



**KINGS RIVER FISHERIES MANAGEMENT PROGRAM
ANNUAL TECHNICAL REPORT
2014-2018**



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EXECUTIVE SUMMARY

The Kings River Water Association, Kings River Conservation District, and California Department of Fish and Wildlife 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 eighteen years in response to the Kings River Fisheries Management Program (KRFMP) Framework Agreement, which was approved on May 28, 1999, with the financial commitment extended for another ten-year period on June 26, 2009. The Framework Agreement includes actions designed to protect and enhance fishery habitat within the lower Kings River and in Pine Flat Reservoir. The Technical Steering Committee is responsible for implementing the actions authorized under the agreement and approved by the Executive Policy Committee. The scope of activities undertaken as part of the KRFMP between May 2014 and September 2018 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 KRFMP.

- Most instream flow targets met as outlined in the Framework Agreement, with most days greatly exceeding these targets;
- Launched a new Kings River Fisheries Management Program website in 2017;
- Incubated over 1.2 million rainbow trout eggs in the incubator building;
- Sponsored multiple habitat projects in Pine Flat Reservoir;
- Implementation of a supplemental stocking plan

1.0 INTRODUCTION

The Kings River Water Association (KRWA), Kings River Conservation District (KRCD), and California Department of Fish and Wildlife (CDFW) 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 eighteen years in response to the Kings River Fisheries Management Program (KRFMP) Framework Agreement, which was approved on May 28, 1999. The Framework Agreement includes 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. The scope of activities undertaken as part of the KRFMP between May 2014 and September 2018 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;
- Routine fish stocking by the CDFW and continued contributions of rainbow trout fry produced from the incubator building; and
- Maintenance activities including brushing and clearing the roads and trails at the Thorburn spawning channel and cleaning the head gate.

The annual report provides a project management structure for reviewing and prioritizing existing and proposed 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 improves 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 KRFMP.

1.1 ADMINISTRATIVE ACTIVITIES

On June 26, 2009, the parties to the KRFMP agreed to and signed a 10-year financial extension of the Framework Agreement, ensuring that the enhancement efforts will continue into the next ten-year period.

1.2 ANNUAL TECHNICAL REPORT

Interested parties and stakeholders, including the KRFMP Executive Policy Committee (ExCom), KRFMP Public Advisory Group (PAG), resource and water agencies, local angling groups, and others have expressed interest in the information being collected as part of the KRFMP'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.

2.0 HYDROLOGY AND OPERATIONS

2.1 RESERVOIR INFLOW

Daily average inflow into Pine Flat Reservoir from hydrologic years 2014-2018, October 1, 2013 through September 30, 2018, are 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. Kings River basin discharge averaged 2,027 cfs, ranging from 83 to 27,197 cfs. Table 2-1 shows the Kings River calculated annual runoff and the corresponding percent water year for the past 19 years; years included in this report are in bold text.

Table 2-1: Kings River basin calculated annual runoff by Water Year, October-September

Water Year (Oct-Sept)	Annual Runoff (TAF)	Percent Water Year
2000	1,534	90%
2001	1,010	59%
2002	1,141	67%
2003	1,426	84%
2004	1,050	62%
2005	2,531	149%
2006	2,952	173%
2007	679	39%
2008	1,216	74%
2009	1,348	79%
2010	2,062	121%
2011	3,318	193%
2012	826	48%
2013	691	40%
2014	537	33%
2015	361	17%
2016	1,253	72%
2017	4,096	220%
2018	1,275	75%

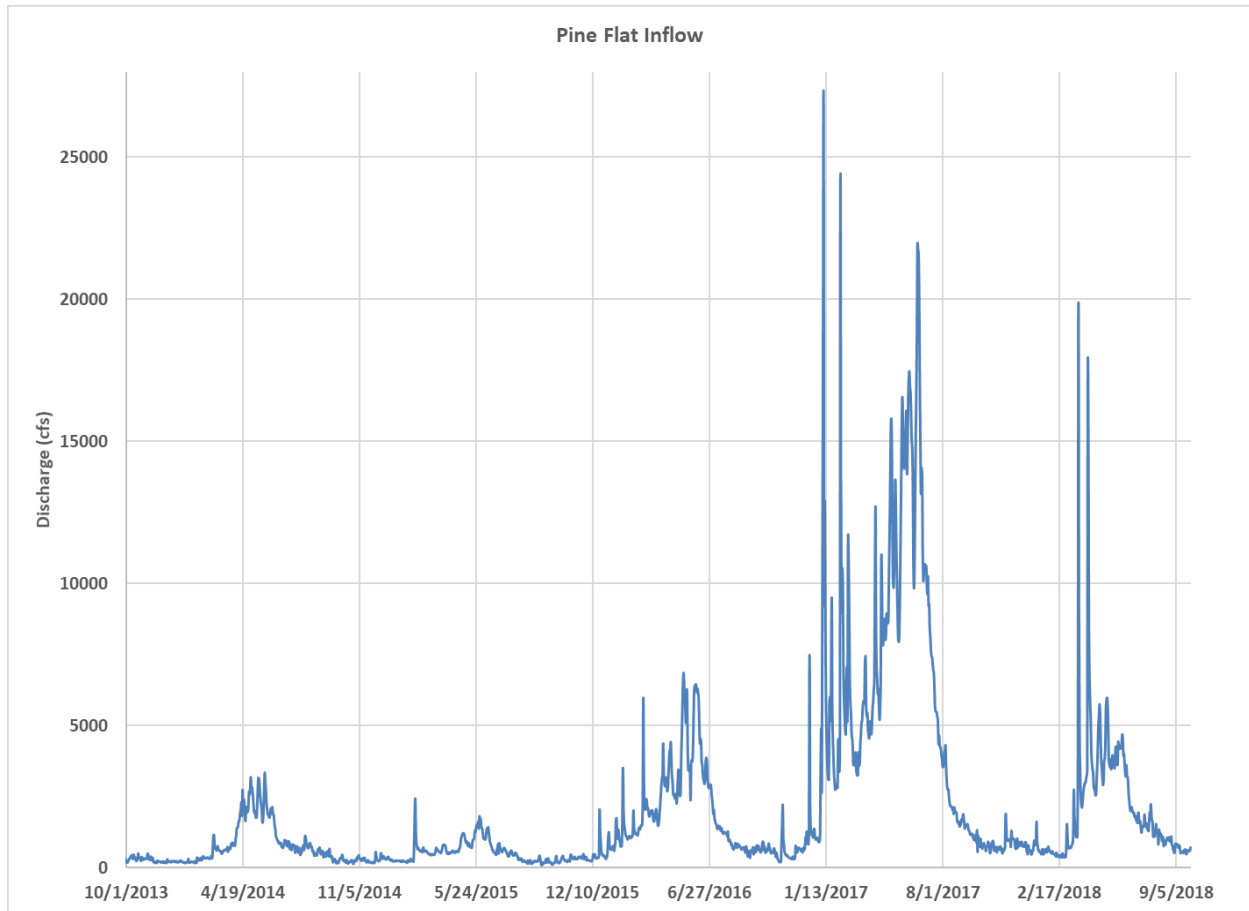


Figure 2 – 1: The estimated annual inflow into Pine Flat Reservoir for water years 2014 - 2018

2.2 RESERVOIR STORAGE

Daily reservoir water storage volume in Pine Flat Reservoir from October 1, 2013 through September 30, 2018 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 100,000 acre-feet.

2.3 RESERVOIR RELEASES

Framework Agreement established minimum instream Exhibit C and Exhibit D flow releases from Pine Flat Reservoir (Figure 2-3), flow at Piedra (Figure 2-4), in Dennis Cut (Figure 2-5), at Fresno Weir (Figure 2-6) and below Fresno Weir (Figure 2-7) to support resident fish populations in the lower river (Table 2-2).

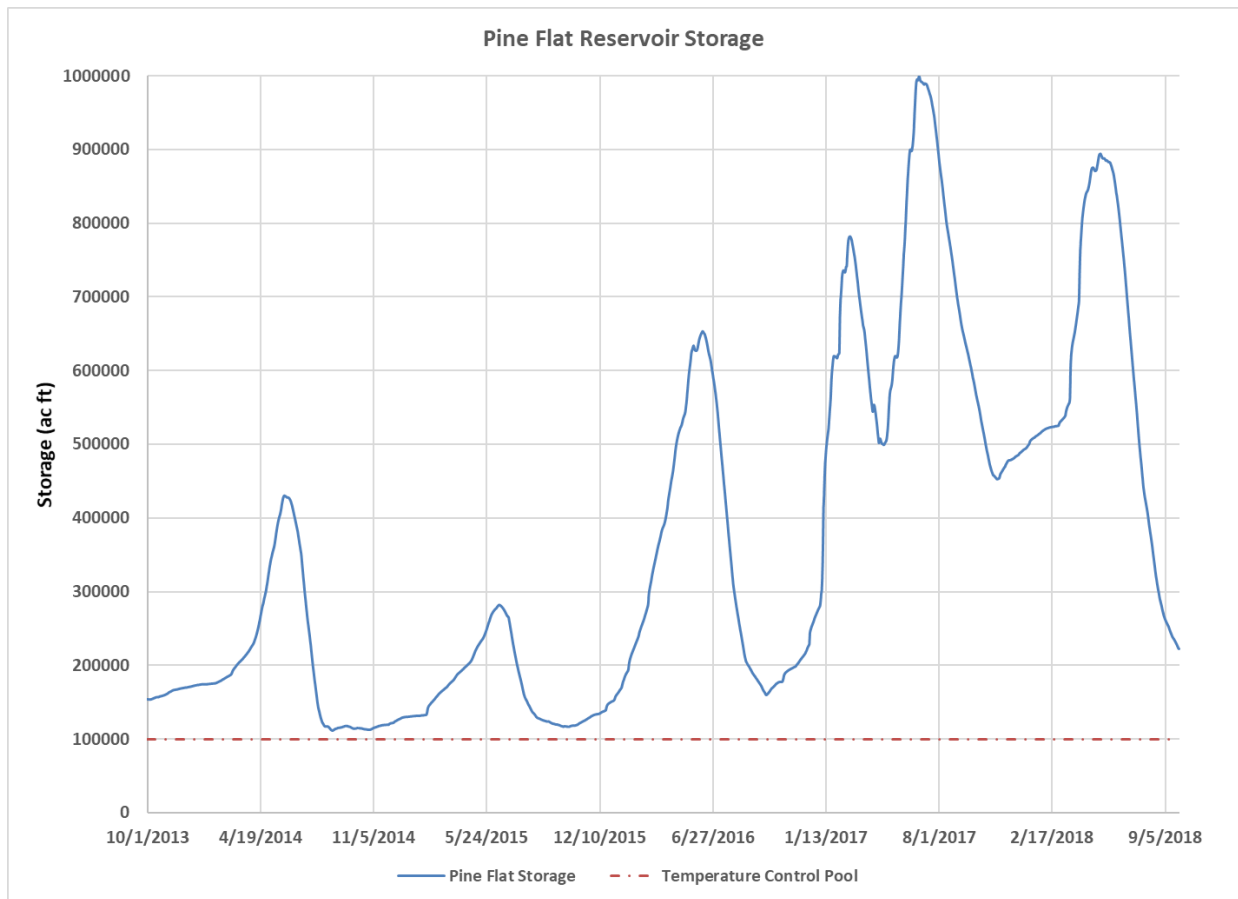


Figure 2-2: Average daily storage in Pine Flat from October 1, 2013 through September 30, 2018

Water discharge from Pine Flat Reservoir to the lower Kings River show high variability within the year as shown in Figure 2-3. Average daily discharge from Pine Flat in the lower Kings River from October 1, 2013 through September 30, 2018 ranged from 51 to 14,783 cfs, all above target flows. Average discharge from Pine Flat was 1,903 cfs during the report period.

Daily average Kings River flow at Piedra from October 1, 2013 through September 30, 2018 demonstrated two slight departures from the 100 cfs target as outlined in the Framework Agreement (Figure 2-4). The daily flow at Piedra on February 6 and 7, 2014 were respectively 99 and 98 cfs. Flow at Piedra averaged 2,022 cfs, during the report period, ranging from 98 to 14,791 cfs.

Daily average flow at Dennis Cut from October 1, 2013 through September 30, 2018 demonstrated several slight departures from the 5 cfs target as outlined in the Framework Agreement, totaling 14-days with flows below the target; five days at 3 cfs and nine days at 4 cfs (Figure 2-5). Flow at Dennis Cut averaged 72 cfs during the report period, ranging from 3 to 510 cfs.

Four hydrologic years of the Exhibit C flow schedule in WY 2014, 2015, 2016, and 2018 (95 cfs, for a water year less than 1,555,000 acre feet), and one wet hydrologic year of the Exhibit D flow schedule in WY 2017 (95 cfs with 250 cfs “enhanced minimum flow period” November 14, 2017

until March 31, 2018 for a water year exceeding 2,100,000 acre feet) framed conditions at Fresno Weir (Figure 2-6). Daily average Kings River flow at Fresno Weir from October 1, 2013 through September 30, 2018 demonstrated several slight departures from the 95 cfs target at Fresno Weir as outlined in the Framework Agreement. For the period November 14-16 and 18, 2014 flow at Fresno Weir was 92, 92, 93 and 94 cfs (respectively). For the period September 25-26 and 29, 2015 flow at Fresno Weir was 93, 93, and 94 cfs (respectively). These corresponded with the end of the irrigation coordinated run period, a time-period where flows are being adjusted to meet KRFMP targets. Flows during the time-period between February 18, 2015 and May 25, 2018 were below normal target flow under direction of the ExCom per Exhibit C of the Framework Agreement during the extended drought period. Over the entire period WY 2014-2018, flow at Fresno Weir averaged 1,565 cfs, ranging from 49 to 13,112 cfs.

Daily flows below Fresno Weir from October 1, 2013 through September 30, 2018 were above targets as outlined in the Framework Agreement (Figure 2-7). Flow below Fresno Weir averaged 972 cfs, ranging from 35 to 10,282 cfs.

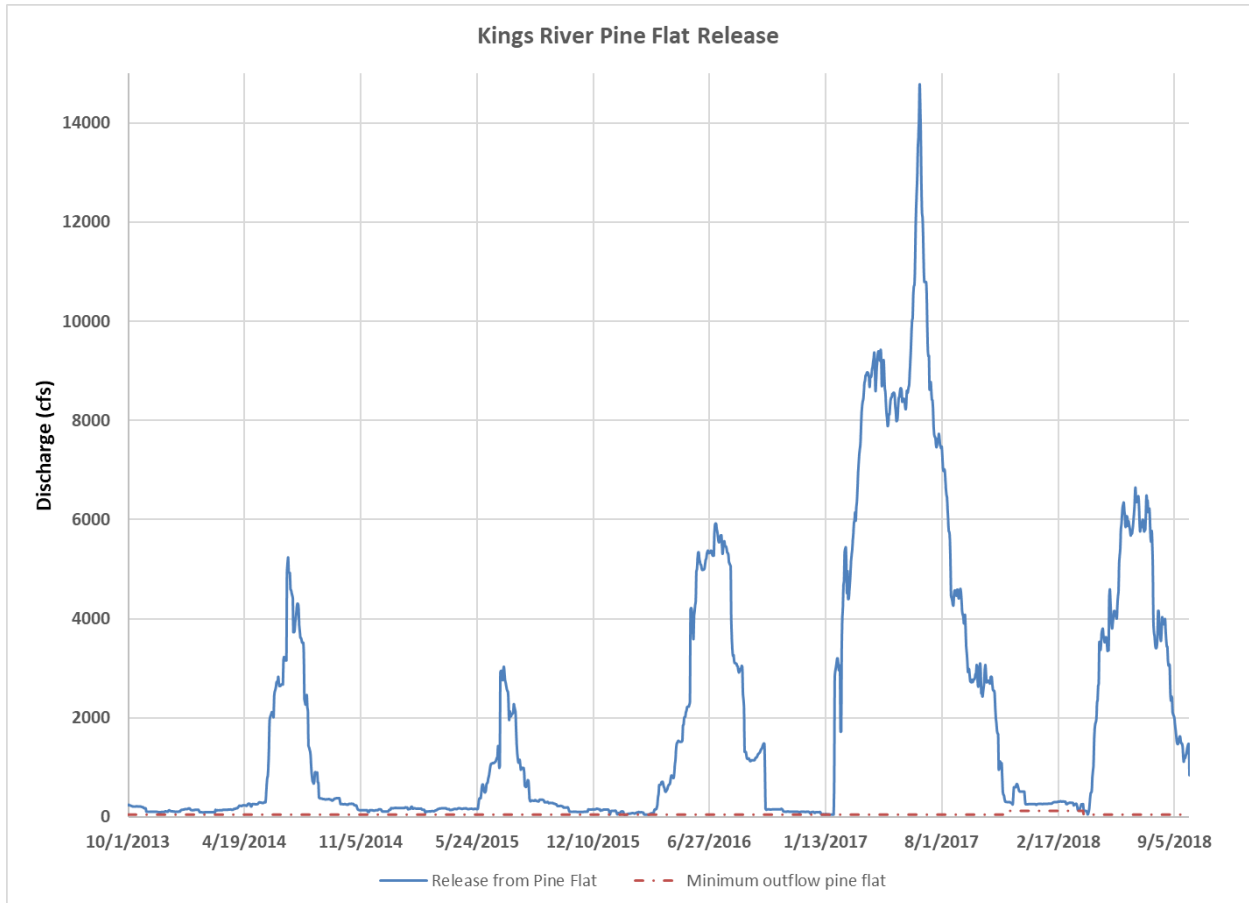


Figure 2-3: Average daily discharge from Pine Flat into the Kings River from October 1, 2013 through September 30, 2018

