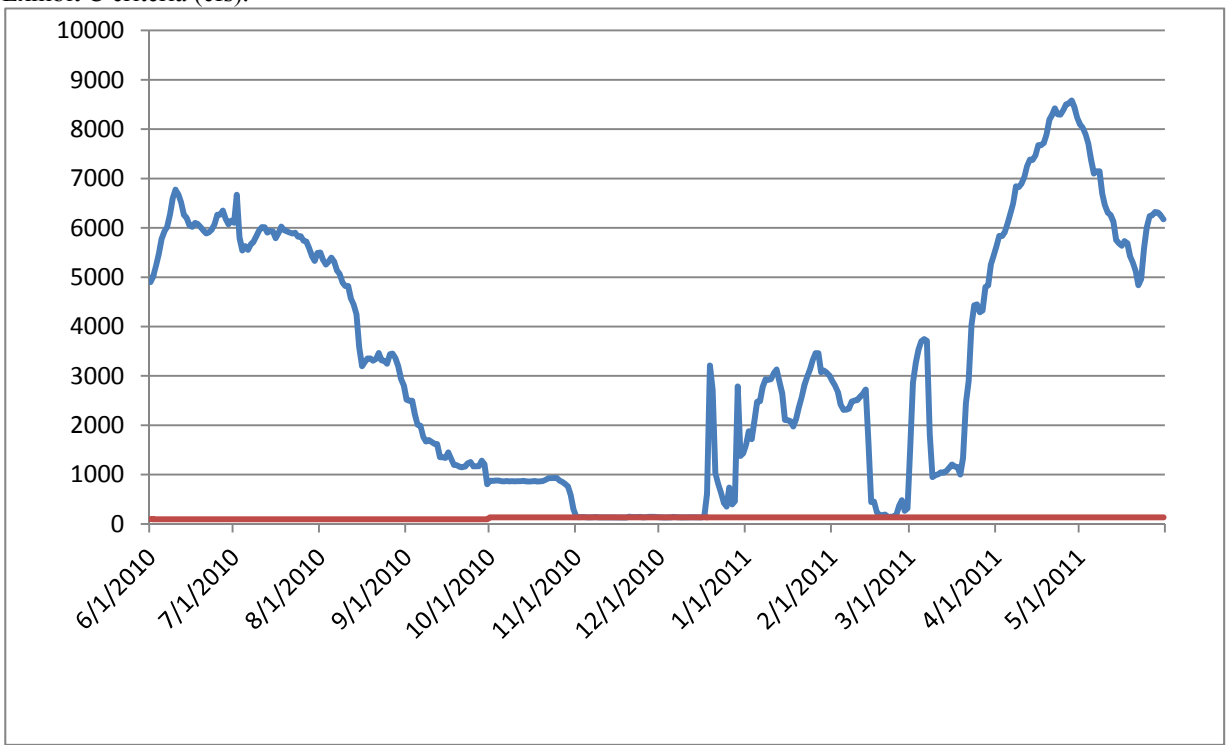

Figure 2-5. Average daily flows in the Kings River at Fresno Weir from June 2010 through May 2011. Note: ----- Flow rate represented in cfs. Red Line represents minimum flow rate as established by the enhanced Exhibit D criteria (cfs).

2.4 TELEMETRY SYSTEM

During 2010-2011, KRWA continued the use of a real-time (telemetry) flow monitoring stations at Fresno Weir and at Dennis Cut. These systems provide 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 2010, the Turbine Bypass was not utilized for temperature and dissolved oxygen management purposes, due to the large amount of carryover storage from the previous wet year, resulting in significant amounts of cold, oxygen rich water in the reservoir.

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).

Exhibit D flows at a rate of 135 cfs (level representing a hydrologic year greater than 1,555,000 AF and less than 2,100,000 AF) at Fresno Weir were released during the fall and winter of 2010, representing the first year in the history of the program that this level of Exhibit D flow was provided. These flows were triggered by the 121% WY for the preceeding 2009-2010 season. The very wet 2010-2011 WY has triggered a third high level (250cfs) Exhibit D requirement for the 2011-2012 WY, and it is anticipated the KRWA Member Units will voluntarily provide these enhanced Exhibit D flows.

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. The last report of this type were issued during the summer and fall of 2009.

2.8 SUMMARY AND DISCUSSION

Hydrologic conditions and Pine Flat Reservoir operations and flows within the lower river during 2010-2011 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 2010 through May 2011 demonstrated **100% compliance** with the instream flow requirements as outlined in the Framework Agreement, with the majority of days greatly exceeding these minimum flow requirements;

- 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 an above-average hydrologic year of the Exhibit D flow schedule (135 cfs at Fresno Weir, for a water year greater than **1,555,000** acre feet, but less than **2,100,000** acre feet);

- Results of daily flow measurements at Fresno Weir from June 2010 through May 2011 resulted in 14 days in which flows did not reach the 135 cfs target at Fresno Weir as outlined in the Framework Agreement. All 14 days were a result of contributions from Mill and Hughes Creeks during storm events, and electrofishing efforts;

- During the late summer and fall of 2010, the Turbine Bypass was not utilized for temperature and dissolved oxygen management purposes, due to the large amount of carryover storage from the previous wet year, resulting in significant amounts of cold, oxygen rich water in the reservoir. The turbine bypass traditionally 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;

- Exhibit D flows at a rate of 250 cfs (level representing a hydrologic year greater than 2,100,000 AF) at Fresno Weir are expected to be released during the fall and winter of 2011. These flows have been triggered by the estimated 193% WY for the 2010-2011 season. The KRWA Member Units are anticipated to voluntarily provide the Exhibit D flows in the coming water-year (2011-2012);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 1 meter intervals from the surface for the first 30 meters and every 2 meters thereafter to the bottom of the water column. These measurements 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 2011 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 2010 through May 2011 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.

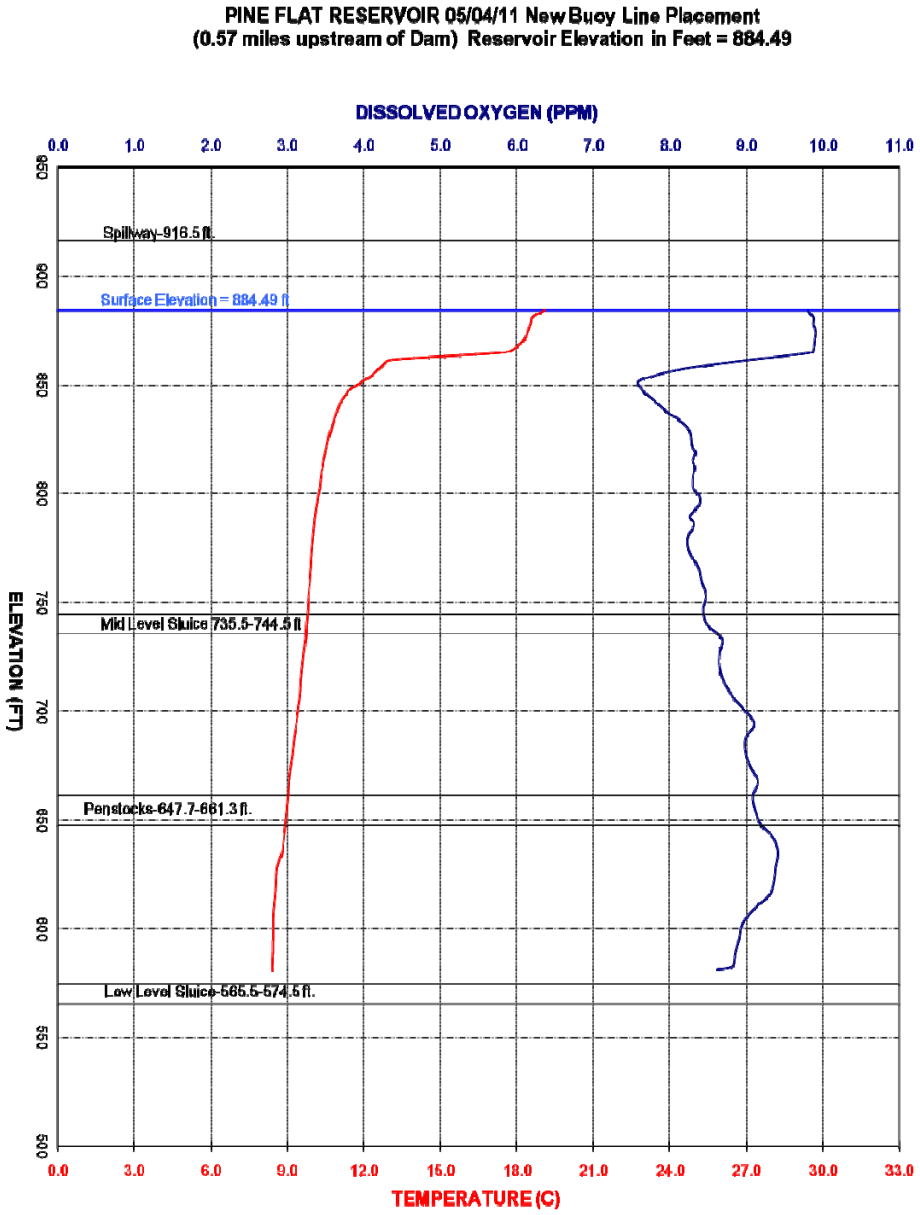

Figure 3-1. May 2011 vertical reservoir temperature and dissolved oxygen profile measurements at Pine Flat Reservoir.

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 ± 0.5˚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 2010-May 2011. 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 2010-2011 study period. As a general guideline, water temperatures within the range from approximately 15-18˚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.