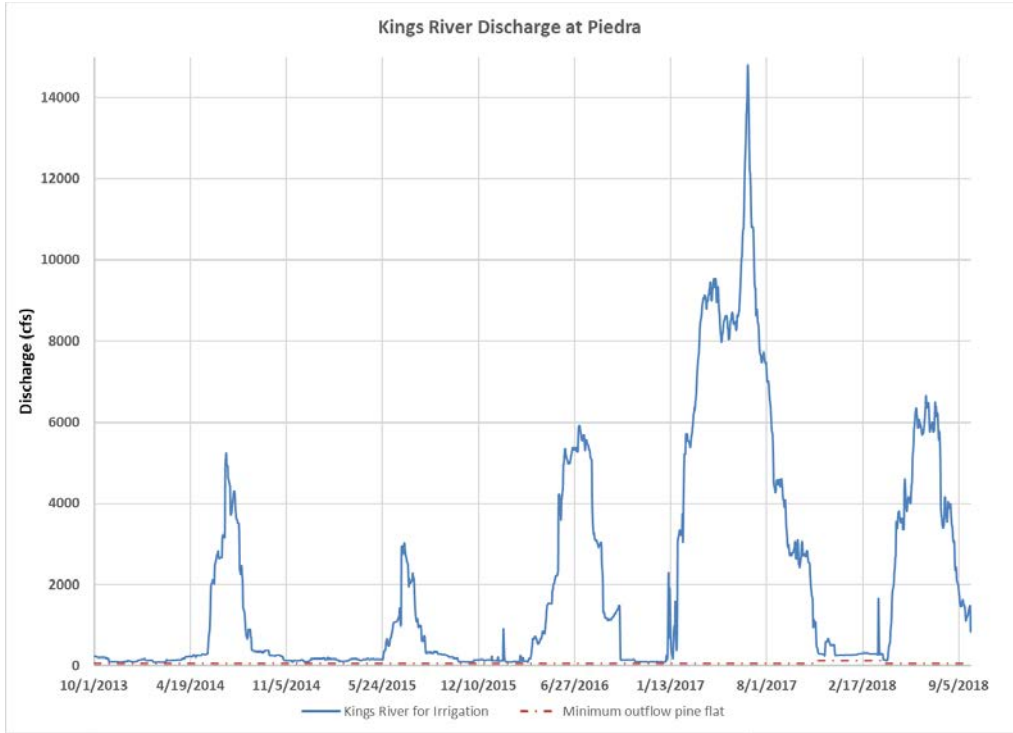


Figure 2-4: Average daily flow of Kings River at Piedra from October 1, 2013 through September 30, 2018

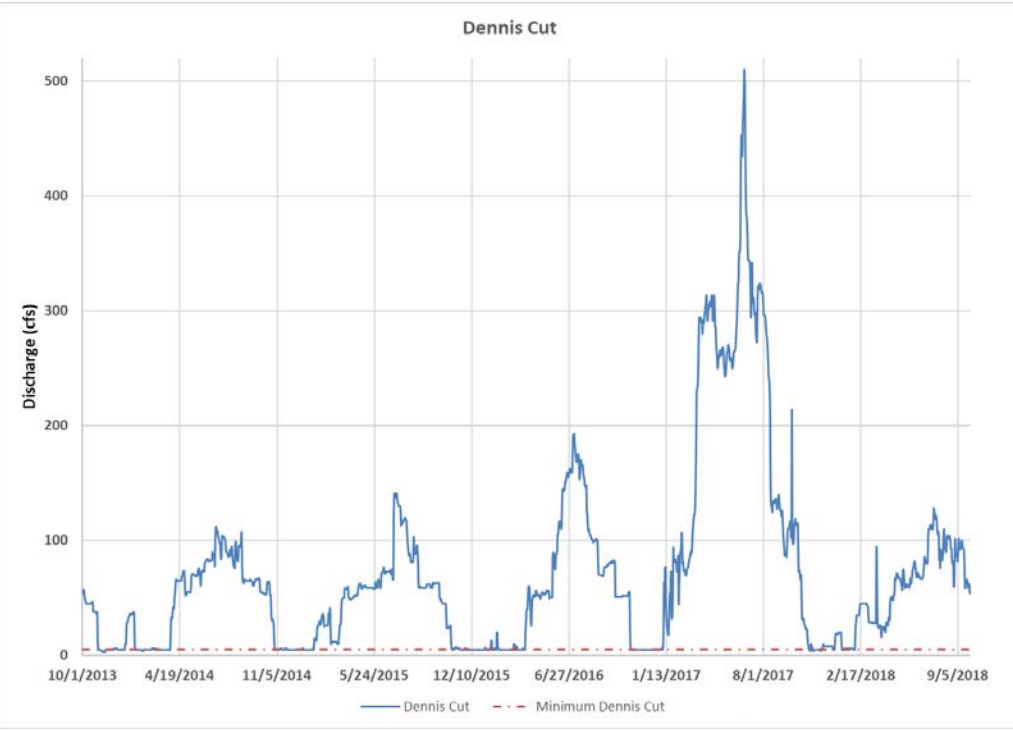


Figure 2-5: Average daily flow in Dennis Cut from October 1, 2013 through September 30, 2018

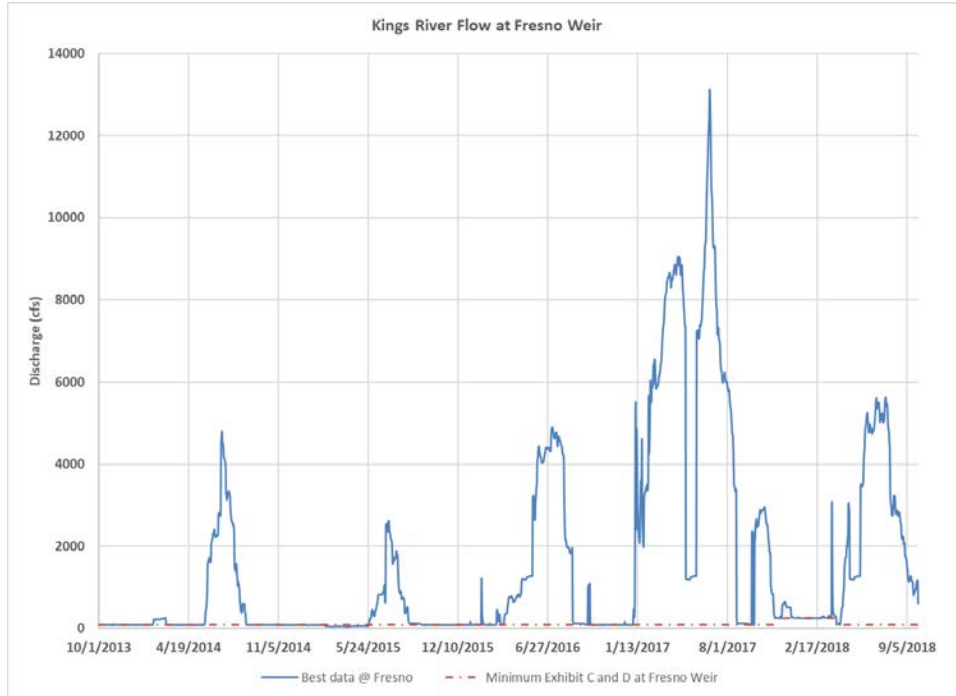


Figure 2-6: Average daily flow of Kings River at Fresno Weir from October 1, 2013 through September 30, 2018

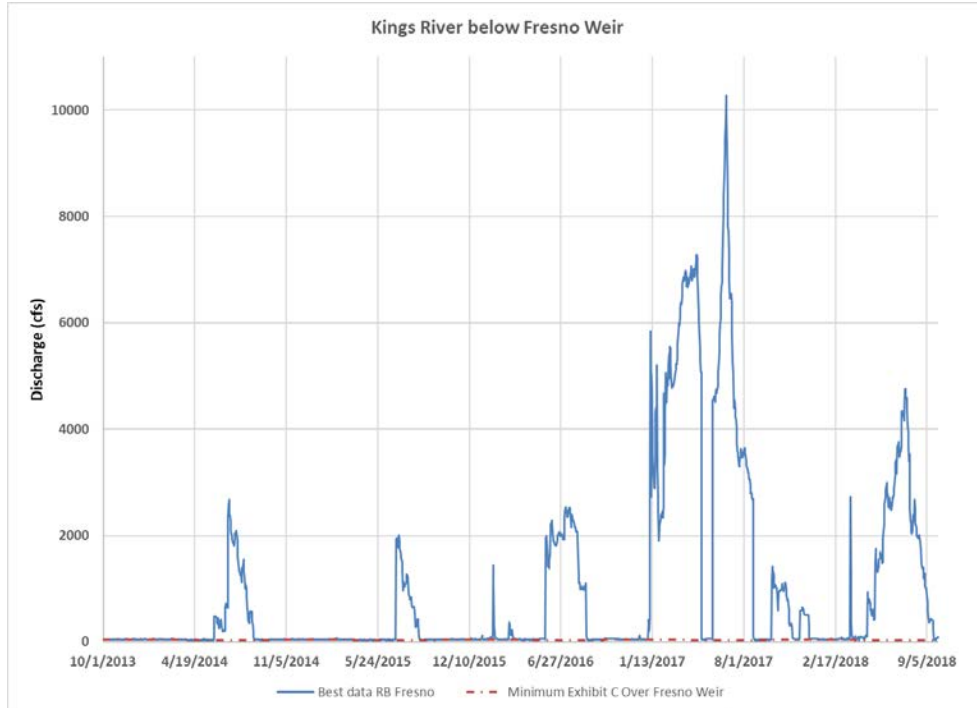


Figure 2-7: Average daily flow of Kings River below Fresno Weir from October 1, 2013 through September 30, 2018

2.4 TELEMETRY SYSTEM

Use of real-time flow monitoring stations below Fresno Weir and at Dennis Cut continued. 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 water temperature monitoring system complements 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 biota within the river.

2.5 EXHIBIT C AND D FLOWS

Exhibit D flows were provided from November 14, 2017 when irrigation demand became less than 250 cfs until March 31, 2018. These flows were triggered by the wetter than normal water-year in October 2016 – September 2017, with 4,096,000 acre feet of runoff, 220% of normal. The dry 2014-2016 and 2018 WY (33, 17, 72, and 75% respectively) triggered an Exhibit C requirement.

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

Exhibit C flows	Oct 1 - Nov 15	Nov 16 - Mar 31	Apr 1 - Sept 30
Required from Pine Flat	50	50	50
Total flow at Piedra	100	100	100
Minimum in Dennis Cut	5	5	5
Minimum to Fresno Weir	95	95	95
Water divertible to China Slough	10	5	15
Required over Fresno Weir	40	45	35

2.6 SUMMARY

Hydrologic conditions, Pine Flat Reservoir operations and flows within the lower river during 2014-2018 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;
- Daily average discharge from Pine Flat and Kings River flow and water temperatures at Fresno Weir from October 2013 through June 2018 demonstrated 100% compliance with the instream flow targets as outlined in the Framework Agreement, with most days greatly exceeding these targets;
- A real-time telemetry system provided information on flow at Fresno Weir and Dennis Cut that is available for monitoring and managing conditions within the lower river as part of the fishery program;
- Flows measured at Fresno Weir were subject to the levels representing a dry hydrologic year of the Exhibit C flow schedule during WY 2014, 2015, 2016, and 2018 (95 cfs at Fresno Weir, for a water year less than 1,555,000 acre feet), and one wet hydrologic year of the Exhibit D flow schedule in WY 2017 (95 cfs with 250 cfs “enhanced minimum flow period” November 14, 2017 until March 31, 2018 for a water year exceeding 2,100,000 acre feet);
- Dennis Cut, Kings River at Piedra and King River at Fresno Weir flow from October 2013 through June 2018 showed slight departures from target instream flow as outlined in the Framework Agreement, with most days greatly exceeding these flow targets.

3.0 WATER QUALITY

Water quality monitoring as part of the KRFMP has focused 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 temperature and dissolved oxygen at the Army Corp of Engineers (ACOE) Bridge and at Fresno Weir.

3.1 RESERVOIR WATER QUALITY

Reservoir temperature and dissolved oxygen measurements are monitored throughout the year. Reservoir profile data are used in temperature control pool management during the fall months after completion of the irrigation season to provide suitable temperature conditions for trout and other fish species within Pine Flat Reservoir and the lower river. Water temperature at each outlet (dam and power plant) are used on a real-time basis for use in evaluating water temperature released from the reservoir into the lower Kings River.

Vertical profiles in Pine Flat Reservoir of temperature and dissolved oxygen are collected on a regular basis. An example reservoir profile is presented in Figure 3-1. Appendix A includes monthly vertical reservoir temperature and dissolved oxygen profile measurements during the period June 2014 – September 2018. A characteristic seasonal pattern of thermal stratification beginning in the spring includes formation of a reservoir hypolimnion (cold water layer near the bottom) and epilimnion (warmer water layer near the surface), which increases through the summer months. Reservoir thermal stratification continues into the fall, at which time atmospheric cooling results in uniform water temperatures throughout the reservoir (reservoir destratification). Later in the fall-winter, cold air temperatures cool the upper layer of water so that the epilimnion is colder than the hypolimnion (reservoir turnover).

3.2 RIVER WATER QUALITY

Water temperature and dissolved oxygen concentrations within the lower Kings River are monitored at the ACOE Bridge, which is located 0.6 miles downstream of Pine Flat Dam. A Hydrolab DataSonde records water temperature and dissolved oxygen levels every 10 minutes. Water temperature is also measured at Fresno Weir. Average daily water temperature in the lower Kings River are shown for ACOE Bridge (Figure 3-2) and Fresno Weir (Figure 3-3). Temperatures within the river have a seasonal pattern, with lowest temperatures occurring during the winter and early spring and 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. Spatial temperature gradients occur in the lower river with the coldest temperatures typically near Pine Flat Dam and increasing as a function of distance downstream within the lower river. The diel temperature variation (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 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 (Moyle, 2002). Because 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. As a general guideline, water temperatures within the range from approximately 15-18°C have been identified as providing optimal habitat conditions for growing 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 cold water species such as rainbow trout may decrease.

As a condition of the Federal Energy Regulatory Commission (FERC) Project License P-2741 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 in operation. KRCD met its license operating and monitoring requirements for the duration of this reporting period. The Hydrolab dissolved oxygen meter used for monitoring is calibrated to laboratory standards with an accuracy of ± 0.5 mg/L. Dissolved oxygen concentrations at the ACOE Bridge during the period from June 2014 through September

2018 are presented in Figure 3-4. Dissolved oxygen concentrations within the lower Kings River are within the range considered suitable for various fish and macroinvertebrate species that occur in this section of the river.

3.3 SUMMARY

Several 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. Water quality monitoring within Pine Flat Reservoir and the lower Kings River during 2014 -2018 have shown:

- Pine Flat Reservoir can become 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). Reservoir profile water temperature becomes almost uniform in the late-fall and winter.
- The temperature of water released from the reservoir into the lower river can be managed through selective operation of different outlet works, including the turbine bypass. The ability to manage water temperatures is limited by the availability of cold water and release points during various seasonal periods within the reservoir.
- Aeration and mixing of water released from the reservoir are effective in maintaining suitable temperature and dissolved oxygen concentrations within the lower river.
- Water temperatures in the lower river have a seasonal pattern with the coldest temperatures occurring during the late winter and temperatures generally increasing during the summer and early fall.
- Water temperatures are variable along a longitudinal gradient downstream of Pine Flat Dam. During summer months the coldest temperatures are immediately downstream of the dam and temperatures generally increase with distance downstream from the dam until reaching thermal equilibrium with downstream from Pine Flat Dam, atmospheric conditions. During the fall and winter, when atmospheric temperatures are cool, a reverse temperature gradient may be observed with temperatures decreasing as a function of distance.

**PINE FLAT RESERVOIR 5/8/14 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 808.05**

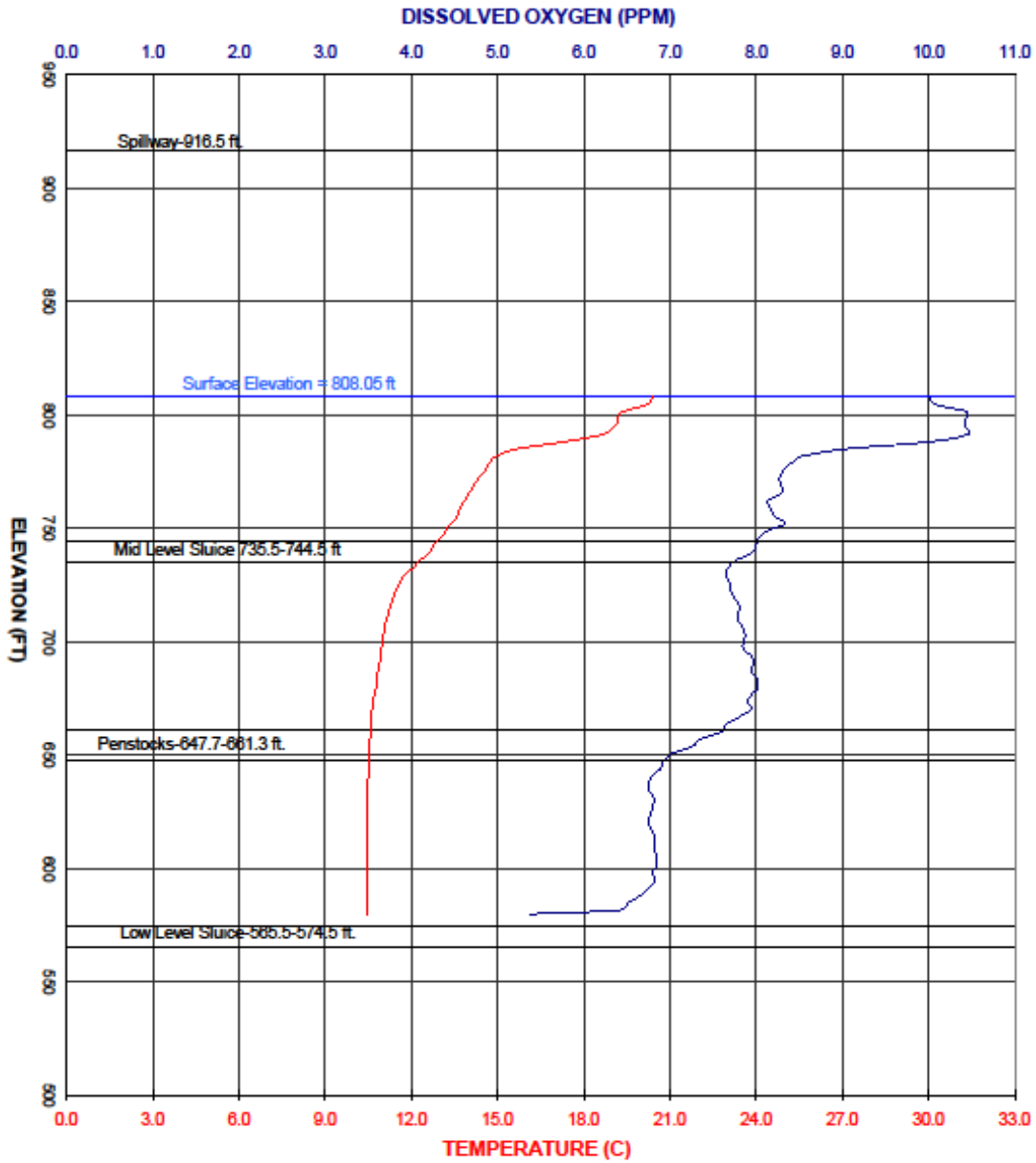


Figure 3-1: Pine Flat Reservoir profile taken 05/08/2014

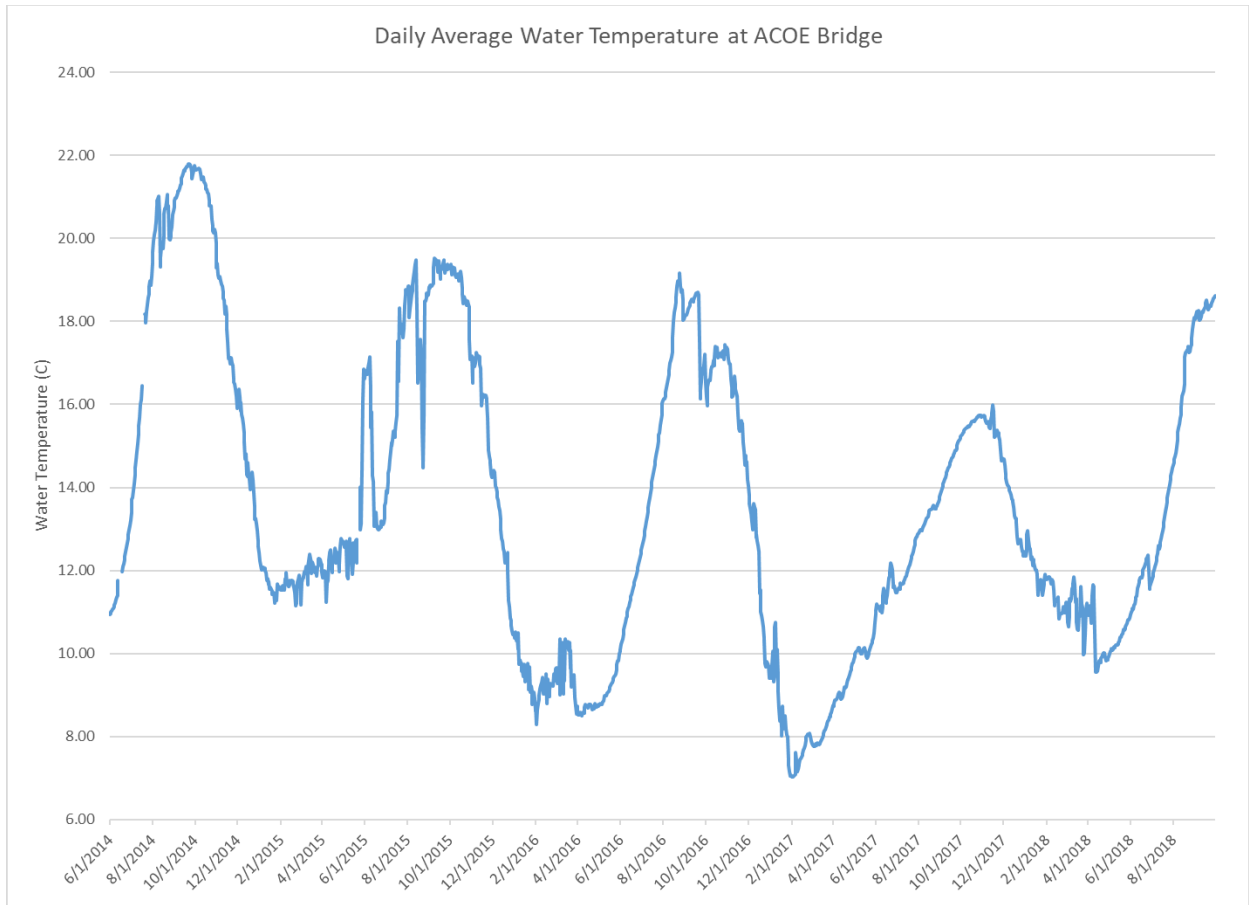


Figure 3-2: Daily average water temperature at ACOE Bridge June 1, 2014 thru September 30, 2018

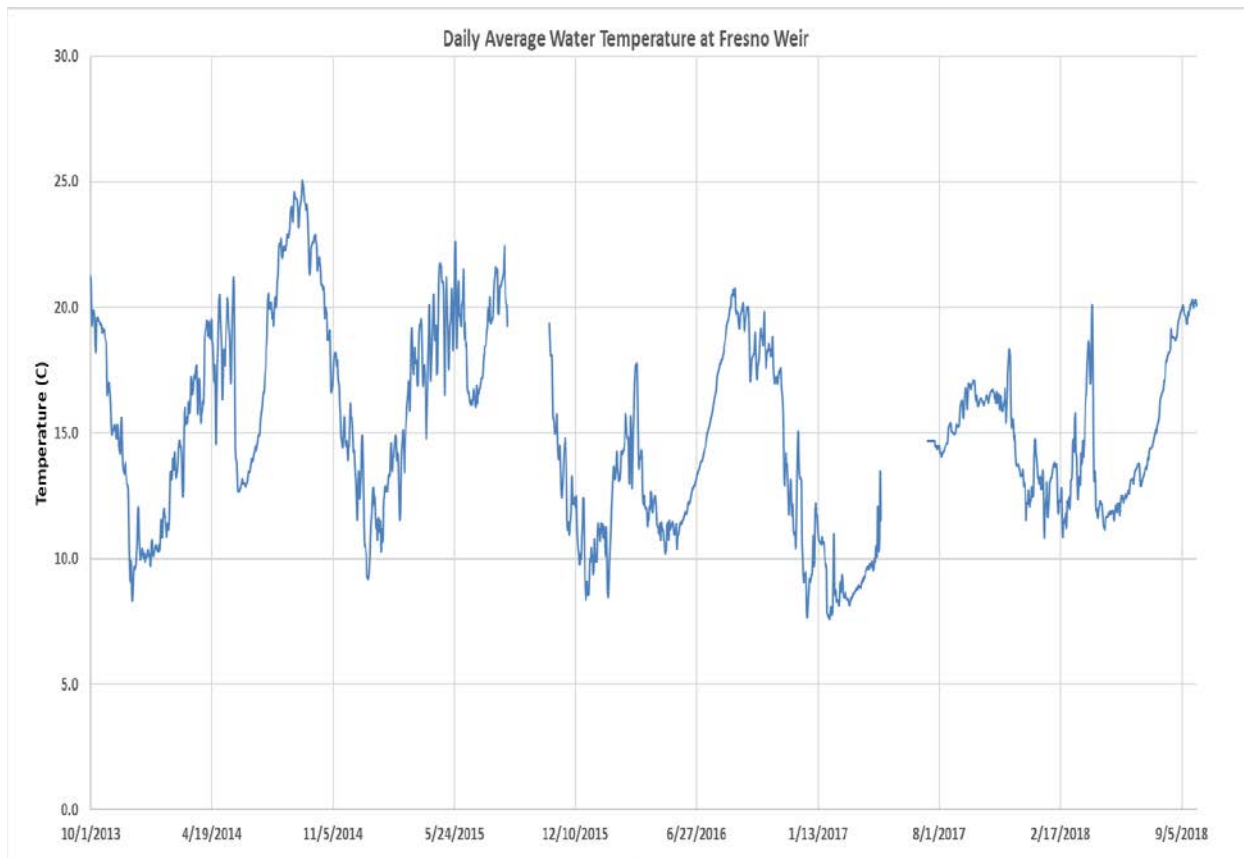


Figure 3-3: Water Temperature at Fresno Weir October 1, 2013 through September 30, 2018

4.0 HABITAT ENHANCEMENT

One goal of the KRFMP 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. A brief description of the habitat enhancement projects planned and/or implemented as part of the KRFMP during 2014-2018 is summarized below.

4.1 RIVER

A high-resolution digital bathymetric data set using LiDAR was obtained in 2013. Both green and red band LiDAR was flown over the 12.5-mile Kings River tailwater fishery and its tributaries. Corresponding ground surveys were conducted by KRCD staff to verify the aerial LiDAR survey. The compiled survey data were used to develop a Digital Elevation Model for the lower Kings River. The Digital Elevation Model of the river substrate may be used to quantify habitat availability at various flow stages. Cramer Fish Sciences was contracted in 2018 to create a 2D hydrologic model, quantify the seasonal availability of spawning and rearing habitat by flow rate, locate and identify locations for future habitat enhancement projects, calculate carrying capacity and create weighted habitat suitability models.

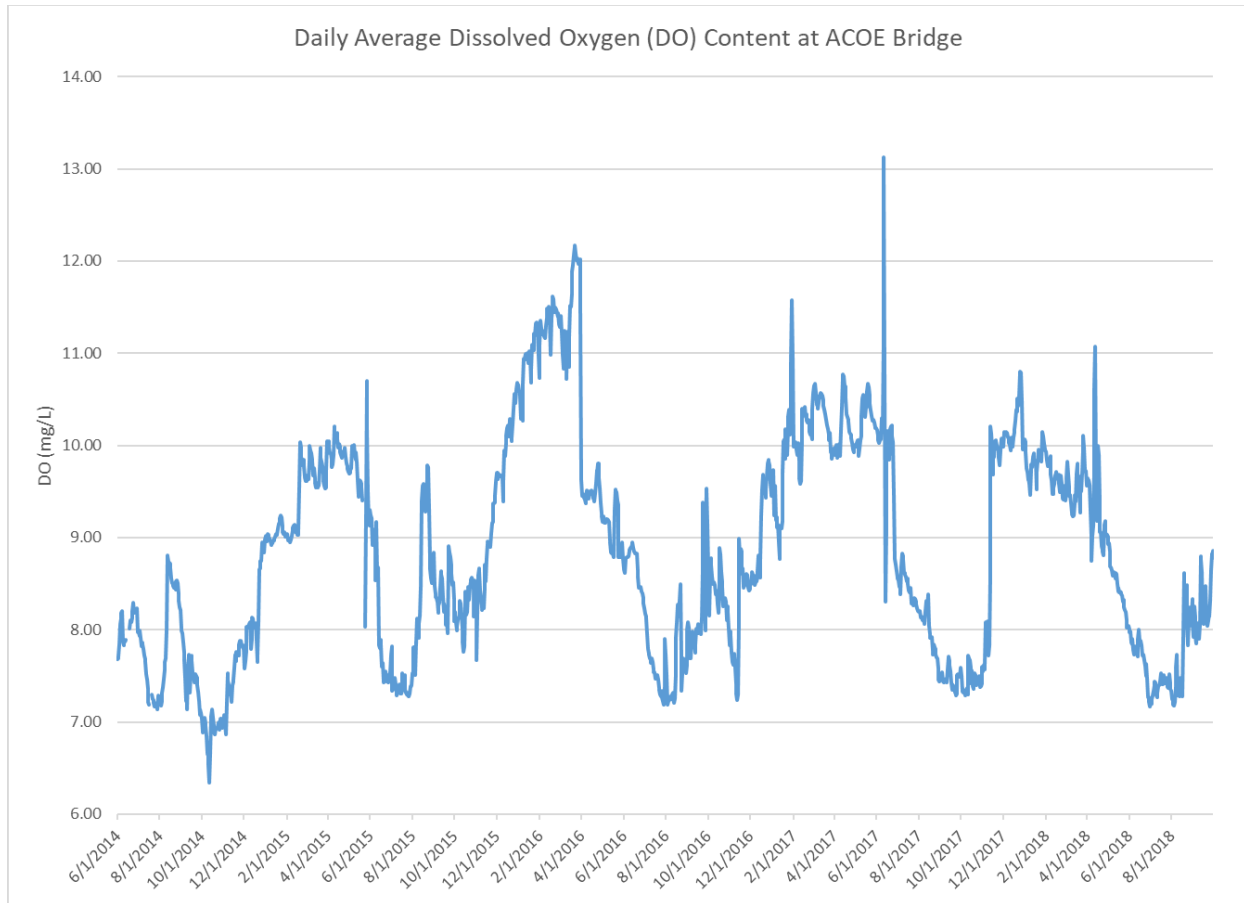


Figure 3-4: Daily average dissolved oxygen (DO) at ACOE Bridge June 1, 2014 thru September 30, 2018.

4.2 PINE FLAT RESERVOIR

The KRFMP budgets for projects to enhance and/or benefit the fishery created within Pine Flat Reservoir. The Pine Flat Army Corps of Engineers staff has been instrumental in helping the program discern the size, type, and locations of such projects. In addition, the ACOE has provided the necessary personnel and logistic resources needed to ensure project completion.

- 2014: ACOE placed manzanita filled gabions in the reservoir above one of the southern coves of the reservoir. Fifty honey-hole bass trees were scattered in deeper sections from the cove to Island Park.
- 2015: The ACOE and the Kerman Bass Club placed 100 manzanita filled gabions near the Lake View Recreation Area on the northern end of the reservoir. Fifty honey-hole bass trees were scattered by boat in deeper waters within a 1.5-mile radius of the dock.
- 2016: ACOE placed approximately 4,000 feet of cable secured with concrete anchors along the reservoir slope near Island Park campground. Eighty gabions filled with branches were placed along the cable at various reservoir elevations by staff and volunteers. The gabions are expected to provide habitat and cover for fish residing in the reservoir throughout the year regardless of changes in reservoir elevation.

- 2017: No habitat improvement projects were done due to an unusually wet water year.
- 2018: The ACOE built and placed 100 spider blocks in Pine Flat Reservoir, with the help of local volunteers. These blocks are designed to provide habitat structure for shelter and cover for game fish.

5.0 FISH STOCKING

During the 2014 through 2018 reporting period, the allotted catchable, sub-catchable, fingerling and trophy rainbow trout size classes were stocked by CDFW in the Kings River between Pine Flat Dam and Fresno Weir. CDFW has transitioned from stocking triploid rainbow trout into the lower Kings River in favor of diploid rainbow trout at the start of 2018. 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 catchable and super-catchable rainbow trout. In addition, trout eggs were incubated by KRCD and released in the lower river. A supplemental rainbow trout stocking program was initiated by the KRFMP.

5.1 SUPPLEMENTAL STOCKING

In 2017 the KRFMP developed a supplemental rainbow trout stocking plan for the tailwater fishery below Pine Flat Dam. The plan focuses on stocking only diploid trout with increased stocking in the fall and winter months when river flows and temperature are best for angler success. The intent is to provide a population of hatchery-produced catchable sized trout capable of sustaining the current level of angler pressure in both the put-and-take and catch-and-release zones. Additionally, the reinstatement of stocking diploid trout provides the potential for holdover trout to spawn and contribute to the resident population when and where conditions are suitable. The plan was fully approved in May 2018 and Calaveras Trout Farm, a private aquaculture facility in Snelling, CA was awarded a 3-year renewable contract to provide the KRFMP 30,000 (10,000 lbs) to 50,000 (16,600 lbs) of diploid rainbow trout between October and March each year. Trout will measure 9-10” in fork length with an average weight of 3 fish per pound. Supplemental stocking by Calaveras Trout Farm began in October 2018, providing weekly plantings distributed into both Reach 1 (75%) and Reach 2 (25%). An overview of the supplemental trout stocking will be included in the next annual technical report.

5.2 INCUBATOR BUILDING

The incubator building has run seasonally since November 2012. Maintenance has been facilitated by KRCD staff as well as volunteers interested in the fishery and the Kings River. During the 2014 – 2018 program years diploid rainbow trout eggs were purchased from Cold Springs Trout Farm, with three incubation periods each year. Table 5-1 summarizes the incubation periods, number of eggs incubated, number of volunteers and estimated volunteer hours at the incubator building. When trout fry reached the button up stage (about 1” long) they were released at multiple locations within the fishery management area. These activities were conducted under Element C16 of the 2016-2017 Long Term Implementation Plan.

Table 5 - 1: Incubator building activity 2014 - 2018

Fiscal Year	Incubation Period	Eggs Incubated	Volunteers	Volunteer Hours
2014-2015	12/03/2014-01/09/2015	100,000	9	21
	01/14/2015-02/20/2015	100,000	9	20
	02/25/2015-04/08/2015	100,000	15	25
2015-2016	11/18/2015-01/07/2016	100,000	10	40
	01/13/2016-02/23/2016	100,000	9	27
	03/01/2016-04/20/2016	104,000	5	20
2016-2017	11/16/2016-12/29/2016	100,000	8	24
	12/30/2016-02/23/2017	120,000	6	25
	03/01/2017-04/27/2017	104,000	5	30
2017-2018	10/18/2017-12/08/2017	150,000	9	36
	12/29/2017-02/21/2018	120,000	9	31
	03/14/2018-04/26/2018	100,000	13	35

5.3 CDFW STOCKING

CDFW provided hatchery grown salmonids in several different size categories to the Kings River below Pine Flat Reservoir, Pine Flat Reservoir, and Avocado Lake. During the 2014-2018 reporting period approximately 107,800 pounds (197,895 fish) were stocked in the Kings River below Pine Flat Reservoir, approximately 63,553 pounds (466,195 fish) were stocked in Pine Flat Reservoir, and approximately 15,325 pounds (22,106 fish) were stocked in Avocado Lake. Details for each size class are summarized below.

5.3.1 Fingerlings

Approximately 46 pounds (8,796 fish) of fingerling brook trout and rainbow trout were stocked in the lower Kings River as part of the put-and-grow program, during the period of 2014 - 2018. Pine Flat Reservoir received approximately 4,020 pounds of fingerling rainbow trout and salmon (369,698 fish). Table 5-2 details stocking of fingerling trout and salmon.

Table 5 - 2: CDFW salmonid fingerlings planted in Pine Flat Reservoir or the Kings River below Pine Flat 2014 - 2018

Water	Species	Fingerlings									
		Year									
		2014		2015		2016		2017		2018	
		# Salmonids	Pounds	# Salmonids	Pounds	# Salmonids	Pounds	# Salmonids	Pounds	# Salmonids	Pounds
Kings River below	Brook trout	0	0	0	0	60	0.2	0	0	0	0
Pine Flat Reservoir	Rainbow Trout	0	0	0	0	0	0	8,736	45.5	0	0
Pine Flat Reservoir	Brown Trout	0	0	0	0	0	0	12,340	1,180	0	0
	Rainbow Trout	95,601	527	0	0	0	0	0	0	0	0
	Chinook Salmon	74,991	366	0	0	0	0	0	0	87012	1044
	Kokanee	50,004	836	0	0	0	0	50,020	65.3	0	0
Total		220,596	1,729	0	0	60	0.2	71,096	1,290.8	87,012	1,044

5.3.2 Sub-Catchable Trout

Sub-catchable rainbow trout stocked by CDFW are generally 4-6 inches long. Table 5-3 details stocking of sub-catchable trout. A total of 5,605 pounds (58,052 fish) of sub-catchable rainbow trout were stocked in the lower Kings River as part of the put-and-grow program during the period of 2014 - 2018. Pine Flat reservoir received a total of 2,795 pounds (22,353 fish) of sub-catchable brown trout during this same period.