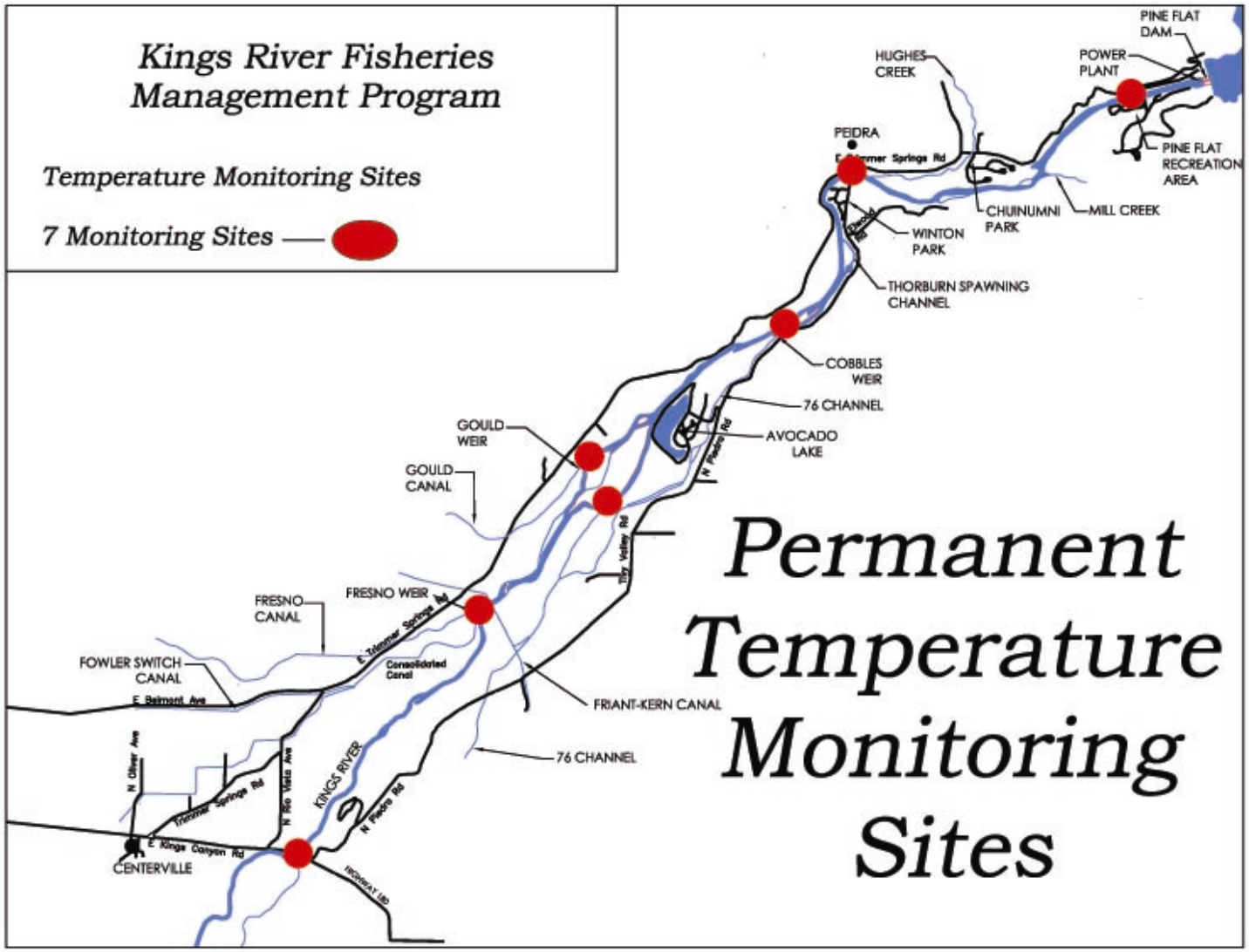

Figure 3-2. Permanent water temperature monitoring locations on the lower Kings River.

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 June 2010 through May 2011 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.

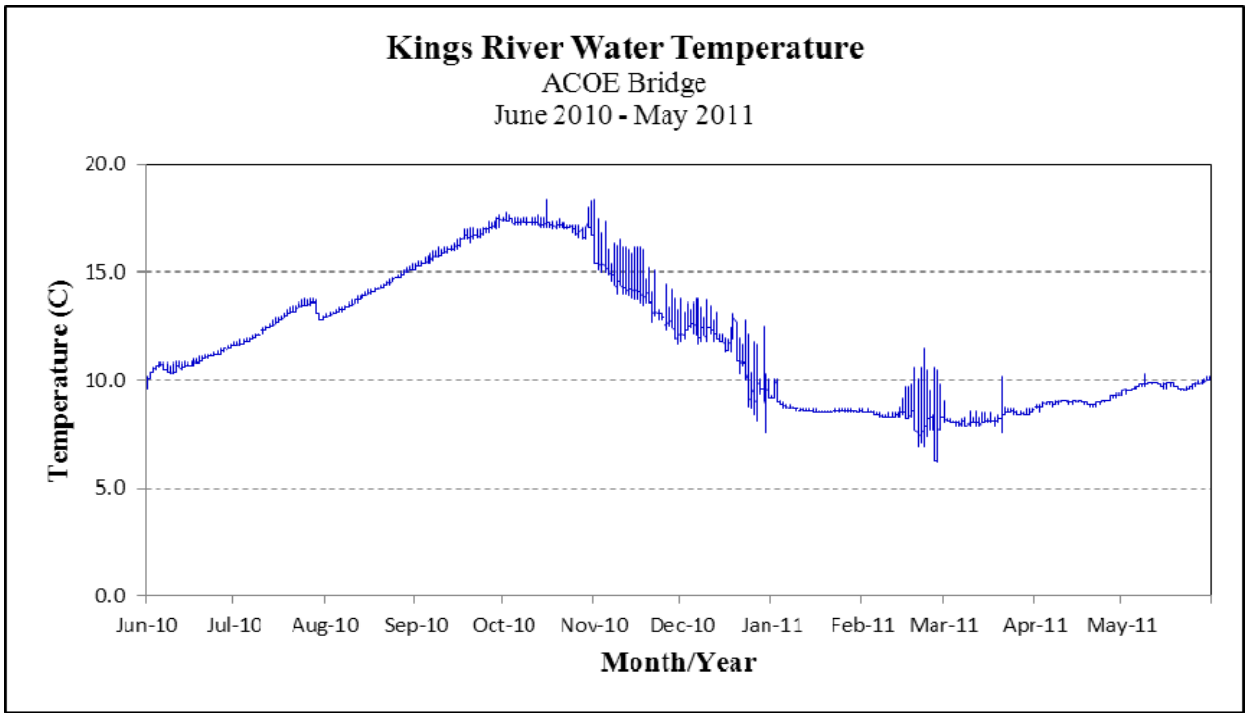

Figure 3-3 Hourly water temperature monitoring results, Army Corps of Engineers Bridge

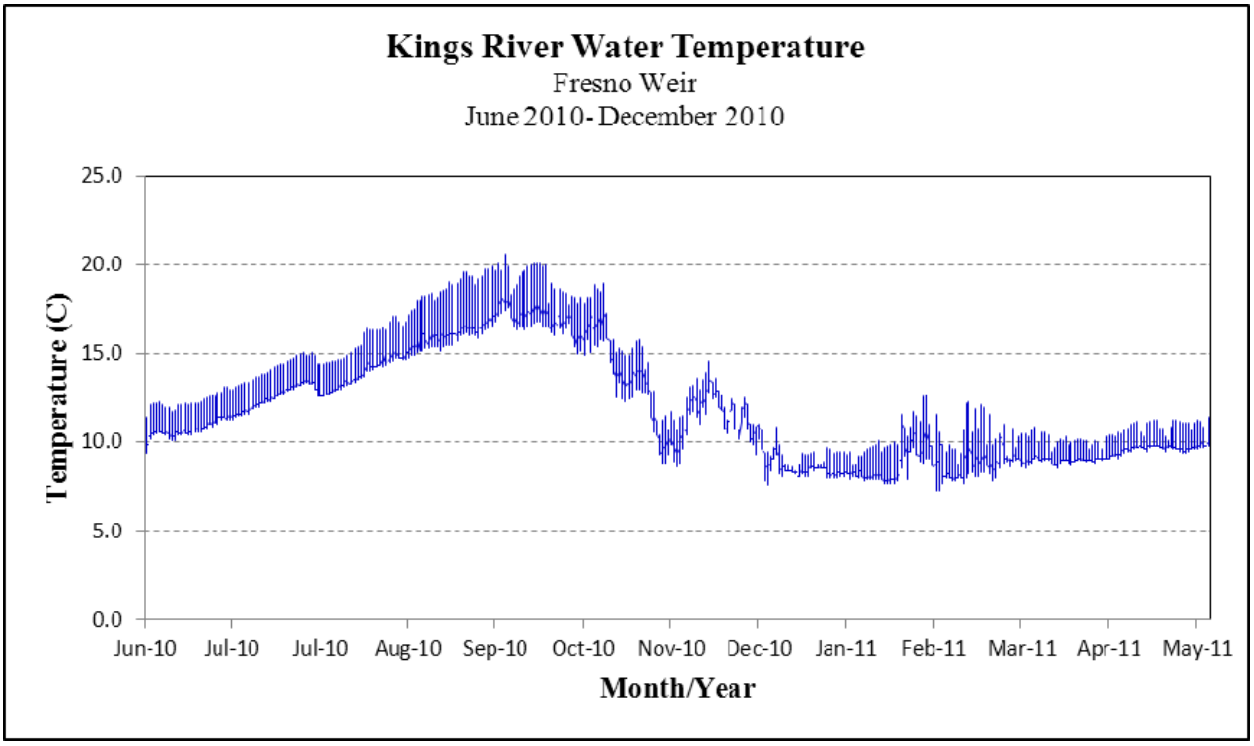

Figure 3-4. Hourly water temperature monitoring results, Fresno Weir

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 June 2010 through May 2011 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 2010-2011, 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 2010" (KRCD 2011) 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 2010. 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.