Table 5 - 3: CDFW sub-catchable trout stocked 2014 - 2018

Water	Species	Sub - Catchables									
		Year									
		2014		2015		2016		2017		2018	
		# Trout	Pounds	# Trout	Pounds	# Trout	Pounds	# Trout	Pounds	# Trout	Pounds
Kings River below Pine Flat Reservoir	Rainbow Trout	30,960	3,000	27,092	2,605	0	0	0	0	0	0
Pine Flat Reservoir	Brown Trout	0	0	0	0	0	0	22,353	2,795	0	0
Total		30,960	3,000	27,092	2,605	0	0	22,353	2,795	0	0

5.3.3 Catchables

The current annual allotment for the Kings River below Pine Flat Reservoir is 18,000 pounds. 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. Table 5-4 details stocking of catchable size trout. A total of 66,504 pounds (110,000 fish) were stocked in the lower Kings River during the reporting period of 2014 – 2018. Pine Flat received a total of 48,440 pounds (64,420 fish) and Avocado Lake received a total of 13,825 pounds (20,865 fish) during this same period.

Table 5 - 4: CDFW catchable sized trout stocked 2014 - 2018

Water	Species	Catchables									
		Year									
		2014		2015		2016		2017		2018	
		# Trout	Pounds	# Trout	Pounds	# Trout	Pounds	# Trout	Pounds	# Trout	Pounds
Kings River below Pine Flat Reservoir	Brook trout	1,000	800	0	0	0	0	1,600	1,600	0	0
Pine Flat Reservoir	Rainbow Trout	23,967	13,300	11,080	6,800	36,396	13,170	8,310	6,000	27,647	24,834
Pine Flat Reservoir	Rainbow Trout	24,820	15,800	11,280	9,000	8,800	4,000	10,700	11,640	9,820	7,000
Avocado Lake	Rainbow Trout	9,740	6,100	2,640	1,800	1,290	1,200	4,565	3,225	2,630	1,500
Total		59,527	36,000	25,000	17,600	46,486	18,370	25,175	22,465	40,097	33,334

5.3.4 Super Catchables

Super-catchable size trout are defined as trout greater than one pound. Table 5-5 details stocking of super-catchable size trout. Kings River below Pine Flat Reservoir received a total of 30,320 pounds of super-catchable trout (19,475 Fish) during the reporting period of 2014 – 2018. Pine Flat Reservoir received 9,300 pounds of super-catchable trout (8,454 Fish) and Avocado Lake received 1,500 pounds of super-catchable trout (1,241 Fish) during this same period.

Table 5 - 5: CDFW super-catchable sized trout stocked 2014 - 2018

Water	Species	Super - Catchables									
		Year									
		2014		2015		2016		2017		2018	
		# Trout	Pounds	# Trout	Pounds	# Trout	Pounds	# Trout	Pounds	# Trout	Pounds
Kings River below	Brook trout	2,448	2,800	735	1,100	0	0	4,037	4,920	0	0
Pine Flat Reservoir	Rainbow Trout	2,676	6,200	1,774	2,300	5,882	9,250	1,090	2,400	833	1,350
Pine Flat Reservoir	Rainbow Trout	0	0	0	0	3,636	4,000	4,818	5,300	0	0
Avocado Lake	Rainbow Trout	0	0	231	300	1,010	1,200	0	0	0	0
Total		5,124	9,000	2,740	3,700	10,528	14,450	9,945	12,620	833	1,350

5.3.5 Trophy Trout

Beginning December 2005, CDFW implemented a trophy trout stocking program in the put-and take section as well as the catch-and-release section. Trophy trout are designated as trout greater than 2.99 pounds each. Trophy trout planted in the lower Kings River average approximately 4 pounds (Table 5-6). A total of 5,325 pounds of trophy trout (1,572 Fish) were planted in the Kings River below Pine Flat Reservoir during the reporting period of 2014 - 2018.

Table 5 - 6: CDFW trophy sized rainbow trout stocked 2014 - 2018

Water	Species	Trophy									
		Year									
		2014		2015		2016		2017		2018	
		# Trout	Pounds	# Trout	Pounds	# Trout	Pounds	# Trout	Pounds	# Trout	Pounds
Kings River below Pine Flat Reservoir	Rainbow Trout	0	0	0	0	0	0	543	2,000	1,029	3,325
Total		0	0	0	0	0	0	543	2,000	1,029	3,325

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 KRFMP and the overall status of the fishery. Water temperature and dissolved oxygen monitoring remain a priority. The KRFMP is also dedicated to continuing its annual fish population surveys in the fall.

6.1 ANNUAL FISH POPULATION SURVEYS IN THE LOWER KINGS RIVER

Long-term annual baseline trout fisheries monitoring within the lower Kings River is being conducted as part of the KRFMP to determine (1) juvenile trout abundance and distribution; (2) adult trout abundance and distribution; (3) reproductive success, growth, and survival; (4) overwintering survival, size and age structure of the population; and (5) assess the abundance and condition of the fish community inhabiting the lower Kings River. Surveys are completed with KRFMP agency staff with the assistance of volunteers and students from Reedley College.

During this reporting period electrofishing surveys were successfully conducted at all six designated study sites in 2014-2016, with only two sites monitored in 2017 due to unsafe water levels. 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 34 years (since 1983) in the Kings River. In 2007, the KRFMP began to use a multi-pass depletion technique. This allowed for 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 number of fishes, species, fish length and weight. Sampling sites are 300 feet in length and were sampled using backpack electrofishers (Kings River Conservation District, 2014, 2015, 2016, 2017). The final reports are available on the KRFMP website.

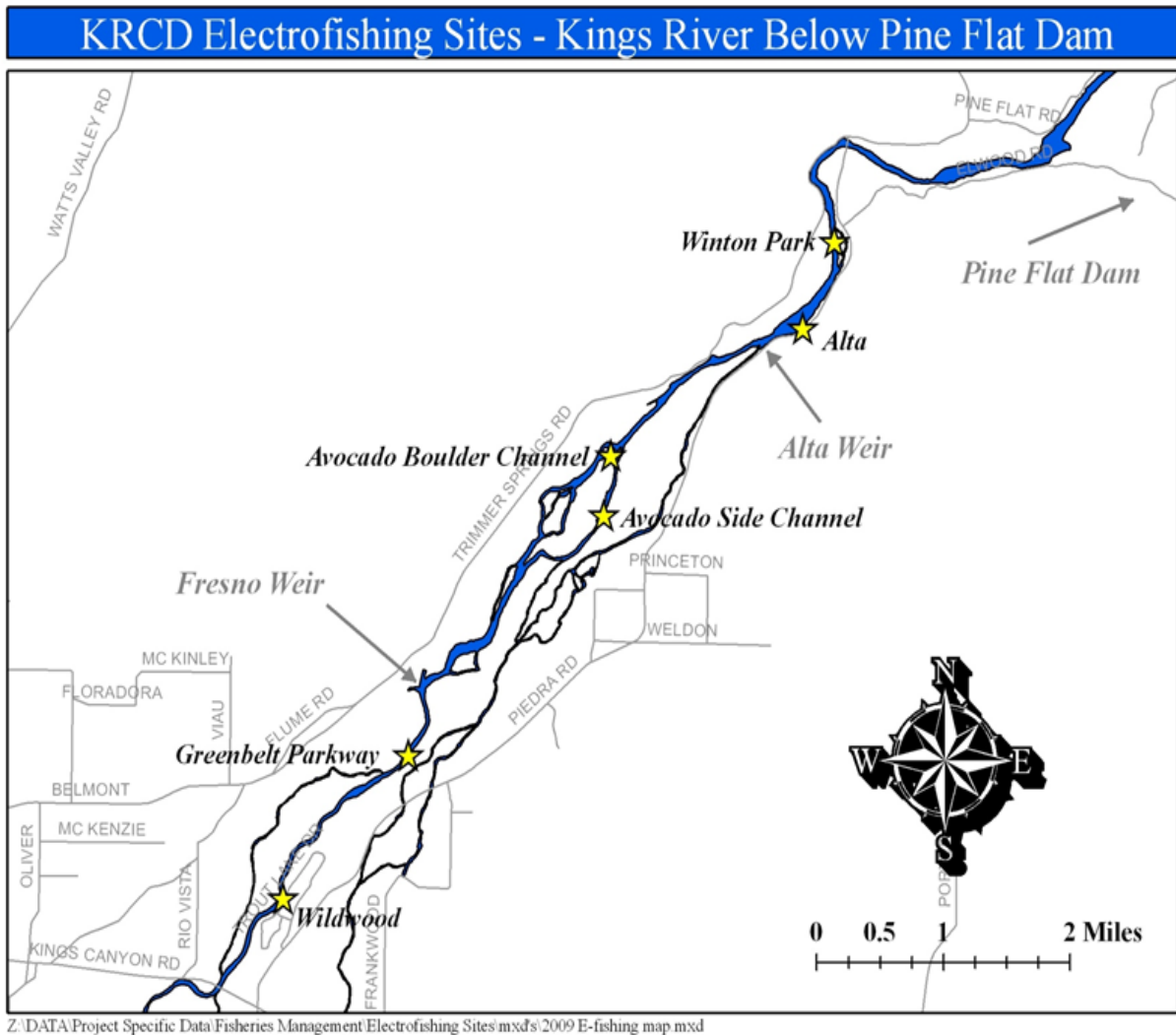


Figure 6-1: Kings River Conservation District annual population monitoring survey sites.

Table 6 - 1: Fish species collected during annual November fish population survey.

Species	Year			
	2014	2015	2016	2017 ^a
Bass sp.	29	61	16	3
Bluegill	-	-	3	-
California Roach	1,055	1,512	1,533	269
Catfish sp.	21	2	-	-
Green Sunfish	-	-	-	5
Hatchery Rainbow Trout	1	1	12	5
Lamprey sp.	362	189	299	127
Mosquitofish	20	57	32	-
Rainbow Trout	-	2	7	3
Sacramento Pikeminnow	959	800	393	39
Sacramento Sucker	533	1,329	2,545	488
Sculpin sp.	717	211	303	306
Three-spined Stickleback	408	122	518	111
Total Fish	4,105	4,286	5,661	1,356
Total Species	10	11	11	10

^a - only two sites surveyed due to unsafe water levels

7.0 PUBLIC EDUCATION AND OUTREACH

7.1 WEBSITE

KRCD staff developed a new KRFMP website which launched in August 2017. The site contains a photo album, contact page, volunteer site, access to program reports and documents, projects and links to resources; <http://krfmp.org/>

7.2 HYDROLOGY AND TEMPERATURE REPORT

For operations, KRWA uses 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 collected 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 that would affect habitat quality. These one-page reports have provided information on flows in the lower river and tributary streams as well as a summary of flow and temperature trends. Copies of these reports remain on file at KRWA.

7.3 EDUCATIONAL TOURS

7.3.1 Thorburn Spawning and Rearing Channel

KRCD Environmental staff has provided tours of the Thorburn Spawning Channel as part of the annual Fresno County Farm Bureau Future Advocates for Agriculture Concerned About Tomorrow (FAACT) class tour, Reedley College's Watershed and Wildlife classes for outdoor labs, and the Fresno State Ichthyology class.

7.3.2 Incubator Building

KRCD staff have hosted many groups for educational tours within the incubator building including: the annual Fresno County Farm Bureau FAACT class tour, the Reedley College Watershed class, Fresno and Clovis Unified School District students from The Center for Advanced Research and Technology (CART), students from Sanger Unified School District and other local community members.

7.4 DIRECTED ENFORCEMENT

With the help of local fishing organizations, the Kings River Conservancy established the Frank P. Jones, Game Warden Fund; a contract with the California Department of Fish and Wildlife's Region 4 Enforcement branch to commit donated funds to warden overtime for Targeted Enforcement. Increased Game Warden presence targeting the Kings River Fisheries Management Zone during the 2014-2018 program years occurred whenever resources were available, with enforcement providing quarterly reports on patrols, contacts, citations and warnings. It is the hope of the recreational community that these funds will help Fish and Wildlife personnel in curtailing illegal activities in the Fisheries Management Zone. These activities were officially outside of the KRFMP, however the KRCD and KRWA contribute annually to the CDFW Warden overtime Fund.

8.0 MAINTENANCE ACTIVITIES

8.1 THORBURN CHANNEL

Spraying of weeds, brushing, and tree trimming took place along the roadway and nature trail. The head gate was checked every 1-2 months and accumulated debris was removed. A large portion of the beaver dam at the end of the channel was also removed to allow accumulated sediment to wash out of the channel and expose spawning gravels. All activities were conducted under Element M-2012-1: Thorburn Channel Maintenance of the Annual Implementation Plan and supported through KRCD Flood Maintenance staff.

8.2 INCUBATOR BUILDING

While in service, daily maintenance of the incubator facility is performed by KRCD Environmental staff Monday thru Friday. Volunteers maintain the facility most weekends and holidays during incubator operation. Staff from the KRCD Pine Flat Power Plant provide building maintenance. During the 2014-2018 program years staff replaced plumbing, added bypass lines around the flowmeters, upgraded the flow nozzles feeding the raceways, and added extra ventilation to combat humidity. In early 2018 a standby electric generator (SEG) with automatic transfer and propane fuel system was installed to protect rearing trout in the event of a power outage. The SEG has been beneficial due to power outages post installation while the incubator building is in operation.

9.0 DEVELOPMENT OF A LONG-TERM IMPLEMENTATION 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 Annual Implementation 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. The Long Term Implementation Plans (formerly 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 Long Term Implementation Plan is a “living plan” that is reviewed by the TSC, Public and ExCom on an annual basis and revised as projects and elements of the program are implemented and as new scientific information becomes available.

REFERENCES

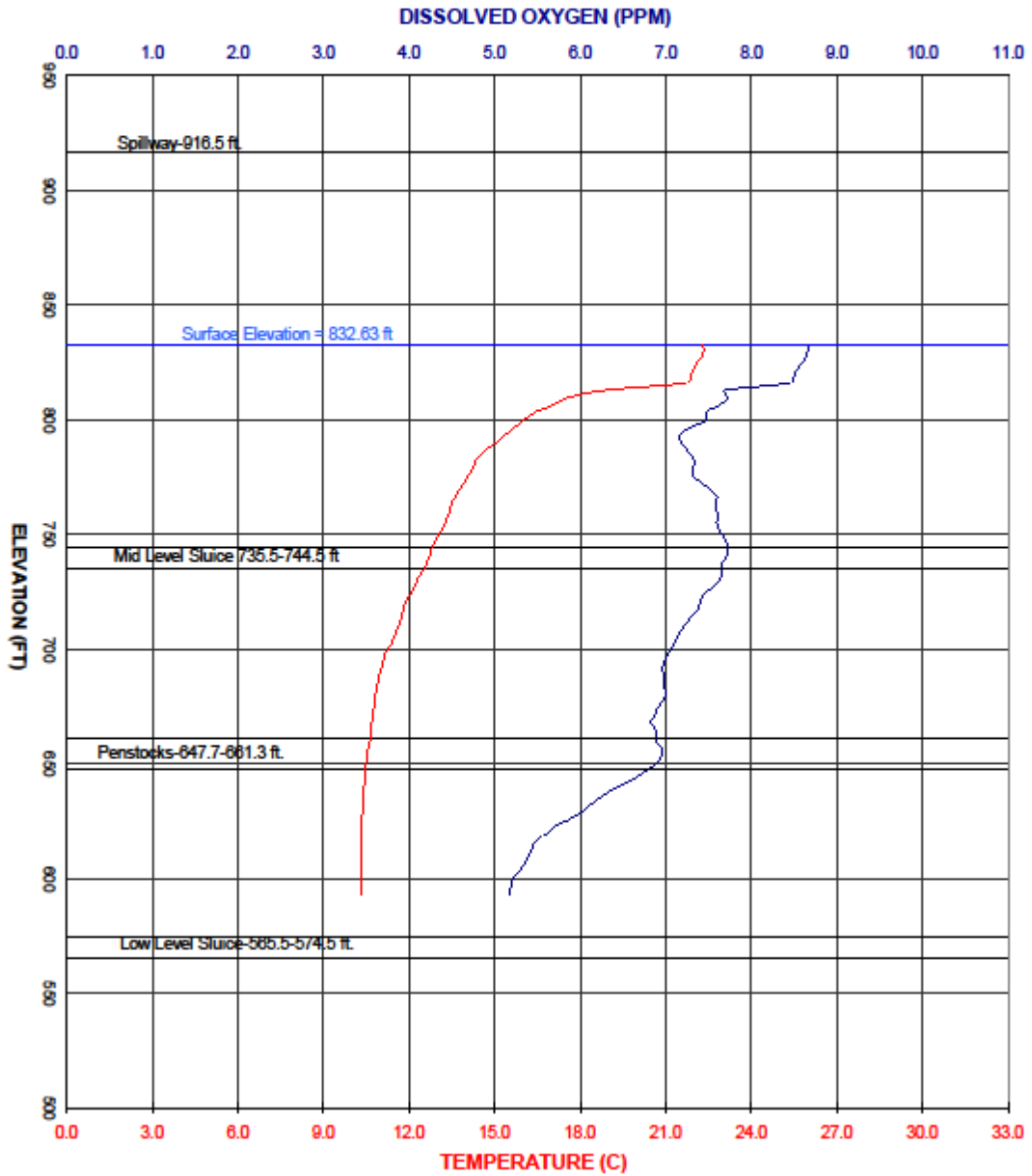
Moyle, P. B. 2002. *Inland Fishes of California: Revised and Expanded*. University of California Press. Berkeley, California. 502 pp.