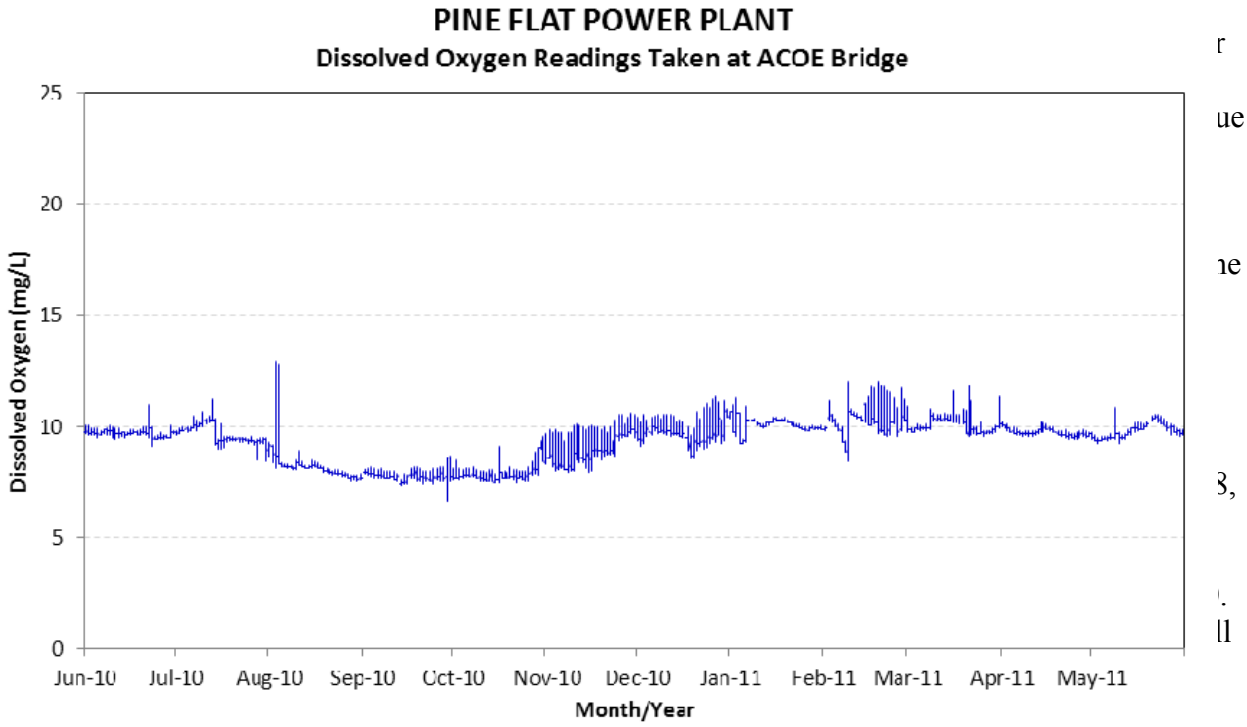

Figure 3-6. Results of dissolved oxygen measurements at the Army Corps Bridge from June 2010 through May 2011.

3.5 CONSTITUENT MONITORING

As per the 2004-2005 and 2006-2007 Water Quality reports, data collected from the Ag-Waiver program on potential water quality constituents are analyzed by the Technical Steering Committee on an annual basis. For this program year, data was collected at the Manning Avenue bridge under the "Core" phase of the Irrigated Lands Regulatory Program's water monitoring protocols. Under this phase, testing is only required for a limited number of constituents, meant to track changes over time. This level of sampling is conducted 2 years out of every 3, with more comprehensive testing occurring in the 3rd year.

The samples were collected monthly, with the exception of no sample being collected in April due to unsafe sampling conditions. Nitrate is now combined with Nitrite, reporting as a single value. This change was implemented after clarification of the reporting requirements was made with the Regional Board. Certain metals (Boron, Cadmium, Zinc) have also been transferred to another laboratory to meet tighter reporting limits. Also, a new column was added to the data set to reflect Basin Plan Objectives (Column reads BPO). This was added for the Regional Board's effort of developing triggers for water quality exceedances. The raw data-set is included in Appendix E.

In all cases, sampling showed evidence of good water quality in the Kings River, with all detected constituents within EPA criterion for the protection of freshwater aquatic life. Overall, evidence of good water quality has been evident for all testing periods since the 2004-2005 and 2006-2007 Water Quality reports, and the Technical Steering Committee will continue to review and analyze the data collected by the Ag-Waiver program on an annual basis going forward.

3.6 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 2010-2011 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 2010-2011 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 2010-2011; and

- Results of the 2010-2011 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 2010-2011 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 2009-2010 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 river-wide 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. A Letter of Permission (LOP) to complete habitat enhancement work under the FMP's Clean Water Act Section 404 permit was received from the U.S. Army Corps of Engineers on May 13, 2010. No permitting activities were conducted during the Program year.

4.1.2 Gravel Placement

No activities were conducted under Element C-2010-1: Fishery Habitat Master Plan of the 10-Year Implementation Plan.

4.1.3 Boulder Placement

No activities were conducted under Element C-2010-1: Fishery Habitat Master Plan of the 10-Year Implementation Plan.

4.1.4 Placement of Half Logs in the Thorburn Channel

No habitat work was completed on the Thorburn Channel.

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

4.1.5 Implementation of Exhibit D Flows

This year marked the first year in which the low-level Exhibit D flow criteria were met, triggering a minimum release of 135 cubic feet per second Heavy precipitation initiated flood releases from Pine Flat Dam in December resulting in flows greater than 135 cfs for most of the winter. These activities were conducted under Element N-2004-1: Development of Exhibit D Flows of the 5-Year Implementation Plan..

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

4.1.6 Large Woody Debris Pilot Study

Due to liability issues related to the woody debris project, the Large Woody Debris pilot study was cancelled and all applications for the necessary permits were rescinded in January 2011. These activities were conducted under Element C-2010-14: 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 across from Trimmer on the south side of the Reservoir, and in Zebe Cove in the fall of 2010. The improvements consisted of 63 wire gabions that were filled with Manzanita brush and Christmas Trees that were installed at various lake elevations before the runoff filled the reservoir. These gabions complemented another 90 that were previously installed in this location as fish habitat structures.

Personnel from the ACOE took the lead in overseeing that these projects were completed, and over 240 hours of labor was provided by the Kerman Bass Club. The KRFMP supports and

applauds the efforts of the ACOE and the Kerman Bass Club in taking on these projects. 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 Streambed Alteration (1600) Permit and CEQA Permit to complete construction of the Large Woody Debris Pilot Study;

- Received Letter of Permission as part of the FMP's 404 Permit from USACE;

5.0 FISH STOCKING

The stocking of fish in State waters is the responsibility of the California Department of Fish and Game. During the 2010 through 2011 reporting period, the allotted catchable, sub-catchable, fingerling and trophy rainbow trout size classes were stocked in the Kings River between Pine Flat Dam and Fresno Weir. In addition, trout eggs (triploid and diploid) were purchased by the program from Trout Lodge for incubation and hatching in the lower river. Catchable and fingerling rainbow trout size classes and fingerling kokanee and chinook salmon were also planted in Pine Flat Reservoir. Avocado Lake received allotments of catachable and super catchable rainbow trout 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 used during this reporting period to hatch eyed rainbow trout eggs, inside the streamside incubators.

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 stocked with 150,000 eyed rainbow trout eggs purchased from Troutlodge Inc. in December of 2010, and again in March of 2011 with 150,000 eggs during the 2010-2011 program year. Unfortunately, triploid eggs were unavailable for purchase due to a shortage of the product, thereby halting the Incubator Effectiveness Study for the 2010-2011 program year. The eggs for the 2011-2012 program year will be triploid to help continue the Incubator Effectiveness Study.

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

A total of 2,200 pounds (26,720 trout) of sub-catchable rainbow trout (4-6 inches in length) were stocked in the lower Kings River as part of the put-and-grow program. The sub-catchables were stocked on December 8, 2010 and December 14, 2010.

5.1.3.2 Fingerling Rainbow Trout

Stocking of regular fingerling allotments were delayed during this period and therefore were classified as sub-catchable size class at time of stocking.

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. A total of 18,520 pounds of catchable sized trout (32,366 fish) were stocked in the lower Kings River during this reporting period. 17,220 pounds (29,826 fish) were Rainbow Trout, and 1,300 pounds were Brook Trout (2,540 fish). 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.

5.1.3.4 Super Catchable-Sized Rainbow Trout

The CDFG San Joaquin Hatchery stocked a total of 12,200 pounds (7,226 fish) of super catchable trout in the lower Kings River. 2,900 pounds (1,618 fish) were brook trout, and 9,320 pounds (5,608 fish) were rainbow trout. Super catchable trout are defined as trout greater than one pound.

5.1.3.5 Trophy Rainbow Trout

Beginning December 2005, CDFG implemented a trophy trout stocking program in the put-and-take section as well as the catch-and-release section. The trophy trout program was implemented to increase licenses sales and get anglers to return to the Kings River. This created a huge response from anglers, throughout the Valley and State. The program also generated positive press releases and magazine articles as a result. Trophy trout are designated as trout greater than 2.99 pounds each. Trophy trout planted in the lower Kings river average approximately 4 pounds (Figure 5-2). According to the data provided by CDFG, no trophy trout were stocked during the 2010-2011 program year.

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 2010-2011 reporting period.

5.2 RESERVOIR

5.2.1 Kokanee Salmon

No Kokanee Salmon were stocked in Pine Flat Reservoir during the 2010-2011 program year.

5.2.2 Fingerling Rainbow Trout

The CDFG San Joaquin hatchery personnel stocked a total of 137,632 fingerling rainbow trout (736 pounds) on February 25, 2011 in Pine Flat Reservoir.

5.2.3 Sub-Catchable Sized Rainbow Trout

No sub-catchable rainbow trout were stocked in Pine Flat Reservoir during the 2010 -2011 program year.

5.2.4 Catchable-Sized Rainbow Trout

The current annual allotment for Pine Flat Reservoir is 22,000 pounds for the calendar year. Between November 15, 2010 and April 13, 2011, 27,500 pounds (44,940 fish) of catchable-sized rainbow trout were planted in Pine Flat Reservoir.

5.2.4.1 Super Catchable-Sized Rainbow Trout

The CDFG San Joaquin Hatchery stocked a total of 2,500 pounds (1,289 fish) of super catchable trout in the Pine Flat Reservoir. Super catchable trout are defined as trout greater than one pound.

5.2.4.2 Trophy Rainbow Trout in Pine Flat Reservoir

No trophy size class rainbow trout were stocked in Pine Flat Reservoir during the 2010 -2011 program year.

5.2.5 Chinook Salmon

CDFG stocked 75,020 Chinook salmon fingerlings (682 pounds) in Pine Flat Reservoir on April 23, 2011.

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 2010-2011 reporting period, the San Joaquin Hatchery planted 6,300 pounds (9,908 fish) of catchable size rainbow trout and 1,000 pounds (510 fish) of super catchable rainbow trout in Avocado Lake.

5.3 SUMMARY AND DISCUSSION

- Whitlock Vibert Boxes (WVB) were used during this reporting period to hatch eyed rainbow trout eggs, inside the streamside incubators, using eggs purchased through Troutlodge Inc.;

    - These incubators were stocked with 150,000 eyed rainbow trout eggs purchased from Troutlodge Inc. in December of 2010, and again in March of 2011 with 150,000 eggs during the 2010-2011 program year. Unfortunately, triploid eggs were unavailable for purchase due to a shortage of the product, thereby halting the Incubator Effectiveness Study for the 2010-2011 program year. The eggs for the 2011-2012 program year will be triploid to help continue the Incubator Effectiveness Study;

    - On December 8, 2010 and December 14, 2010 a total of 26,720 sub-catchable rainbow trout (2,200 pounds) 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;

    - Stocking of regular fingerling allotments were delayed during this period and therefore were classified as sub-catchable size class at time of stocking.

- A total of 18,520 pounds of catchable sized trout (32,366 fish) were stocked in the lower Kings River during this reporting period.

- A total of 12,200 pounds (7,226 fish) of super catchable trout were stocked in the lower Kings River during this reporting period.

- No Kokanee Salmon were stocked in Pine Flat Reservoir during the 2010-2011 program year.

- The CDFG San Joaquin hatchery personnel stocked a total of 137,632 fingerling rainbow trout (736 pounds) on February 25, 2011 in Pine Flat Reservoir.

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

- Between November 15, 2010 and April 13, 2011, 27,500 pounds (44,940 fish) of catchable-sized rainbow trout were planted in Pine Flat Reservoir.

- The CDFG San Joaquin Hatchery stocked a total of 2,500 pounds (1,289 fish) of super catchable trout in the Pine Flat Reservoir.

- CDFG stocked 75,020 Chinook salmon fingerlings (682 pounds) in Pine Flat Reservoir on April 23, 2011.

- In 2010-2011 reporting period, the San Joaquin Hatchery planted 6,300 pounds (9,908 fish) of catchable size rainbow trout and 1,000 pounds (510 fish) of super catchable 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) at two sites in addition to the six sites that are sampled annually. During the 2010-2011 study period, electrofishing surveys were conducted in November, 2010 only. 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.

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 28 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 a 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. Sampling sites are 300 feet in length and were sampled using backpack electrofishers. A final report is available in the KRCD library and on the KRCD website.

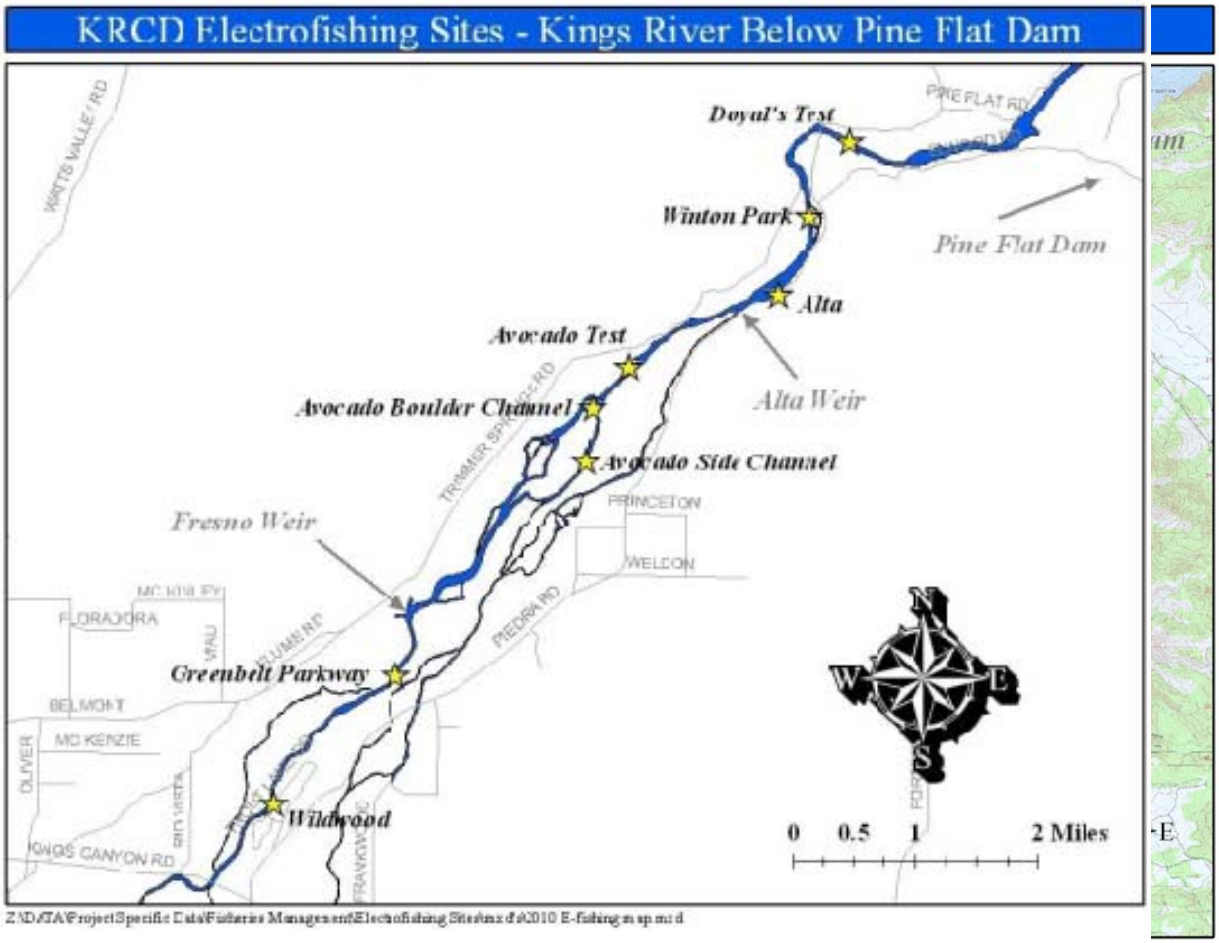

Figure 6-1: Kings River Conservation District annual population monitoring survey sites. Eight sites were surveyed in 2010.

Crews consisting of 15 to 24 people and five to seven electrofishers were used to conduct the sampling. Few resident rainbow trout (*Onchorhyncus mykiss*) were collected at any of the six sites sampled. The most abundant fish were the sculpin (*Cottus spp.*), California roach (*Hesperoleucus symmetricus*), and Sacramento sucker (*Catostomus occidentalis*)..

6.1.2 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-2010-5: Monitoring of the 10-Year Implementation Plan.

6.1.3 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-2010-5: Monitoring of the 10-Year Implementation Plan.

6.1.4 Calibrated Angler 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-2010-5: Monitoring of the 10-Year Implementation Plan.

6.1.5 Incubator Effectiveness Study

While funds were budgeted for this element, no activity occurred due to the lack of availability of triploid rainbow trout eggs from Trout Lodge, Inc. Funds will be carried over to the next program year. Funds were budgeted under Element C-2010-5: Monitoring of the 10-Year Implementation Plan.

6.1.6 Annual Technical Report

The eighth Annual Technical Report was published and distributed by the FMP in June 2010 The report covered activities for program year 2009-2010 and its 5-Year Implementation Plan. The report was reviewed and approved by the PAG and ExCom. The activities were conducted under Element C-2010-5: Monitoring of the 10-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 2010-2011 program year, CDFG chose not to release data regarding these angling tournaments.

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	2009	2010
No. Tournaments	31	16	25	29	33	32	23	32	40	36	24
No. Anglers	862	367	702	820	890	841	658	1,000	1,413	994	698
Total Hrs. Fished	7,012	3,454	6,428	7,067	7,807	7,304	5,279	7,940	11,133	8,229	5,260
Total No. Bass	1,495	811	1,680	2096	2136	1,634	1,505	2,315	3,091	1,654	1,405
Total Weight (lbs.)	1,750	1,245	3,108	3,593.5	3,289.1	2,385	2,570	3,199	4,153	1,971	2,262
Hrs fished/angler	8.13	9.41	9.16	8.62	8.77	8.68	8.02	7.93	7.89	8.28	7.53
Avg. per bass (lbs)	1.17	1.54	1.85	1.71	1.54	1.46	1.71	1.38	1.34	1.19	1.54

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

It is unknown whether 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 2010-2011 monitoring program have shown:

- The FMP continues to monitor trout and non-game fish populations downstream of Pine Flat Dam; and
- The eighth Annual Technical Report was released in June 2010.

7.0 PUBLIC EDUCATION AND OUTREACH

7.1 News Releases and Newsletters

There were no newsletters produced during the 2010-2011 program year.

7.2 Summer Hydrology and Temperature Report

KRWA has developed a real-time telemetry system for monitoring water temperature and streamflow at Fresno Weir. Typically, during the summer and fall of dry hydrologic years, information developed from monitoring being conducted on the lower Kings River is 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 are typically 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. During the 2010-2011 program year, due to the wet hydrologic cycle resulting in a large amount of carryover water that was very cold and rich with dissolved oxygen, these reports were not issued.

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 C5: Monitoring of the 10-Year Implementation Plan.

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

There were no tours given during the 2010-2011 program year.

7.4 Kings River Day 2011

Due to the high flows during the spring on the Kings River, the 2011 Kings River Day event was cancelled. This event is traditionally held on an annual basis to provide valuable historical, operational, scientific and recreational opportunities to hundreds of 6th graders. 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. It is anticipated this event will be held again during the 2011-2012 program year.

7.5 Directed Enforcement

Local groups of fisherman worked established a contract with the California Department of Fish and Game's Enforcement branch to commit additional funds for Directed Enforcement Actions targeting the Kings River Fisheries Management Zone during the 2010-2011 program year. It is the hope of the fisherman that these funds will help Fish and Game personnel in curtailing 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 2010-2011 10-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 (C15). - Implementation of this element did not occur during the program year. Funds will be carried over to the next program year.

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-2010-1: Thorburn Channel Maintenance of the 10-Year Implementation Plan.

9.2 Streamside Incubator Operation and Maintenance

The water pump motor for the upper incubator was replaced with a new motor due to a bad bearing. The pump was placed back into service in December 2010. These activities were conducted under Element M-2010-2: Streamside Incubator Operation and Maintenance of the 10-Year Implementation Plan.

10.0 DEVELOPMENT OF 10-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.

With the extension of the Framework Agreement in June of 2009, due to the financial structure agreed to by all parties, it was determined that the new budgetary documents must reflect a longer term approach to financing projects. As such, the TSC was directed to develop a 10-Year Plan to replace what were previously 5-Year Plans.