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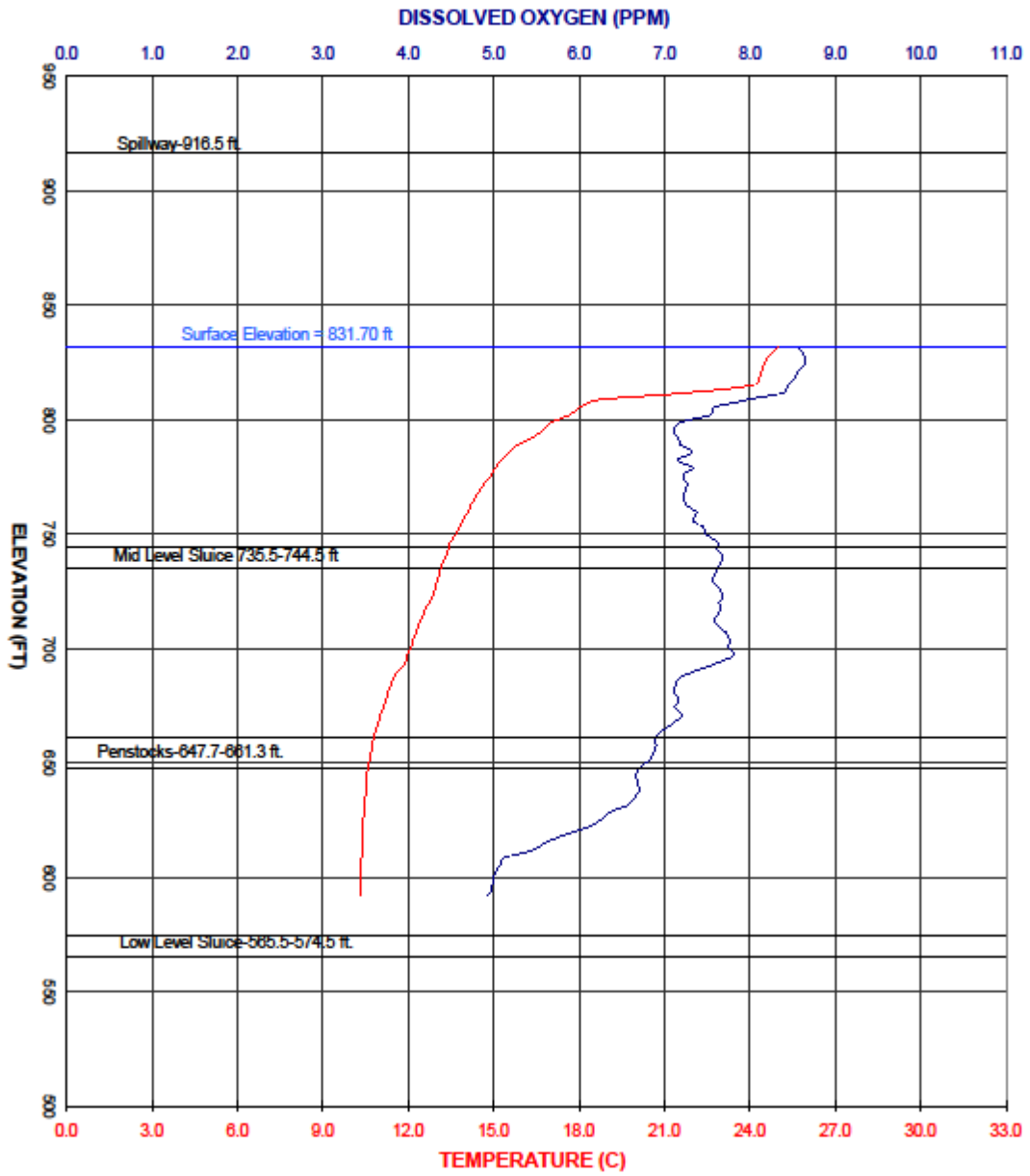
Appendix A

Pine Flat Reservoir Temperature and Dissolved Oxygen Profiles
June 2014 – September 2018

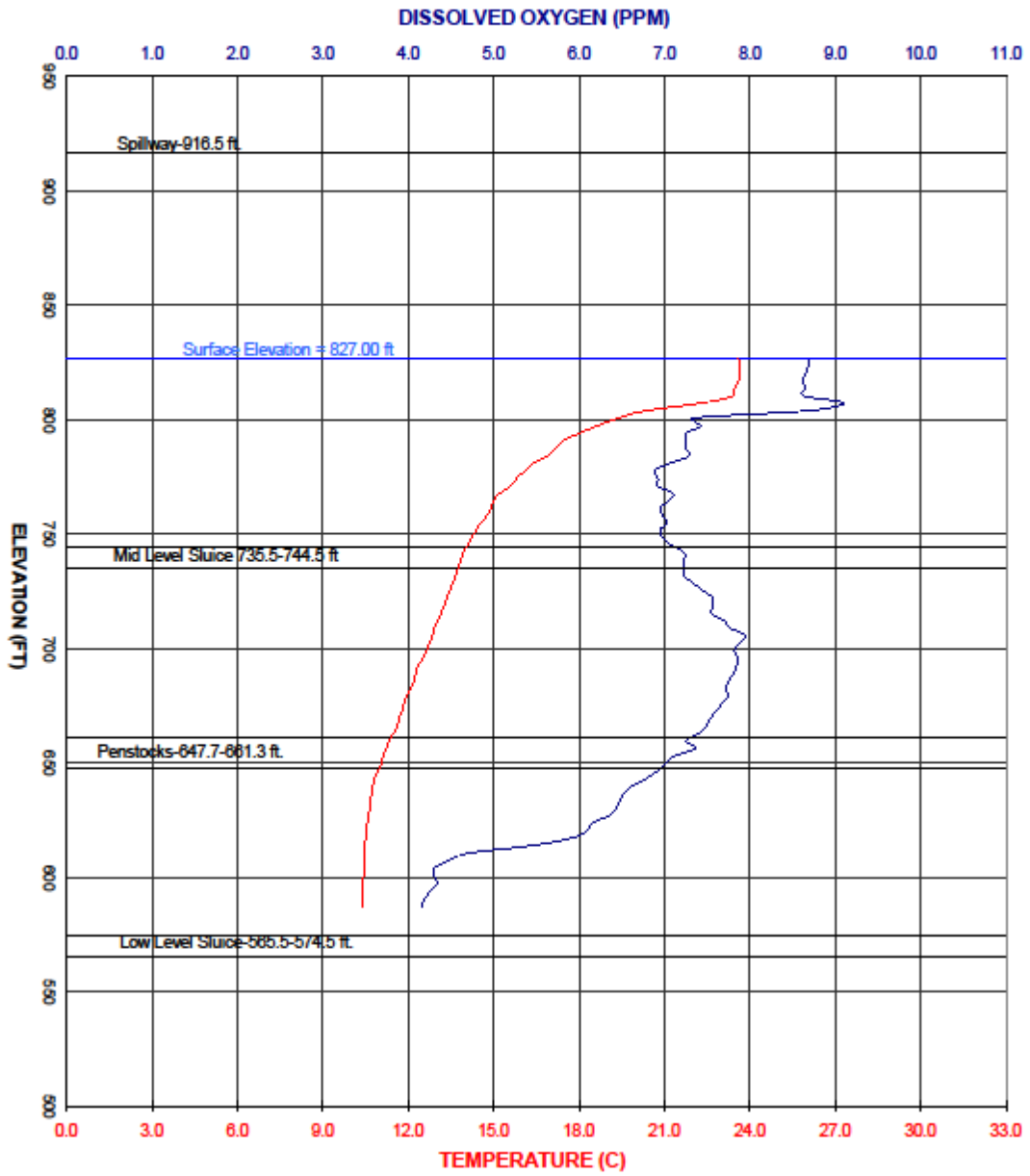
**PINE FLAT RESERVOIR 6/3/14 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 832.63**



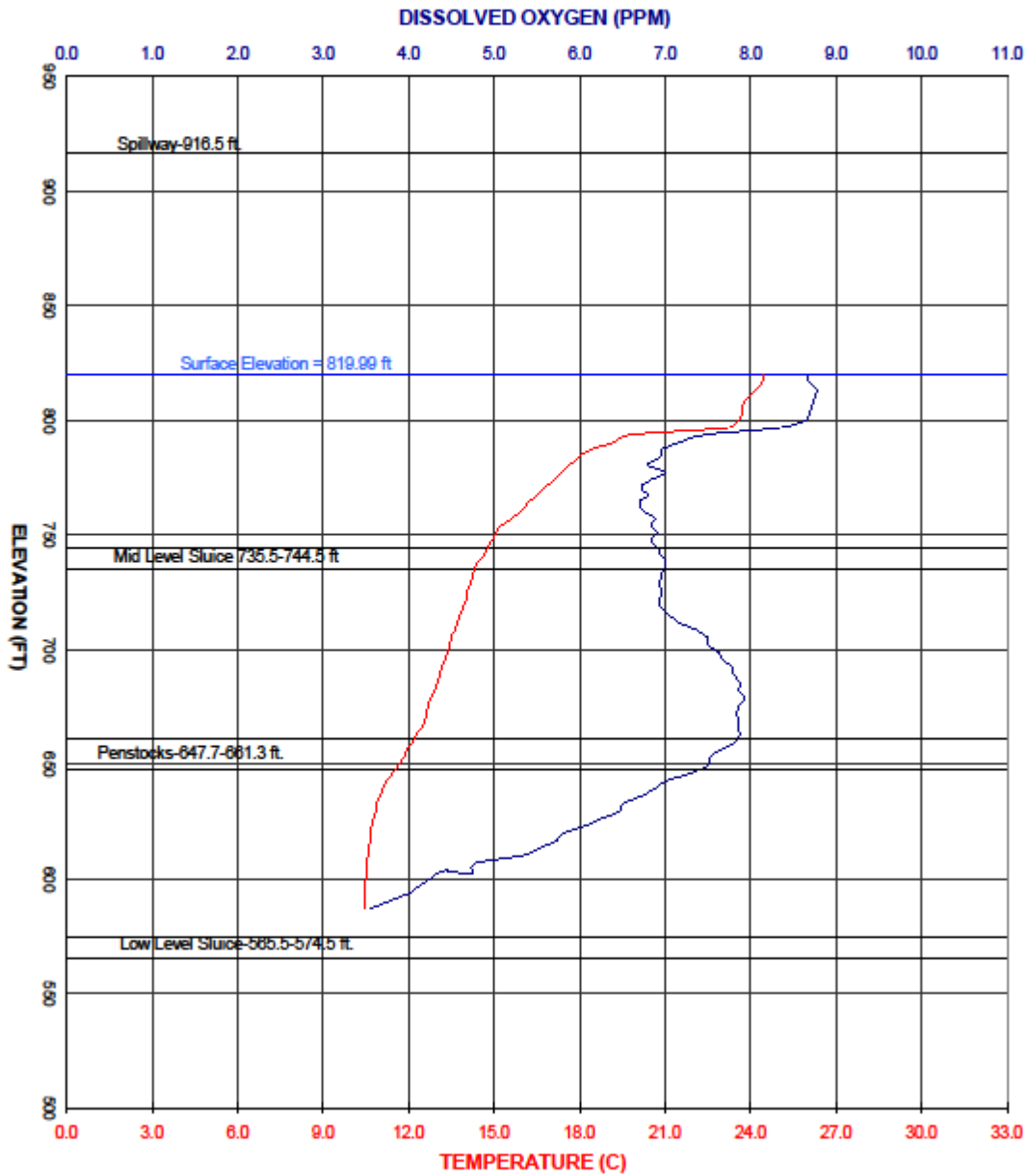
**PINE FLAT RESERVOIR 6/10/14 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 831.70**



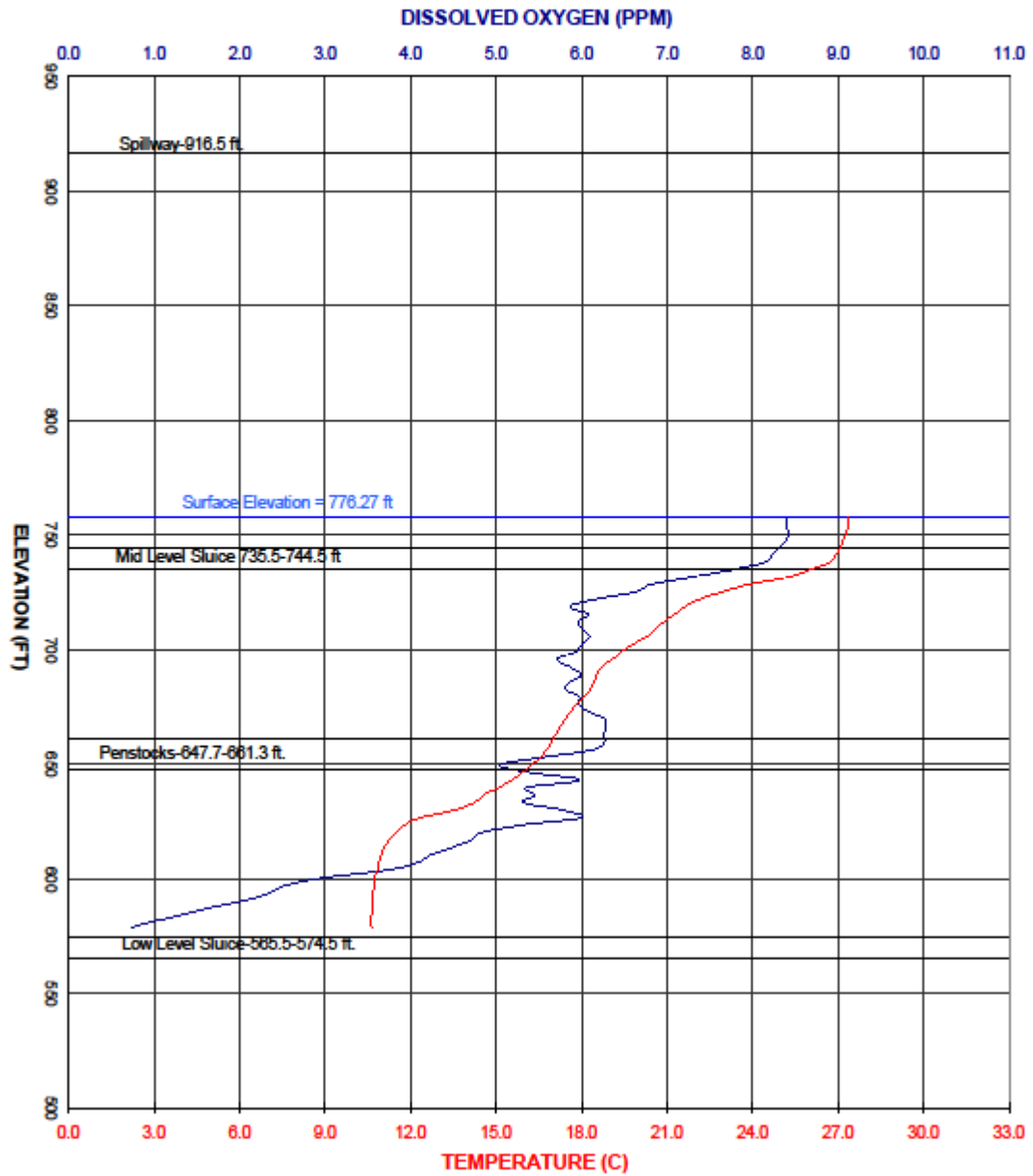
**PINE FLAT RESERVOIR 6/17/14 New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 827.00**



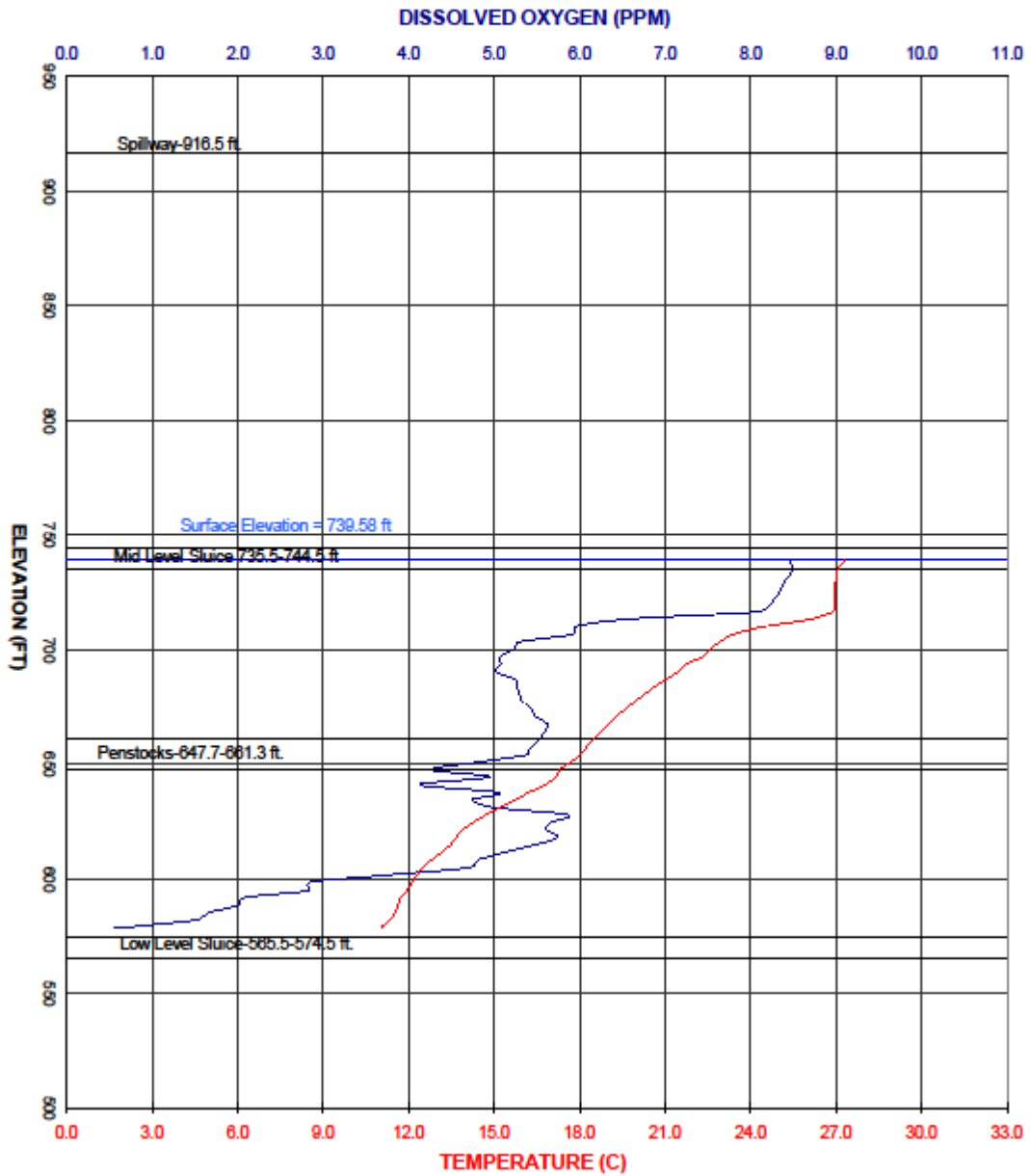
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(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 819.99**