A 10-Year Plan was developed during this reporting period (May 2010 to May 2011). This was the third edition of a 10-Year plan, which followed eight annual modifications to the previous 5-Year Plans since the signing of the Framework Agreement on May 28, 1999. Development of the 10-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 10-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 10-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
6/1/2010	734018	5979	11152	2119
6/2/2010	742203	6129	13046	2219
6/3/2010	752304	6366	14466	2421
6/4/2010	764819	6622	16797	2591
6/5/2010	781978	6947	19809	2849
6/6/2010	801911	7102	21926	3006
6/7/2010	821970	7198	21397	3088
6/8/2010	840380	7459	20562	3314
6/9/2010	855169	7807	18546	3613
6/10/2010	866823	8004	16359	3777
6/11/2010	873289	7926	12896	3809
6/12/2010	875258	7773	10124	3716
6/13/2010	876148	7515	9204	3477
6/14/2010	878185	7451	10193	3490
6/15/2010	881991	7310	11247	3381
6/16/2010	886416	7274	10791	3309
6/17/2010	887857	7358	9110	3390
6/18/2010	888911	7332	8935	3406
6/19/2010	889799	7266	8740	3347
6/20/2010	890410	7192	8436	3282
6/21/2010	891133	7137	8520	3226
6/22/2010	891911	7165	8516	3253
6/23/2010	893079	7221	8828	3287
6/24/2010	894749	7320	9230	3382
6/25/2010	896923	7524	9601	3575
6/26/2010	899044	7521	9375	3577
6/27/2010	900944	7607	9450	3659
6/28/2010	903520	7435	9483	3501
6/29/2010	904809	7324	8683	3475
6/30/2010	905201	7398	8199	3576
7/1/2010	904472	7356	7358	3534
7/2/2010	902288	7219	6316	4100
7/3/2010	899715	7044	5866	3230
7/4/2010	896644	6783	5333	2971
7/5/2010	892967	6876	5120	3059
7/6/2010	889355	6805	5024	2991
7/7/2010	885254	6921	4840	3093
7/8/2010	880721	6977	4523	3124
7/9/2010	875378	7090	4239	3207
7/10/2010	869231	7208	4142	3297

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
7/11/2010	863547	7278	4299	3422
7/12/2010	858427	7203	4465	3381
7/13/2010	853000	7178	4247	3276
7/14/2010	847594	7213	4278	3344
7/15/2010	841508	7196	3846	3348
7/16/2010	835448	7061	3748	3168
7/17/2010	830106	7173	4415	3253
7/18/2010	823668	7305	3937	3390
7/19/2010	817207	7230	3635	3293
7/20/2010	810143	7207	3332	3266
7/21/2010	802382	7188	2952	3239
7/22/2010	793987	7176	2609	3221
7/23/2010	784868	7192	2280	3236
7/24/2010	775653	7116	2116	3156
7/25/2010	766347	7128	2073	3168
7/26/2010	757863	7038	2330	3080
7/27/2010	749029	7018	2142	3094
7/28/2010	740052	6881	1930	2991
7/29/2010	730887	6710	1753	2830
7/30/2010	721736	6608	1679	2710
7/31/2010	712011	6767	1549	2906
8/1/2010	701969	6786	1396	2970
8/2/2010	692150	6633	1316	2832
8/3/2010	682499	6538	1327	2744
8/4/2010	672590	6564	1193	2840
8/5/2010	662476	6607	1105	2993
8/6/2010	652444	6503	1041	2997
8/7/2010	642261	6319	988	2926
8/8/2010	632163	6246	954	3003
8/9/2010	622879	6045	939	2920
8/10/2010	613259	5961	874	2874
8/11/2010	603539	5959	822	2918
8/12/2010	594478	5700	821	2768
8/13/2010	585576	5588	815	2667
8/14/2010	577007	5369	785	2483
8/15/2010	569764	4666	722	2428
8/16/2010	563390	4302	683	2381
8/17/2010	556537	4420	577	2463
8/18/2010	549599	4492	656	2496
8/19/2010	542706	4482	642	2495

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
8/20/2010	535900	4431	643	2451
8/21/2010	528720	4464	551	2492
8/22/2010	521424	4586	593	2625
8/23/2010	514469	4444	586	2489
8/24/2010	507685	4366	528	2497
8/25/2010	501150	4297	615	2438
8/26/2010	494174	4483	586	2620
8/27/2010	486687	4486	476	2635
8/28/2010	479060	4393	472	2569
8/29/2010	471771	4209	494	2470
8/30/2010	464891	3940	493	2237
8/31/2010	459036	3785	513	2116
9/1/2010	453837	3477	491	1834
9/2/2010	448785	3452	458	1810
9/3/2010	443685	3455	434	1808
9/4/2010	439033	3163	421	1549
9/5/2010	434747	2951	412	1362
9/6/2010	430483	2928	407	1336
9/7/2010	426577	2679	399	1126
9/8/2010	422392	2580	390	1042
9/9/2010	418450	2548	404	1073
9/10/2010	414786	2466	407	1049
9/11/2010	411359	2421	393	1020
9/12/2010	407910	2422	378	1015
9/13/2010	404914	2140	366	748
9/14/2010	401965	2166	356	738
9/15/2010	398811	2233	350	716
9/16/2010	395489	2345	344	821
9/17/2010	392361	2225	336	685
9/18/2010	389424	2095	332	583
9/19/2010	386393	2088	323	577
9/20/2010	383586	2086	317	584
9/21/2010	380295	2105	315	579
9/22/2010	377406	2120	311	592
9/23/2010	374598	2187	312	659
9/24/2010	371836	2208	311	681
9/25/2010	369981	2120	299	586
9/26/2010	366102	2118	290	584
9/27/2010	363339	2136	283	578
9/28/2010	360414	2241	276	590

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
9/29/2010	357844	2141	267	468
9/30/2010	356716	1326	263	52
10/1/2010	355659	1185	287	76
10/2/2010	354534	1177	241	56
10/3/2010	353446	1183	438	60
10/4/2010	353480	1183	1500	60
10/5/2010	353480	1163	1091	61
10/6/2010	353208	1155	790	54
10/7/2010	352868	1151	658	64
10/8/2010	352835	1140	606	63
10/9/2010	352393	1146	523	48
10/10/2010	351918	1148	515	47
10/11/2010	351579	1150	481	48
10/12/2010	351241	1145	453	47
10/13/2010	350800	1150	392	54
10/14/2010	350293	1146	369	44
10/15/2010	349684	1146	295	41
10/16/2010	348739	1157	303	45
10/17/2010	347727	1155	365	52
10/18/2010	347222	1147	412	42
10/19/2010	346784	1154	432	45
10/20/2010	345876	1156	361	49
10/21/2010	345171	1189	323	48
10/22/2010	344601	1223	360	48
10/23/2010	344064	1221	425	48
10/24/2010	343562	1222	782	51
10/25/2010	346414	1217	3206	51
10/26/2010	347639	1168	1607	54
10/27/2010	348064	1111	992	52
10/28/2010	348637	1038	773	44
10/29/2010	348874	973	685	54
10/30/2010	349786	758	866	71
10/31/2010	351410	392	790	76
11/1/2010	353548	149	741	76
11/2/2010	355624	150	751	62
11/3/2010	357707	146	700	55
11/4/2010	359796	136	638	50
11/5/2010	361789	137	606	45
11/6/2010	363580	138	629	45
11/7/2010	365479	137	681	48

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
11/8/2010	367974	136	1019	51
11/9/2010	370477	136	892	45
11/10/2010	372884	136	840	45
11/11/2010	375264	136	764	45
11/12/2010	377512	137	658	45
11/13/2010	379484	138	607	45
11/14/2010	381532	137	723	45
11/15/2010	383373	138	751	47
11/16/2010	384970	139	693	56
11/17/2010	386357	136	633	49
11/18/2010	387889	137	585	53
11/19/2010	389389	138	543	55
11/20/2010	391357	140	945	61
11/21/2010	393474	138	953	55
11/22/2010	395417	146	802	48
11/23/2010	397690	164	1068	55
11/24/2010	399644	139	831	57
11/25/2010	401529	138	772	49
11/26/2010	403384	138	834	51
11/27/2010	405206	139	866	58
11/28/2010	407251	140	857	59
11/29/2010	408643	139	752	56
11/30/2010	409669	139	769	55
12/1/2010	410734	138	823	48
12/2/2010	411874	137	815	47
12/3/2010	413089	137	852	47
12/4/2010	415340	136	1106	48
12/5/2010	417708	137	1229	49
12/6/2010	421088	156	1767	56
12/7/2010	423772	158	1244	50
12/8/2010	426016	160	1058	45
12/9/2010	428340	159	1174	47
12/10/2010	431047	158	1299	48
12/11/2010	433538	159	1216	49
12/12/2010	435997	158	1182	50
12/13/2010	438387	170	1154	51
12/14/2010	440479	182	1049	47
12/15/2010	442844	173	1206	49
12/16/2010	445254	174	1111	49
12/17/2010	449555	168	2299	65

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
12/18/2010	468619	662	10604	438
12/19/2010	518024	3321	28592	2636
12/20/2010	541181	2795	14270	2537
12/21/2010	553406	1059	7012	850
12/22/2010	563996	822	6045	599
12/23/2010	572595	651	4652	396
12/24/2010	579724	432	3634	274
12/25/2010	586547	356	3380	204
12/26/2010	593278	751	3673	524
12/27/2010	598933	405	2768	261
12/28/2010	604571	470	2916	156
12/29/2010	620966	2816	10820	2276
12/30/2010	629183	1402	5085	758
12/31/2010	634416	1448	3517	725
1/1/2011	638563	1623	3266	872
1/2/2011	650065	1898	7363	1117
1/3/2011	658528	1719	5466	941
1/4/2011	662759	2105	3688	1279
1/5/2011	665398	2504	3375	1715
1/6/2011	666767	2538	2597	1720
1/7/2011	666956	2841	2387	1974
1/8/2011	666484	2996	2204	2108
1/9/2011	665728	2988	2037	2132
1/10/2011	664690	3013	1968	2176
1/11/2011	663277	3135	1864	2288
1/12/2011	661629	3205	1803	2359
1/13/2011	660266	2966	1739	2128
1/14/2011	659467	2705	1797	1890
1/15/2011	659796	2162	1770	1392
1/16/2011	660501	2154	2000	1384
1/17/2011	661394	2134	2151	1391
1/18/2011	662994	2010	2376	1285
1/19/2011	664219	2155	2382	1412
1/20/2011	664078	2418	2210	1632
1/21/2011	663371	2641	2093	1849
1/22/2011	662759	2889	2171	2092
1/23/2011	661723	3059	2181	2273
1/24/2011	659984	3215	2125	2427
1/25/2011	657778	3405	2085	2617
1/26/2011	655108	3544	1989	2757