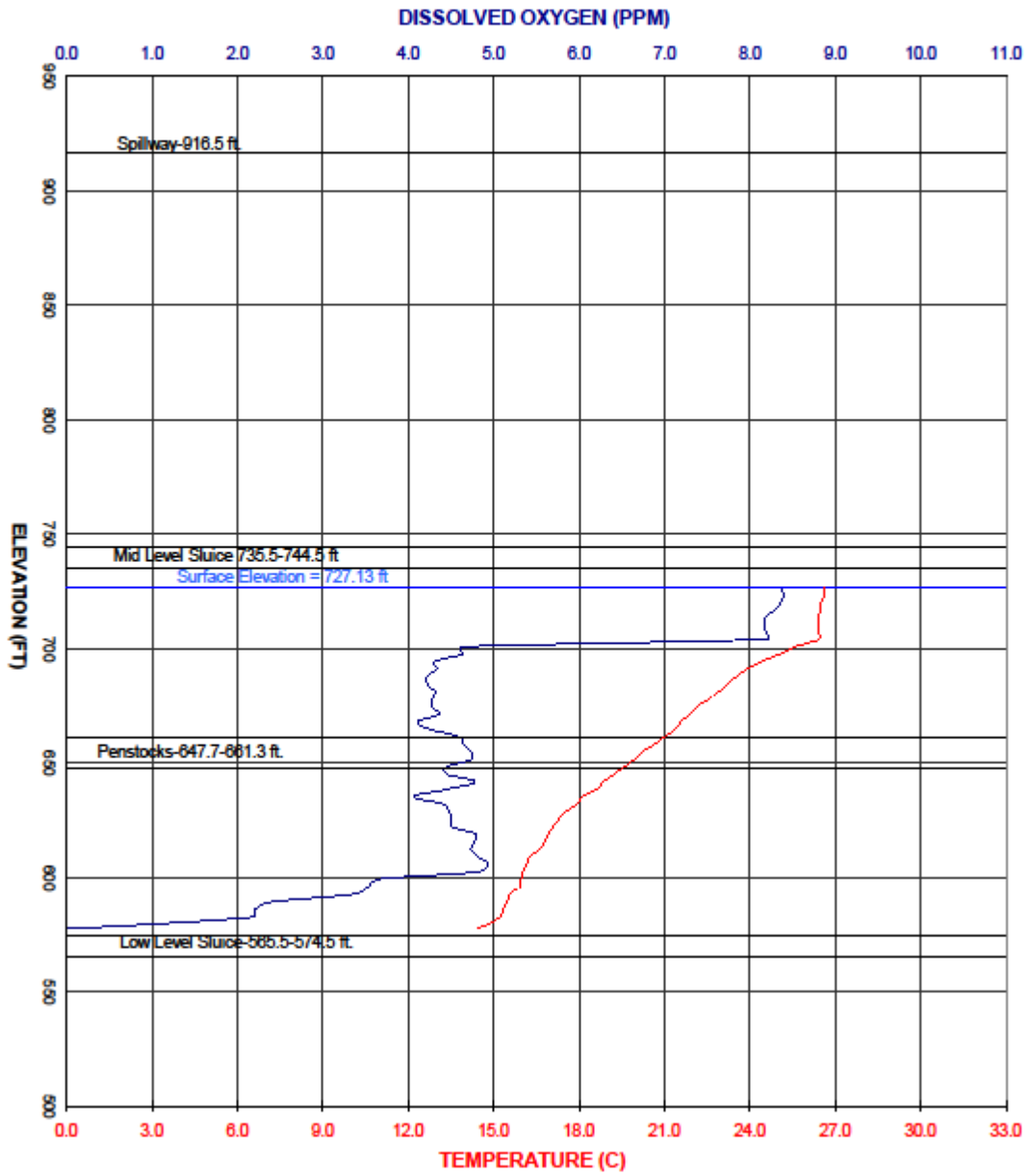
PINE FLAT RESERVOIR 7/22/14 (Time: 1025-1052) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 758.04



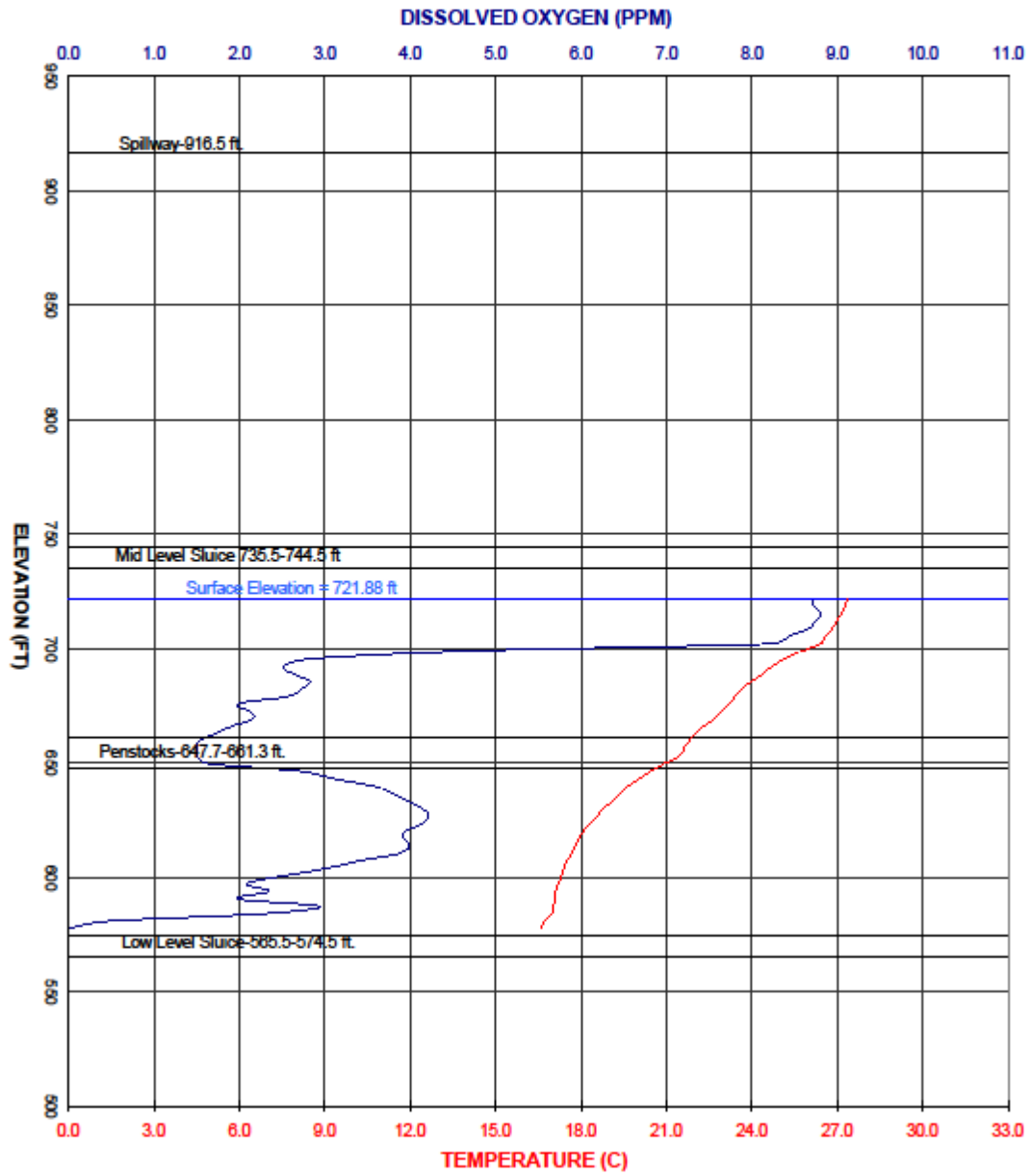
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 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 739.58



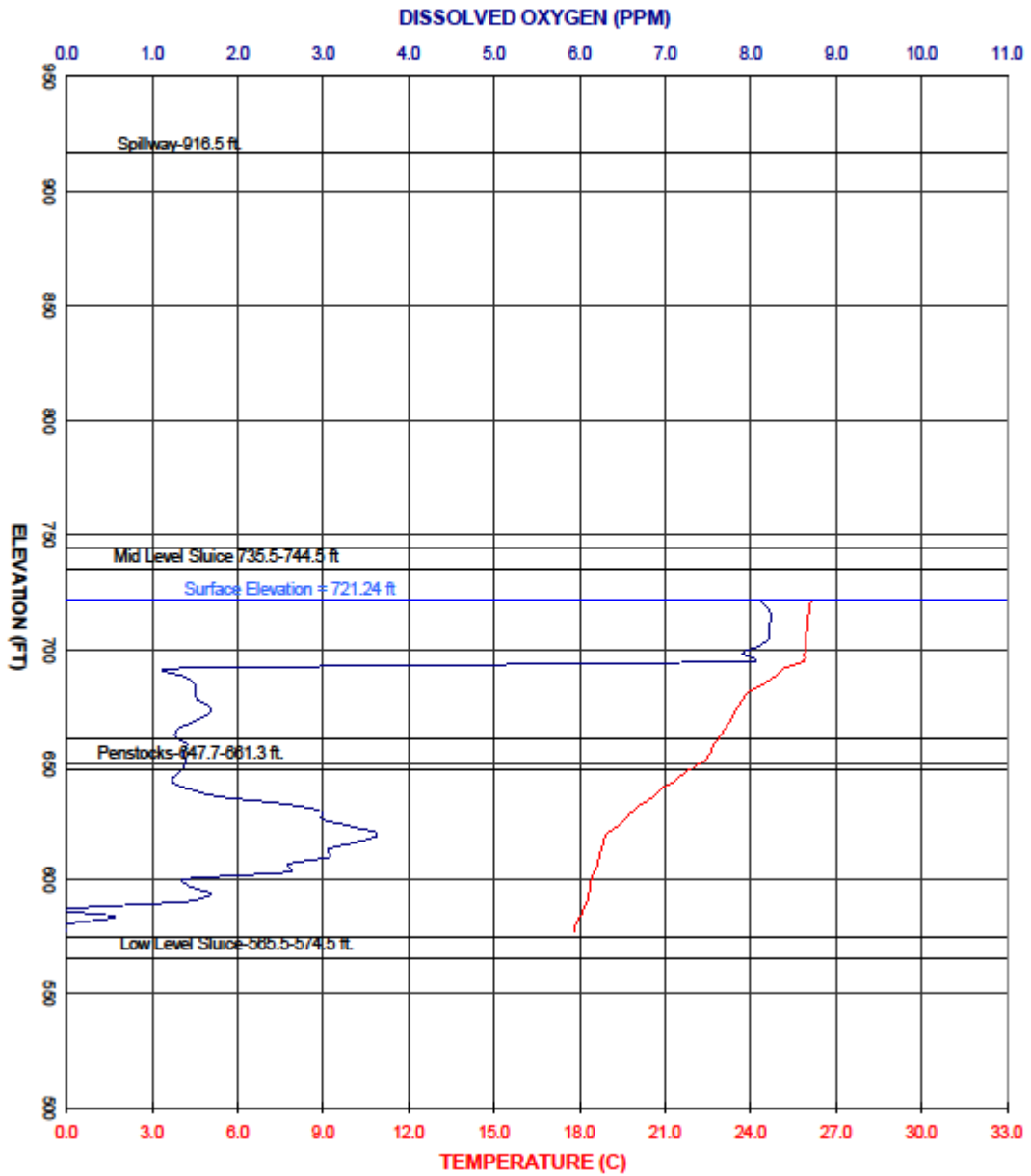
**PINE FLAT RESERVOIR 8/5/14 (Time: 1000-1030) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 727.13**



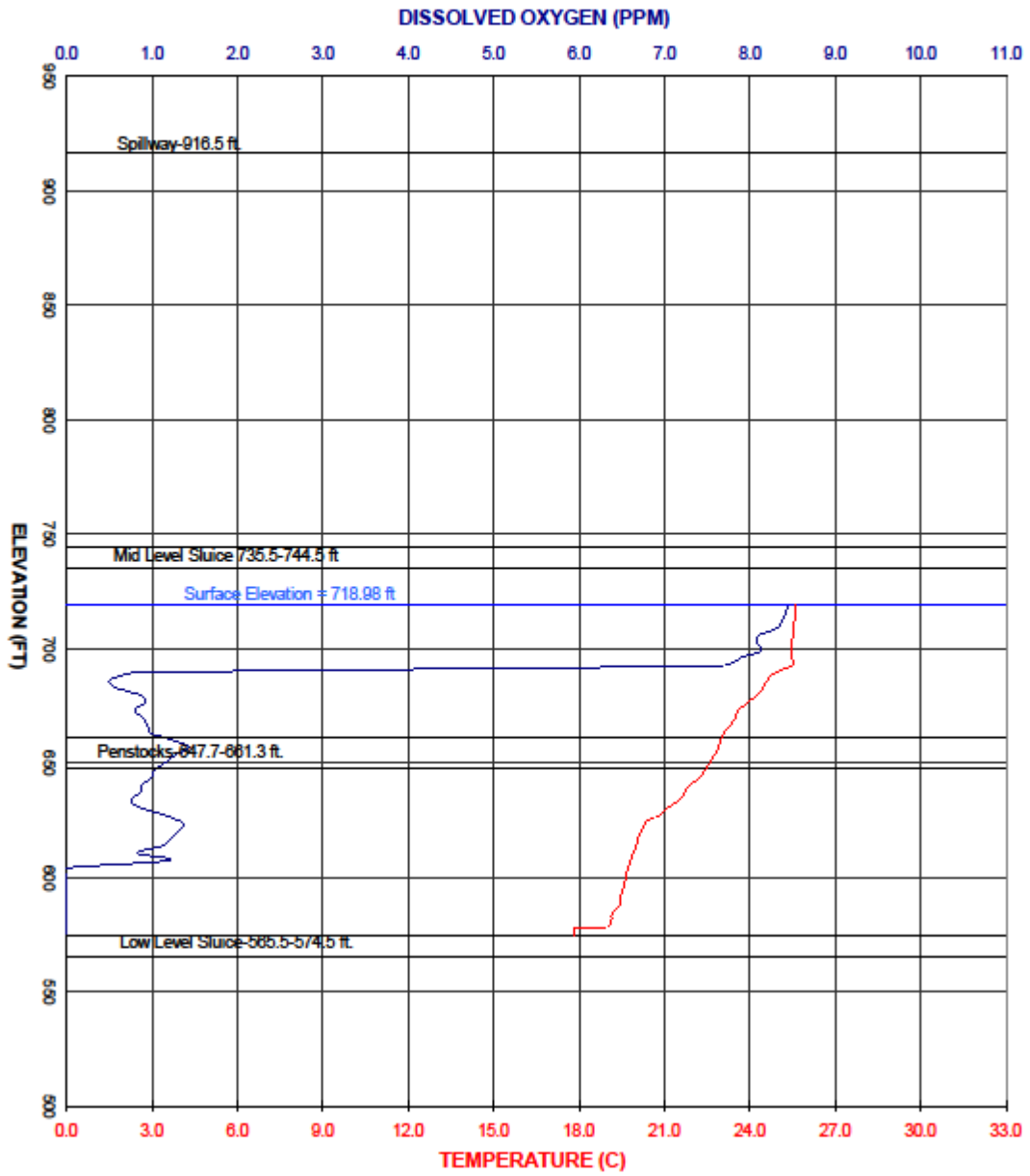
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(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 721.88



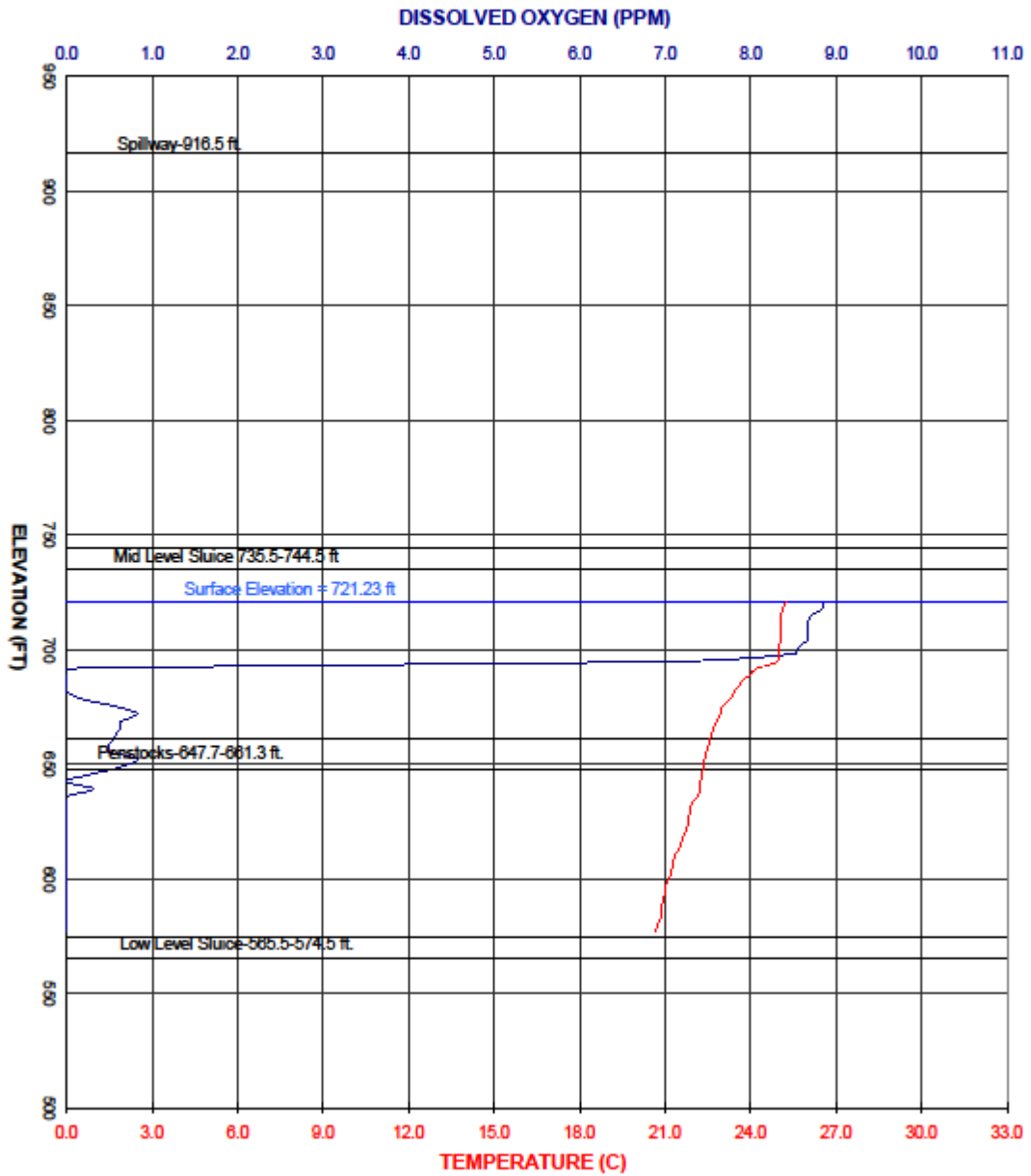
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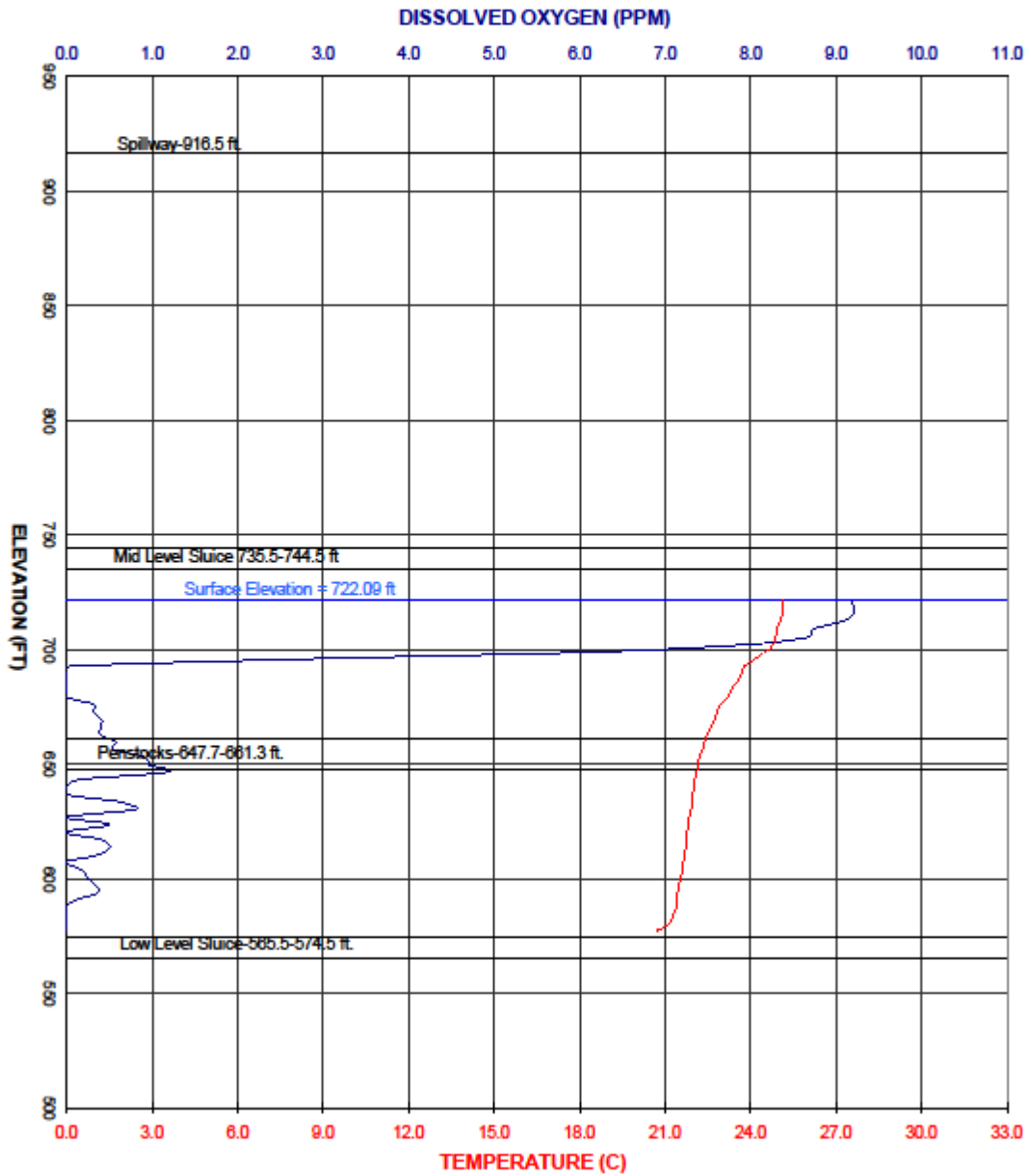
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 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 718.98



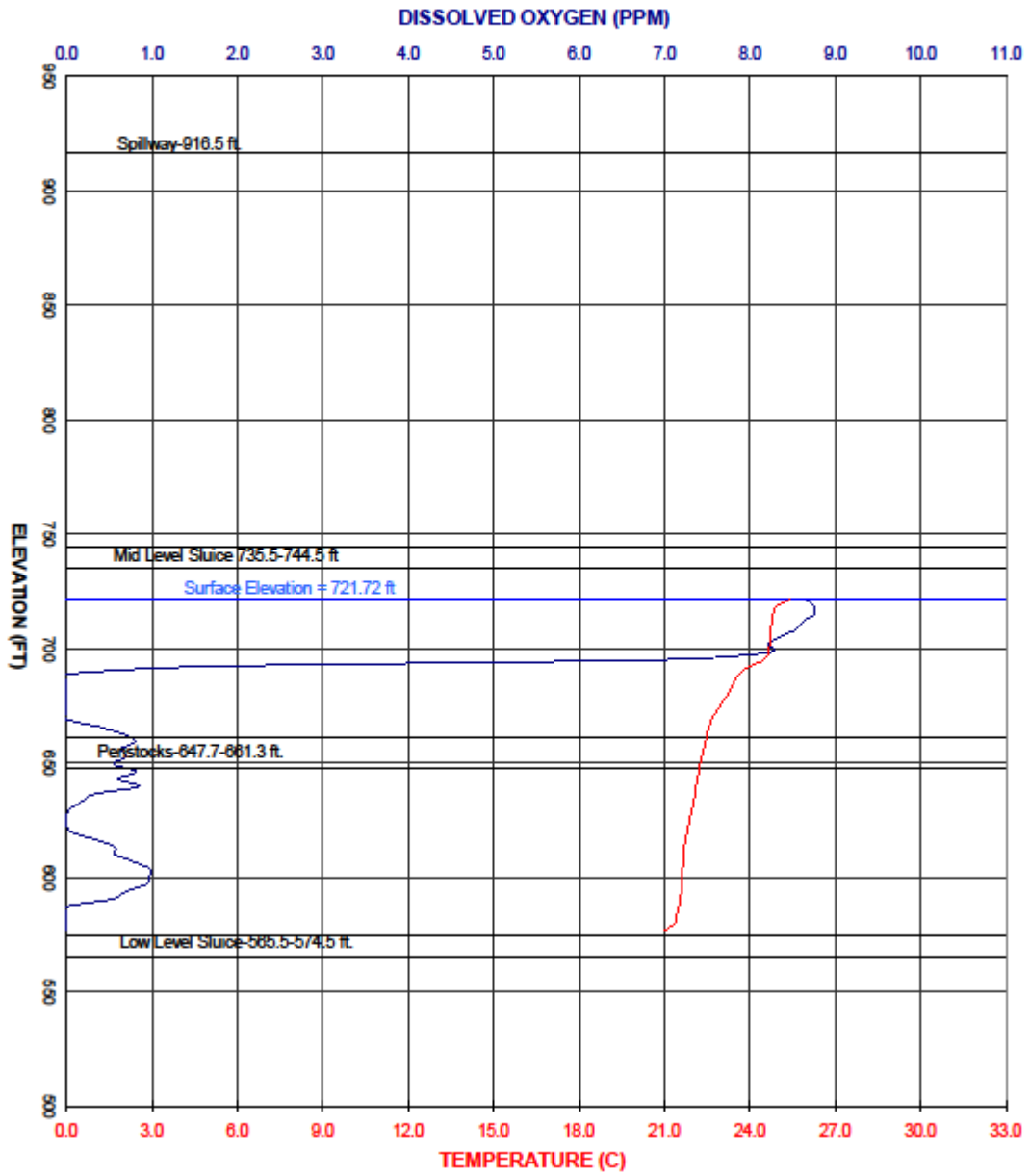
PINE FLAT RESERVOIR 9/9/14 (Time: 1030-1110) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 721.23



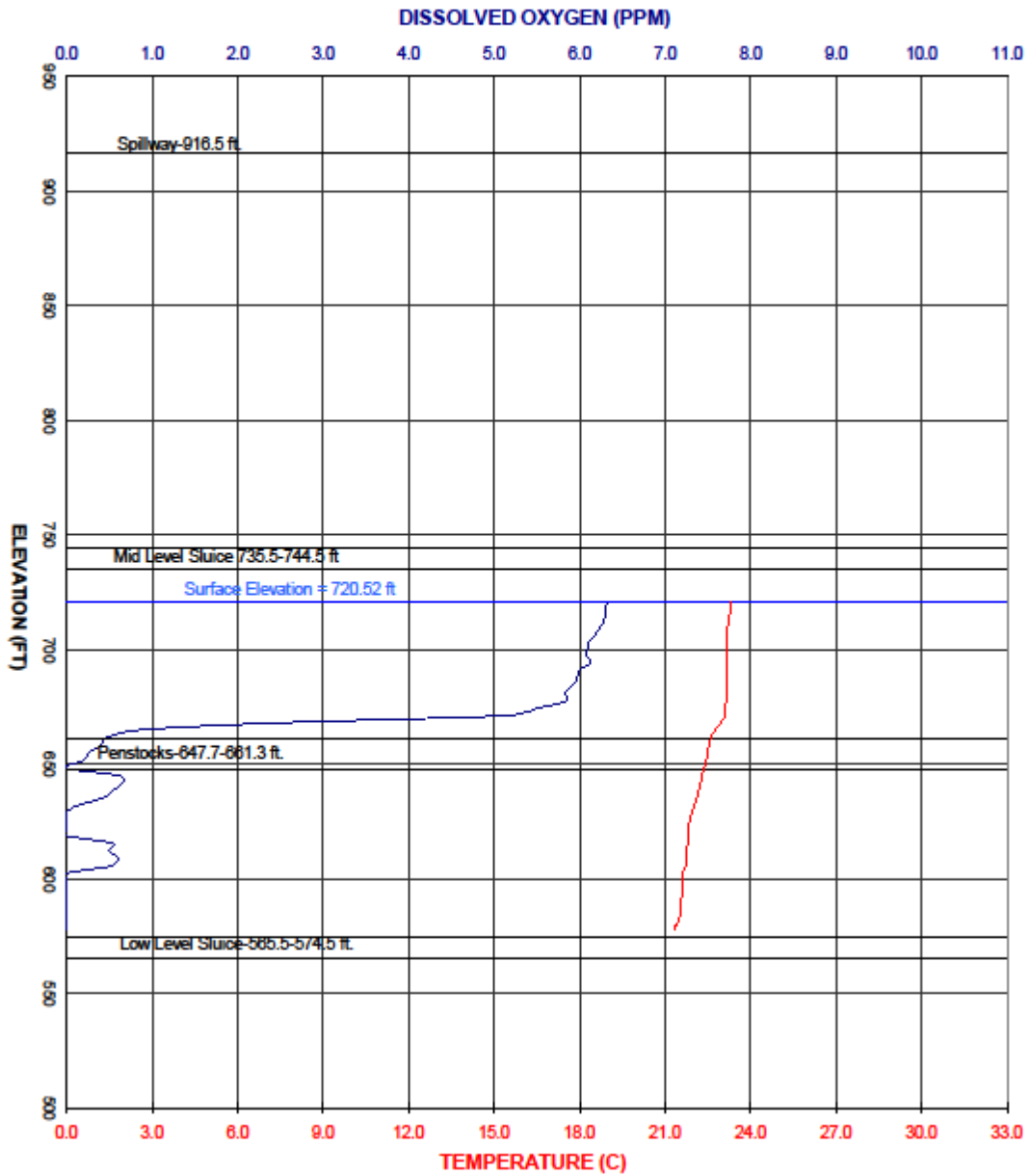
PINE FLAT RESERVOIR 9/16/14 (Time: 1005-1045) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 722.09



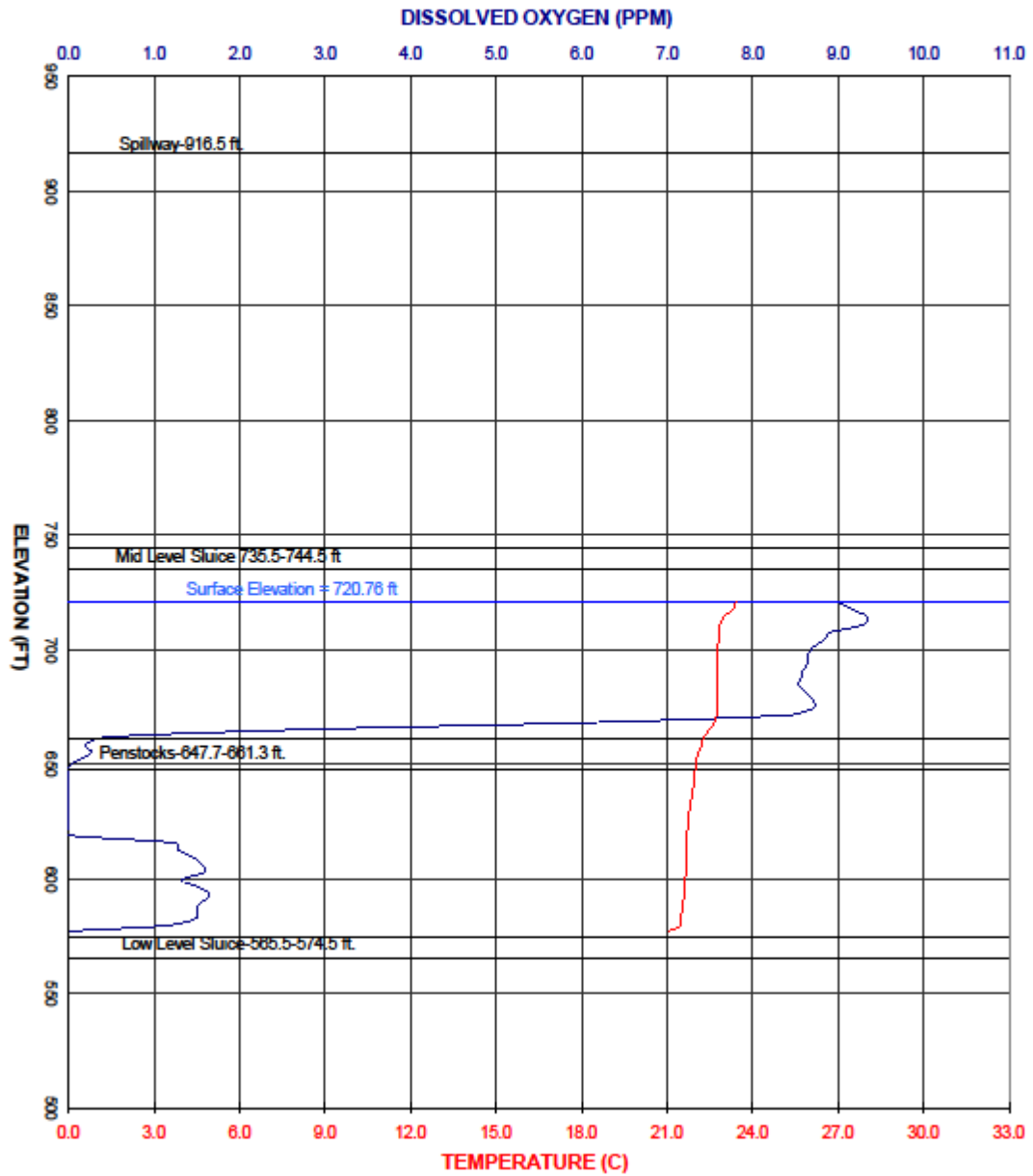
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(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 721.72



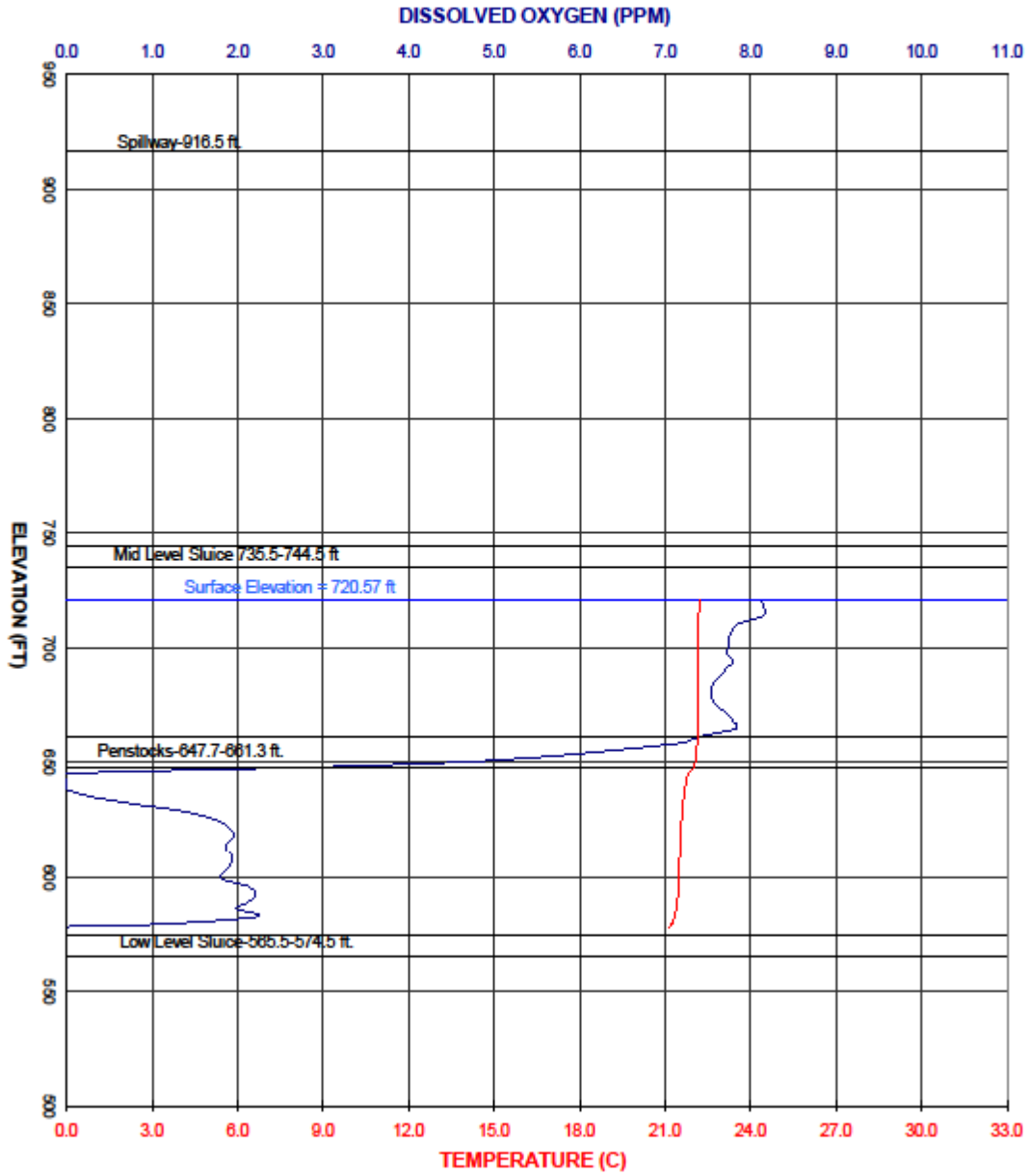
PINE FLAT RESERVOIR 9/30/14 (Time: 1025-1110) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 720.52