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
1/27/2011	652771	3548	2069	2758
1/28/2011	651044	3164	2000	2378
1/29/2011	649133	3198	1949	2400
1/30/2011	647970	3156	2263	2358
1/31/2011	646436	3091	2001	2295
2/1/2011	644996	2983	1928	2171
2/2/2011	643373	2886	1758	2072
2/3/2011	642076	2750	1752	1965
2/4/2011	641012	2493	1688	1733
2/5/2011	640087	2384	1703	1611
2/6/2011	639348	2390	1835	1609
2/7/2011	638609	2412	1805	1615
2/8/2011	637455	2533	1594	1733
2/9/2011	636395	2527	1881	1742
2/10/2011	635198	2539	1738	1746
2/11/2011	633863	2606	1671	1804
2/12/2011	632209	2694	1551	1861
2/13/2011	630603	2801	1715	1948
2/14/2011	630878	1700	1618	1147
2/15/2011	633312	504	1454	308
2/16/2011	636764	513	1968	360
2/17/2011	640457	298	1889	168
2/18/2011	644161	228	2120	132
2/19/2011	649273	230	2456	132
2/20/2011	653518	241	2186	145
2/21/2011	657356	195	1924	101
2/22/2011	661300	178	1712	99
2/23/2011	664690	215	1572	99
2/24/2011	667948	270	1555	109
2/25/2011	673872	468	3262	230
2/26/2011	678774	596	3308	120
2/27/2011	682834	377	1855	69
2/28/2011	686619	432	2052	86
3/1/2011	687867	1688	2000	1091
3/2/2011	686859	3023	2332	1855
3/3/2011	685948	3433	2690	2153
3/4/2011	683887	3705	2386	2342
3/5/2011	680970	3877	2275	2474
3/6/2011	678059	3923	2363	2498
3/7/2011	677916	3888	3944	2925

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
3/8/2011	680158	1962	2959	1202
3/9/2011	683647	1080	2717	248
3/10/2011	687003	1124	2784	230
3/11/2011	690270	1154	2237	211
3/12/2011	693499	1198	2628	195
3/13/2011	696397	1191	3213	183
3/14/2011	699156	1229	2585	188
3/15/2011	702066	1291	2794	213
3/16/2011	706200	1359	3694	280
3/17/2011	710055	1325	3364	223
3/18/2011	713088	1307	2761	226
3/19/2011	717404	1136	3191	183
3/20/2011	728854	1466	6800	716
3/21/2011	743506	2553	9323	1677
3/22/2011	748929	2998	5540	1957
3/23/2011	754373	4108	6071	3026
3/24/2011	759535	4505	7262	3449
3/25/2011	769051	4528	9137	3478
3/26/2011	774269	4361	6631	3331
3/27/2011	777193	4410	5511	3339
3/28/2011	778324	4921	4848	3786
3/29/2011	778735	4968	4799	3853
3/30/2011	778375	5417	5061	4268
3/31/2011	778992	5622	5697	4370
4/1/2011	781308	5813	7031	4427
4/2/2011	784248	6043	7759	4582
4/3/2011	787297	6047	7734	4556
4/4/2011	789005	6137	7193	4573
4/5/2011	790508	6322	7384	4684
4/6/2011	791131	6526	7802	4819
4/7/2011	790560	6887	7301	5002
4/8/2011	788643	7352	6084	5345
4/9/2011	783629	7353	5804	5310
4/10/2011	778529	7408	4870	5373
4/11/2011	773603	7552	4943	5486
4/12/2011	767724	7787	4818	5619
4/13/2011	761971	7914	4658	5703
4/14/2011	755536	7905	4442	5672
4/15/2011	748979	8003	4420	5719
4/16/2011	743005	8206	5340	5852

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
4/17/2011	738804	8211	6705	5852
4/18/2011	735960	8259	7806	5872
4/19/2011	732974	8545	7308	6041
4/20/2011	729349	8872	7130	6175
4/21/2011	724005	8988	7040	6264
4/22/2011	717847	9125	6008	6326
4/23/2011	711472	9002	6147	6158
4/24/2011	704156	8995	5882	6156
4/25/2011	696397	9093	5487	6189
4/26/2011	688251	9267	5435	6225
4/27/2011	680588	9345	6213	6175
4/28/2011	673777	9484	6628	6154
4/29/2011	668185	9374	7298	5959
4/30/2011	662570	9184	6824	5707
5/1/2011	656840	9044	6423	5547
5/2/2011	651604	8974	6764	5491
5/3/2011	647830	8835	7699	5374
5/4/2011	646575	8643	9295	5141
5/5/2011	648528	8404	11100	4819
5/6/2011	653378	8156	12453	4489
5/7/2011	659045	8201	13248	4506
5/8/2011	665020	8203	13037	4544
5/9/2011	667715	7727	9188	4130
5/10/2011	667287	7489	8645	3915
5/11/2011	665823	7341	7245	3764
5/12/2011	665776	7214	8228	3736
5/13/2011	669462	7004	10814	3621
5/14/2011	674252	6595	10447	3304
5/15/2011	679060	6503	10439	3267
5/16/2011	680588	6434	7873	3282
5/17/2011	680731	6527	6997	3464
5/18/2011	680922	6530	6879	3510
5/19/2011	679824	6301	5976	3274
5/20/2011	678774	6173	6041	3127
5/21/2011	678869	5989	6911	2895
5/22/2011	681065	5682	7991	2600
5/23/2011	684078	5821	8543	2666
5/24/2011	685756	6547	8530	3227
5/25/2011	687435	7002	9283	3556
5/26/2011	690223	7287	10369	3753

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
5/27/2011	694078	7352	11358	3775
5/28/2011	700464	7414	12867	3872
5/29/2011	705372	7405	11557	3918
5/30/2011	706152	7347	8798	3863
5/31/2011	705957	7265	8014	3741

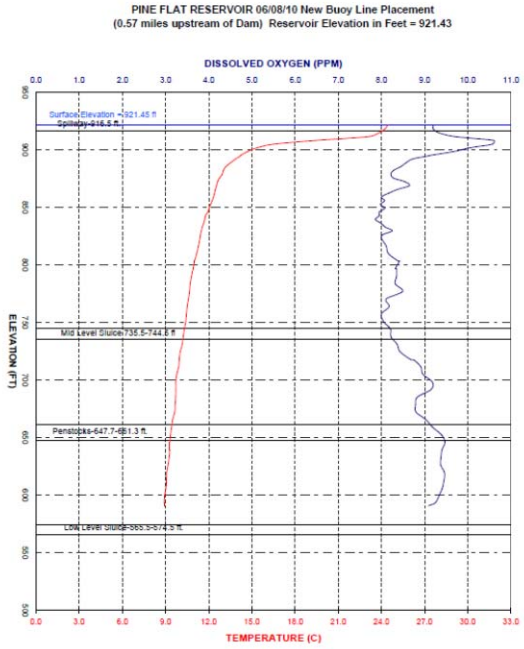
APPENDIX B

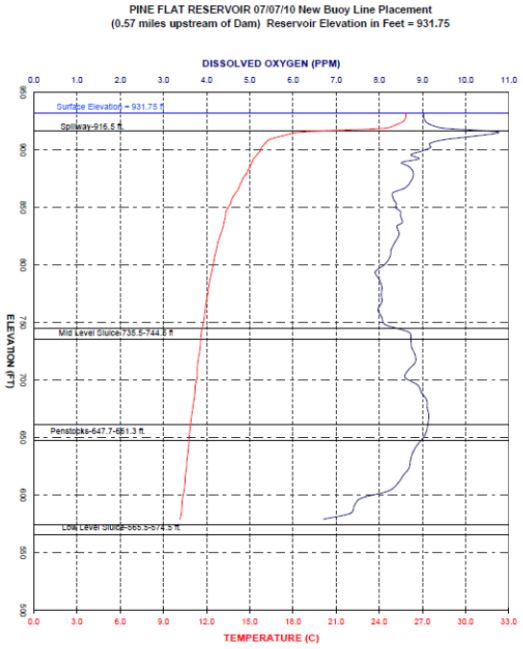
Hydrologic and Climate Summary Reports for 2010-2011 Program Year

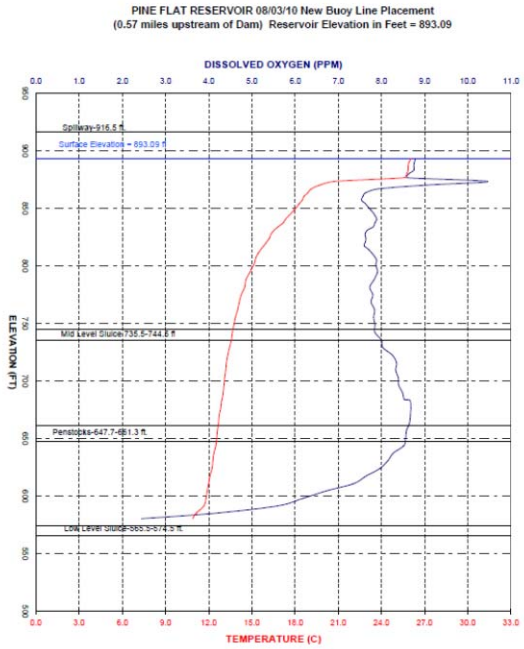
Due to a very good hydrologic year in the 2010-2011 program year, temperature issues were not present in the Kings River system, and as such, Hydrologic and Climate Summary Reports were not issued. The 2011-2012 program year will also likely be a year without these reports issued.

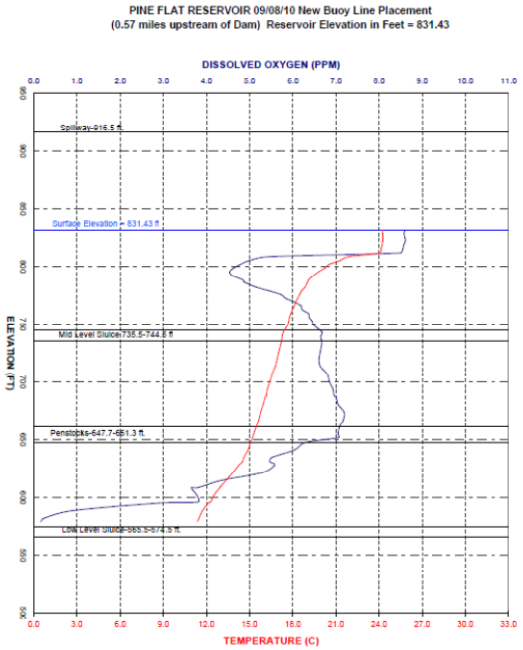
APPENDIX C

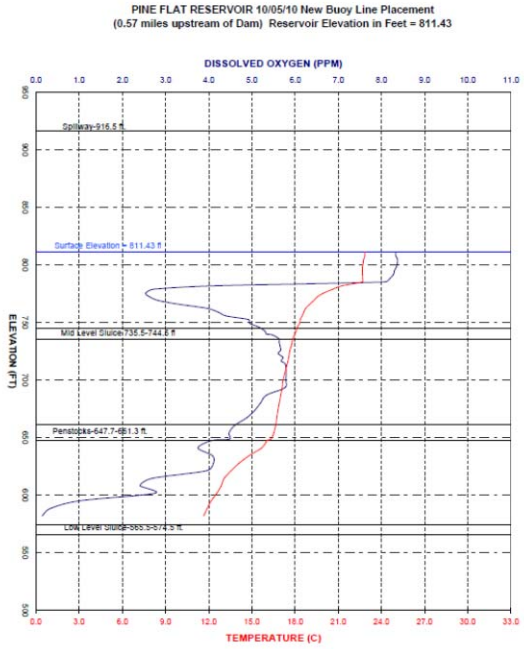
Pine Flat Reservoir Temperature and Dissolved Oxygen Profiles from May 2010 through May 2011 (on following pages)

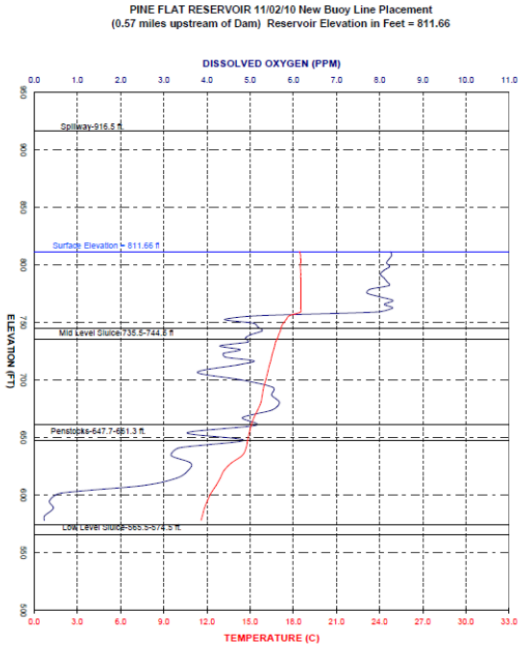

PINE FLAT RESERVOIR 06/08/10 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 921.43
DISSOLVED OXYGEN (PPM)
Surface Elevation = 921.45 ft
Spillway-916.5 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-661.3 ft
Low Level Sluice-565.5-574.5 ft
ELEVATION (FT)
TEMPERATURE (C)

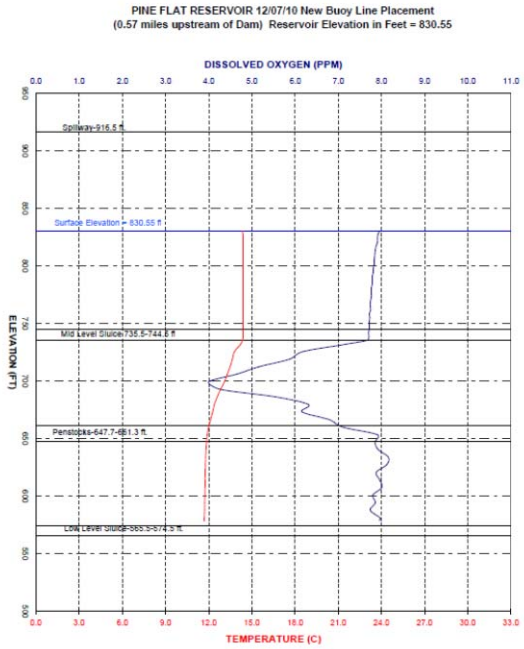

PINE FLAT RESERVOIR 07/07/10 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 931.75
DISSOLVED OXYGEN (PPM)
Surface Elevation = 931.75 ft
Spillway-916.5 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-661.3 ft
Low Level Sluice-565.5-574.5 ft
ELEVATION (FT)
TEMPERATURE (C)

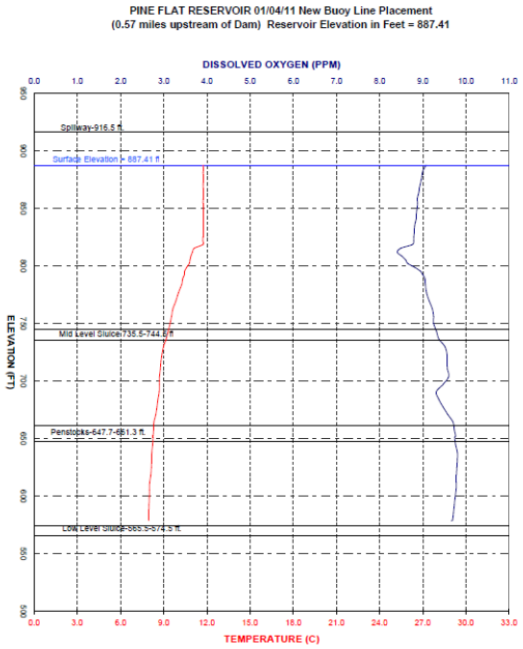

PINE FLAT RESERVOIR 08/03/10 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 893.09
DISSOLVED OXYGEN (PPM)
Spillway-916.5 ft
Surface Elevation = 893.09 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-661.3 ft
Low Level Sluice-565.5-574.5 ft
ELEVATION (FT)
TEMPERATURE (C)

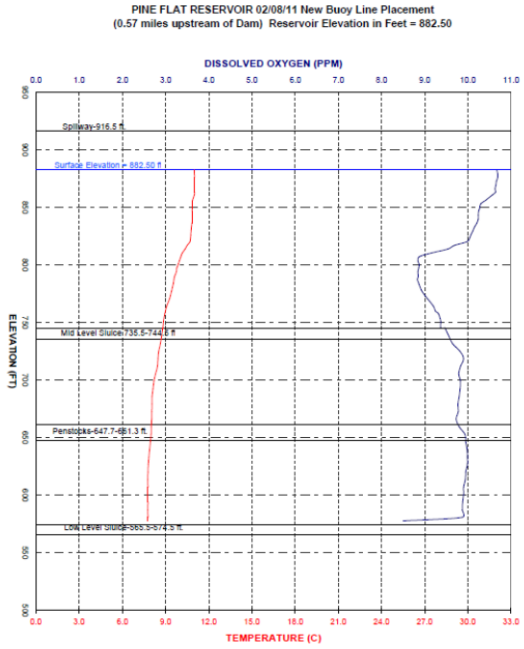

PINE FLAT RESERVOIR 09/08/10 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 831.43
DISSOLVED OXYGEN (PPM)
Spillway-916.5 ft
Surface Elevation = 831.43 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-661.3 ft
Low Level Sluice-565.5-574.5 ft
ELEVATION (FT)
TEMPERATURE (C)

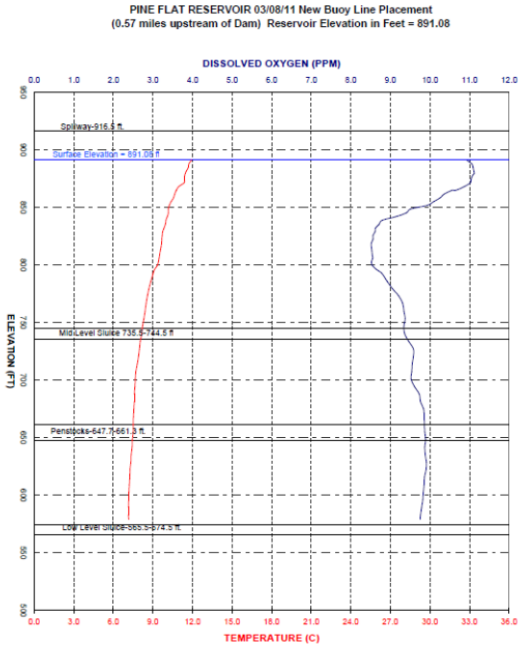

PINE FLAT RESERVOIR 10/05/10 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 811.43
DISSOLVED OXYGEN (PPM)
Spillway-916.5 ft
Surface Elevation = 811.43 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-681.3 ft
Low Level Sluice-565.5-574.5 ft
ELEVATION (FT)
TEMPERATURE (C)

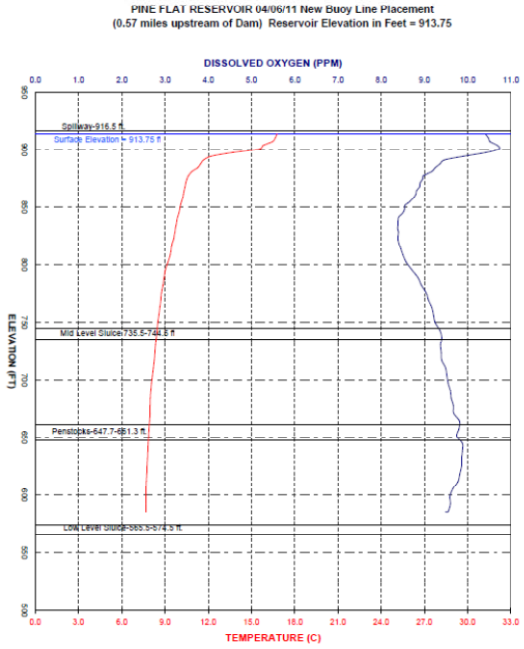

PINE FLAT RESERVOIR 11/02/10 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 811.66
DISSOLVED OXYGEN (PPM)
Spillway-916.5 ft
Surface Elevation = 811.66 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-681.3 ft
Low Level Sluice-565.5-574.5 ft
ELEVATION (FT)
TEMPERATURE (C)

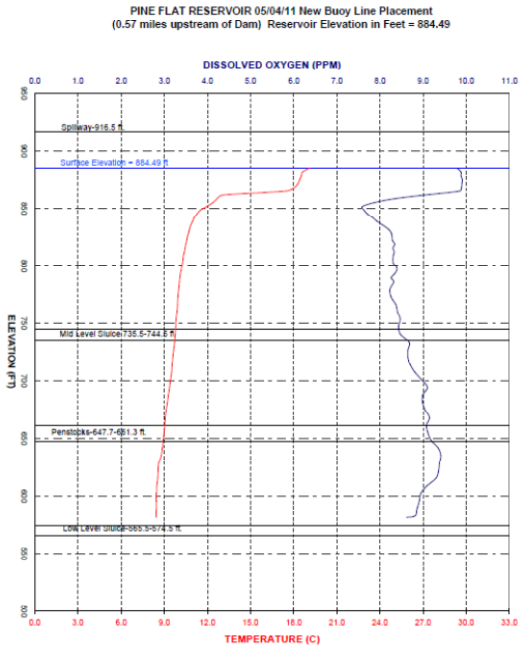

PINE FLAT RESERVOIR 12/07/10 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 830.55
DISSOLVED OXYGEN (PPM)
Spillway-916.5 ft
Surface Elevation = 830.55 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-681.3 ft
Low Level Sluice-565.5-574.5 ft
ELEVATION (FT)
TEMPERATURE (C)


PINE FLAT RESERVOIR 01/04/11 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 887.41
DISSOLVED OXYGEN (PPM)
Spillway-916.5 ft
Surface Elevation = 887.41 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-681.3 ft
Low Level Sluice-565.5-574.5 ft
ELEVATION (FT)
TEMPERATURE (C)


PINE FLAT RESERVOIR 02/08/11 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 882.50
DISSOLVED OXYGEN (PPM)
ELEVATION (FT)
TEMPERATURE (C)
Spillway-916.5 ft
Surface Elevation = 882.50 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-661.3 ft
Low Level Sluice-565.5-574.5 ft

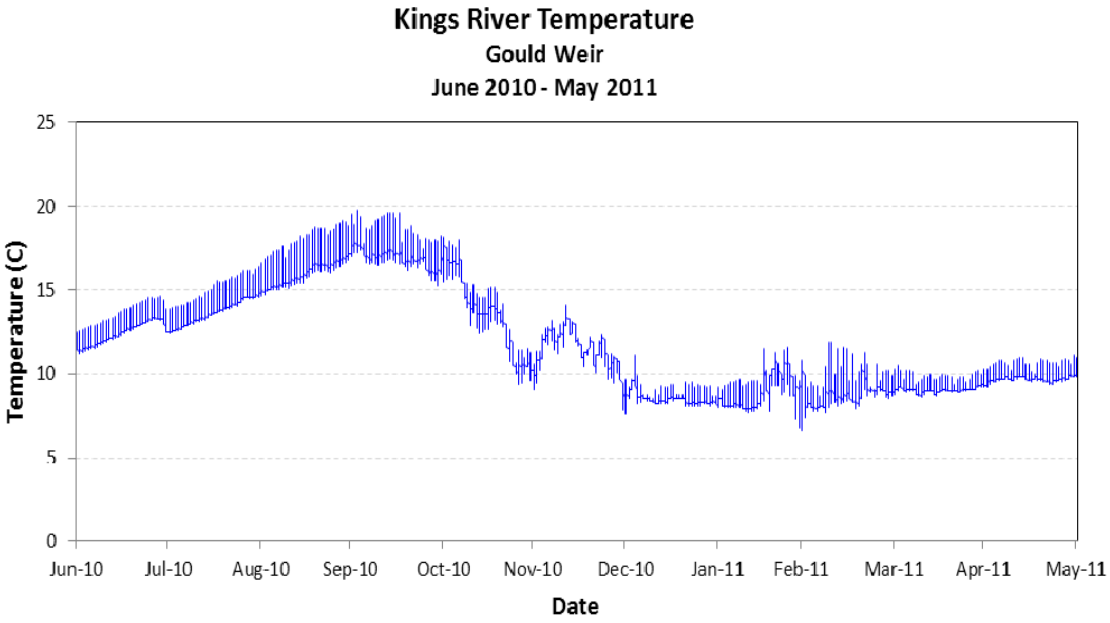

PINE FLAT RESERVOIR 03/08/11 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 891.08
DISSOLVED OXYGEN (PPM)
ELEVATION (FT)
TEMPERATURE (C)
Spillway-916.5 ft
Surface Elevation = 891.08 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-661.3 ft
Low Level Sluice-565.5-574.5 ft


PINE FLAT RESERVOIR 04/06/11 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 913.75
DISSOLVED OXYGEN (PPM)
ELEVATION (FT)
TEMPERATURE (C)
Spillway-916.5 ft
Surface Elevation = 913.75 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-661.3 ft
Low Level Sluice-565.5-574.5 ft


PINE FLAT RESERVOIR 05/04/11 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 884.49
DISSOLVED OXYGEN (PPM)
ELEVATION (FT)
TEMPERATURE (C)
Spillway-916.5 ft
Surface Elevation = 884.49 ft
Mid Level Sluice-735.5-744.5 ft
Penstocks-647.7-661.3 ft
Low Level Sluice-565.5-574.5 ft

APPENDIX D

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


Kings River Temperature
Gould Weir
June 2010 - May 2011
Temperature (C)
25
20
15
10
5
0
Jun-10
Jul-10
Aug-10
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Date

APPENDIX E

Water Quality Constituent Monitoring Results as provided by Ag-Waiver Program
(on following page)

						2010 Manning Avenue Tests							
Constituent	Field/Lab	BPO	MDL	PQL	Units	May 10	Jun 10	Jul 10	Aug 10	Sept 10	Oct 10	Nov 10	Dec 10
Flow	KRWA				cfs	2000	3530	3338	2730	590	70	70	45
EC	Field	200			umhos/cm	44.9	34.6	23.1	21.4	31.3	84.2	123.6	141.7
EC dup	Field	200			umhos/cm	43.5	34.2	23.2	21.2	31.3	84.5	123.1	141.3
pH	Field	6.5-8.3			pH	6.92	6.94	6.78	6.73	6.62	7.01	7.25	7.12
pH dup	Field	6.5-8.3			pH	7.02	6.85	6.88	6.75	6.77	7.19	7.5	7.17
Temperature	Field				Celsius	10.1	12.8	15.2	16	19	17.5	12.9	13.1
Temperature dup	Field				Celsius	9.9	12.8	15.3	16	19.1	17.6	12.9	13.1
Dissolved Oxygen	Field	7			mg/L	11.26	10.69	10.4	10.3	8.41	9.54	10.82	9.53
Dissolved Oxygen dup	Field	7			mg/L	11.3	10.99	9.95	10.03	8.48	9.38	10.53	8.83
TDS	APPL		4.4	10	mg/L	ND	25	29	18	24	52	57	100
Turbidity	APPL		0.035	0.1	NTU	3.6	0.53	1	0.78	0.34	0.4	0.54	0.36
Nitrate-N	APPL		0.01	0.2	mg/L	0.22	ND	0.18 J	0.19 J	0.25	0.42	0.59	0.56
Nitrite-N	APPL		0.01	0.1	mg/L	ND	ND	ND	ND	ND	ND	ND	ND
Orthophosphate-P	APPL		0.21	0.6	mg/L	ND	ND	ND	ND	ND	ND	ND	ND
Ammonia-N	APPL	25 ug/L	0.12	0.5	mg/L	ND	ND	ND	ND	ND	1.3 B	0.33 J	ND
Unionized Ammonia	APPL				mg/L	ND	ND	ND	ND	ND	0.0044 B	0.0014 J	ND
TKN	APPL		0.267	0.5	mg/L	ND	ND	ND	ND	0.55	0.77	ND	ND
Color	APPL			1	APHA	15	13	15	9	6	15	13	12
Phosphorus	APPL		8.1	50	ug/L	13.1 J	ND	ND	ND	ND	43.9 J	139	131
Arsenic	APPL		0.09	0.2	ug/L								
Boron	APPL		5	10	ug/L								
Cadmium	APPL		0.02	0.2	ug/L								
Copper	APPL		0.13	0.5	ug/L								
Lead	APPL		0.11	0.2	ug/L								
Nickel	APPL		0.16	0.5	ug/L								
Selenium	APPL		0.1	1	ug/L								
Zinc	APPL		2.3	20	ug/L								
Hardness	APPL		1	1	mg/L	15.3	12.8	8.5	7.1	10.8	35.8	44.4	48.5
Molybdenum	APPL		0.07	0.5	ug/L	2.1	1.6	1.1	1.2	1.9	1.4	2.4	2.5

2011 Manning Avenue Tests										
Constituent	Field/Lab	BPO	MDL	PQL	Units	Jan 11	Feb 11	Mar 11	April 11	May 11
Flow	KRWA				cfs	1340	829	210	{1}	3200
EC	Field	700			umhos/cm	70.1	53.2	114.8		47.2
EC dup	Field	700			umhos/cm	70.2	52.3	114.9		44.4
pH	Field	6.5-8.3			pH	7.31	7.16	7.24		6.9
pH dup	Field				pH	7.36	7.2	7.28		7.17
Temperature	Field	var			Celsius	9	8.2	12.7		11.2
Temperature dup	Field				Celsius	9	8.2	12.8		10.4
Dissolved Oxygen	Field	5 & 7			mg/L	10.99	10.98	10.01		11.4
Dissolved Oxygen dup	Field				mg/L	10.9	11.12	9.12		10.57
TDS	APPL	450	4.4	10	mg/L	56	46	71		46
Turbidity	APPL	var	0.035	0.1	NTU	2.6	0.68	0.9		0.98
Nitrate-N	APPL		0.01	0.2	mg/L	0.29	0.19 J	0.62		
Nitrite-N	APPL		0.01	0.1	mg/L	ND	ND	ND		
Nitrate-Nitrite N	Caltest		0.02	0.05	mg/L					0.08
Orthophosphate-P	APPL/Caltest		0.006	0.006	mg/L	ND	ND	ND		0.014
Ammonia-N	APPL/Caltes	var	0.04	0.1	mg/L	0.29 J	0.21 J	ND		ND
Unionized Ammonia	APPL/Caltes	25 ug/L			mg/L	0.01 J	0.005 J	ND		
TKN	APPL		0.267	0.5	mg/L	ND	ND	ND		0.31 J
Color	APPL			1	APHA	19	14	15		18
Phosphorus	APPL/Caltest		0.007	0.01	mg/L	136	107	155		0.025
Arsenic	APPL	150	0.09	0.2	ug/L					
Boron	APPL/Caltes	700	0.7	10	ug/L					6.6 J
Cadmium	APPL/Caltes	var	0.04	0.1	ug/L					ND
Copper	APPL	var	0.13	0.5	ug/L					
Lead	APPL	var	0.11	0.2	ug/L					
Nickel	APPL	var	0.16	0.5	ug/L					
Selenium	APPL	5	0.1	1	ug/L					
Zinc	APPL/Caltes	var	0.7	1	ug/L					2.8
Hardness	APPL		1	1	mg/L	26.6	19.5	41.6		14.3
Molybdenum	APPL	10	0.07	0.5	ug/L	1.3	2.4	0.66		1.1