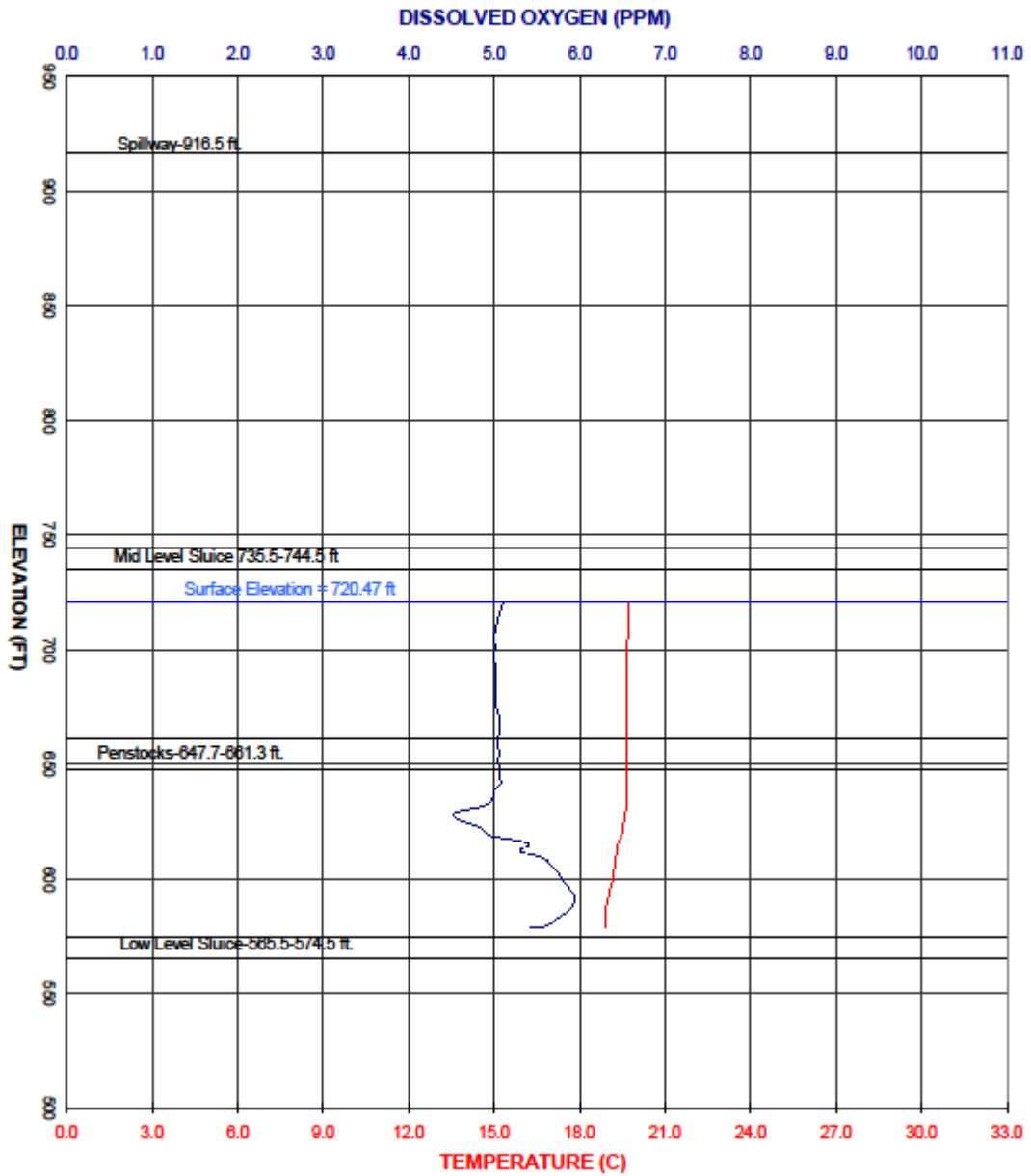
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 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 720.76



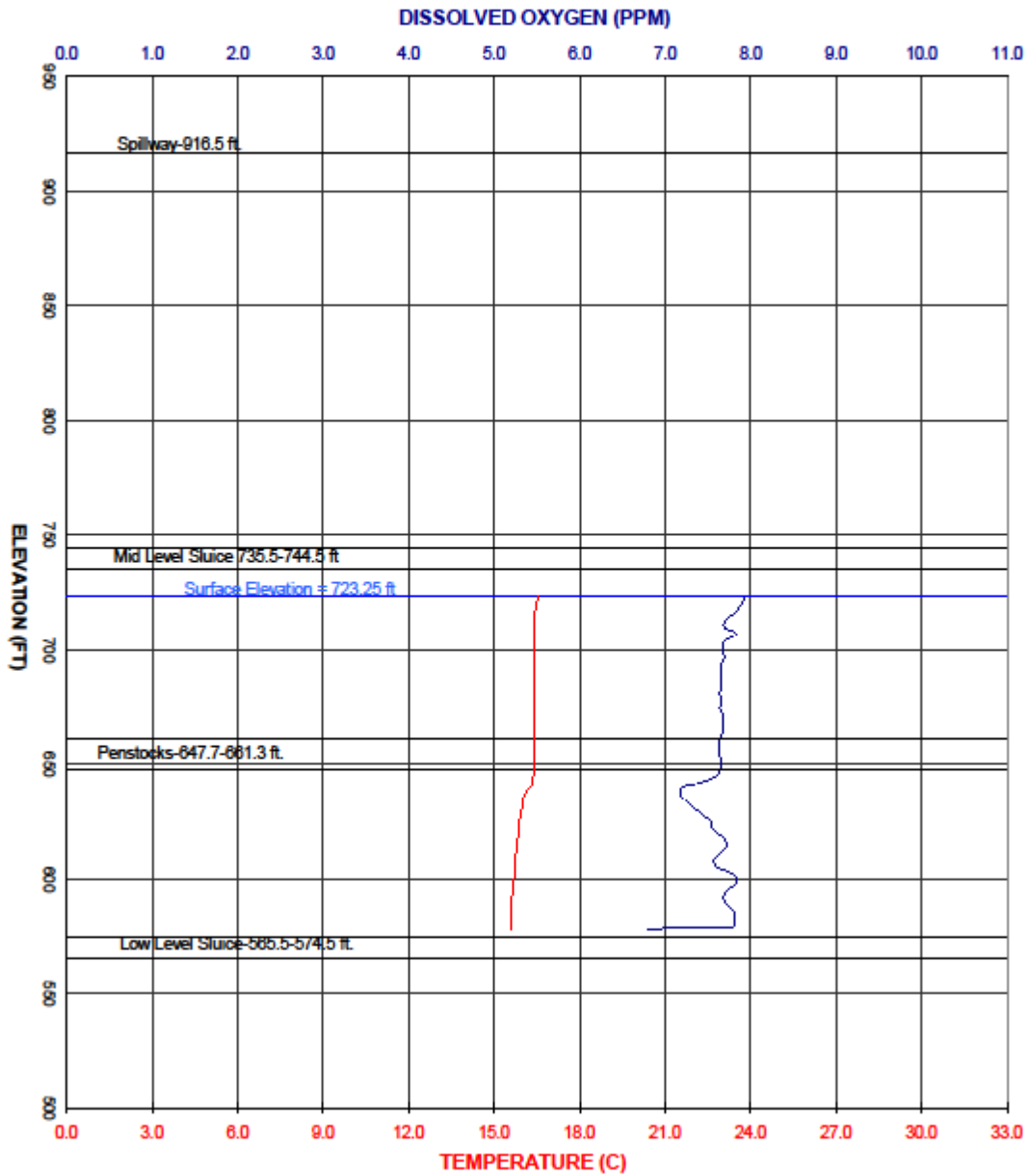
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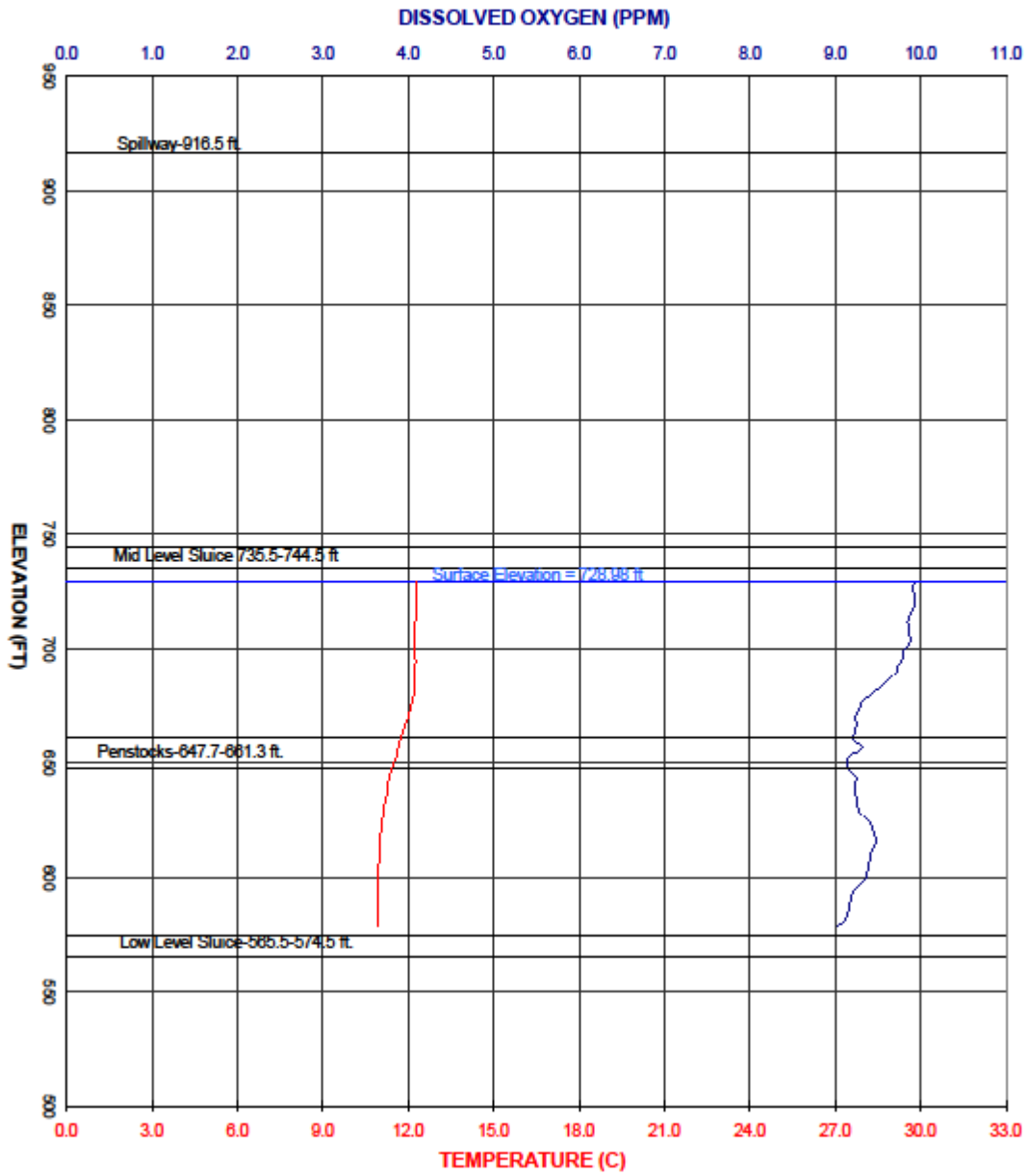
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(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 720.47



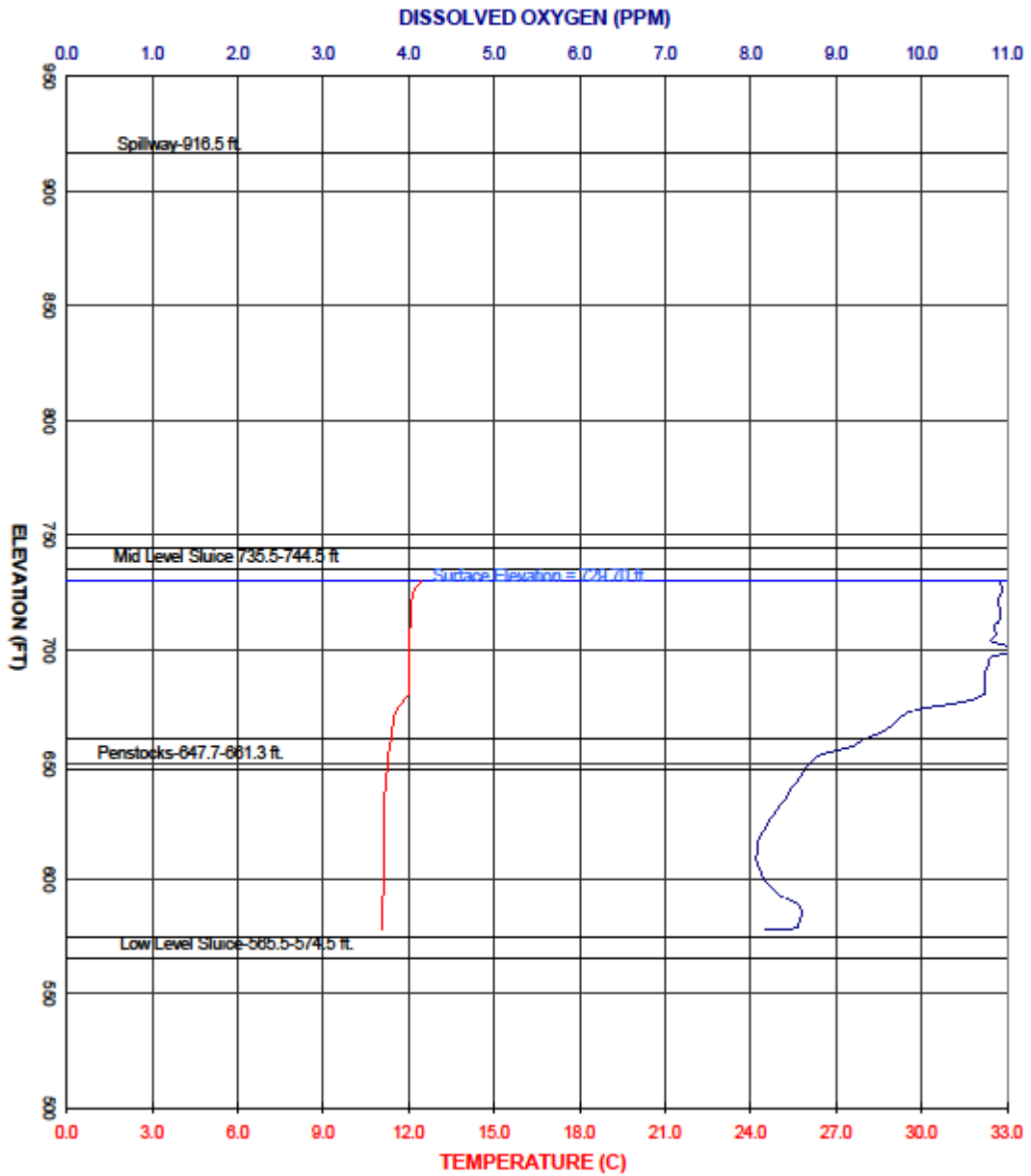
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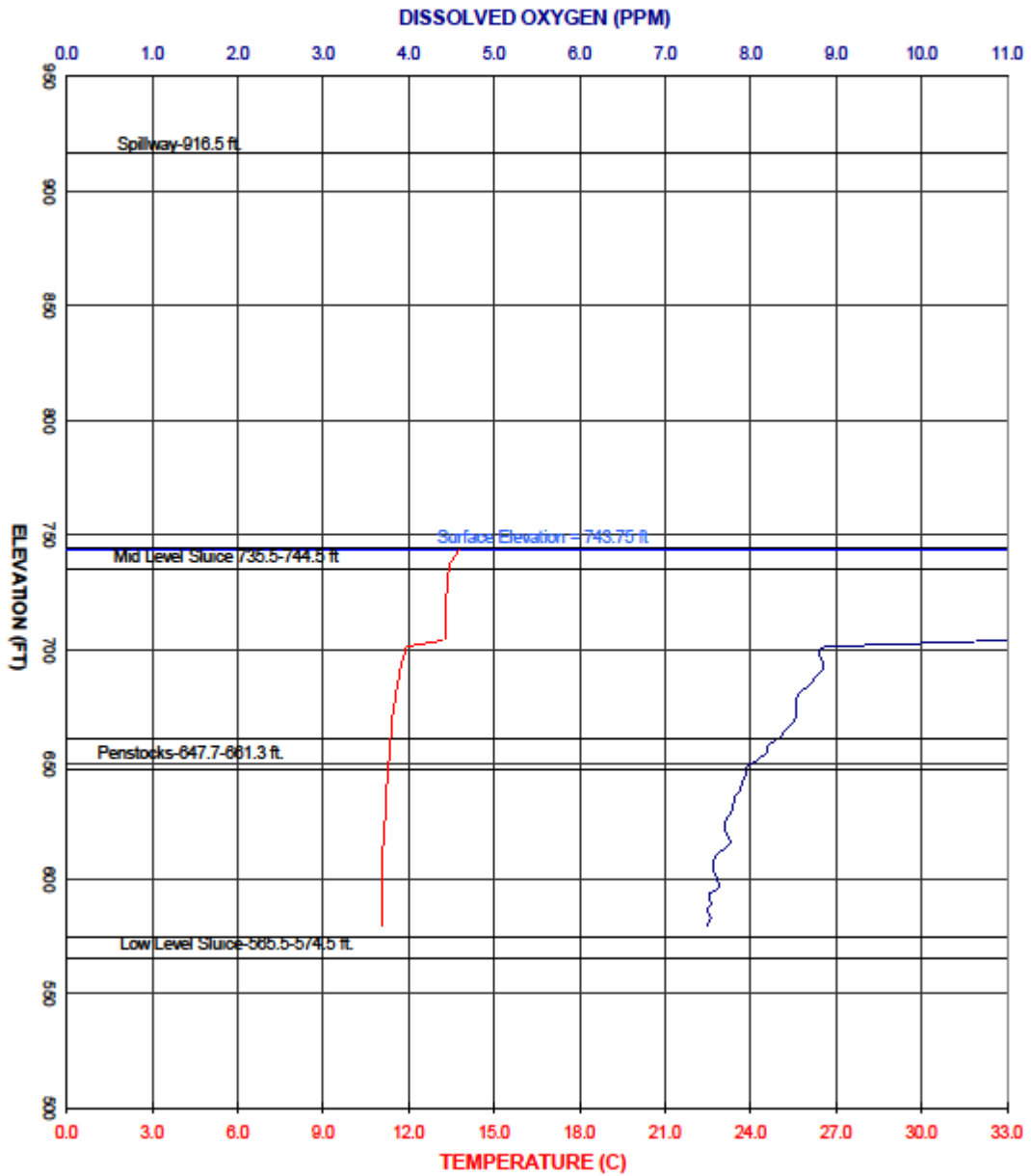
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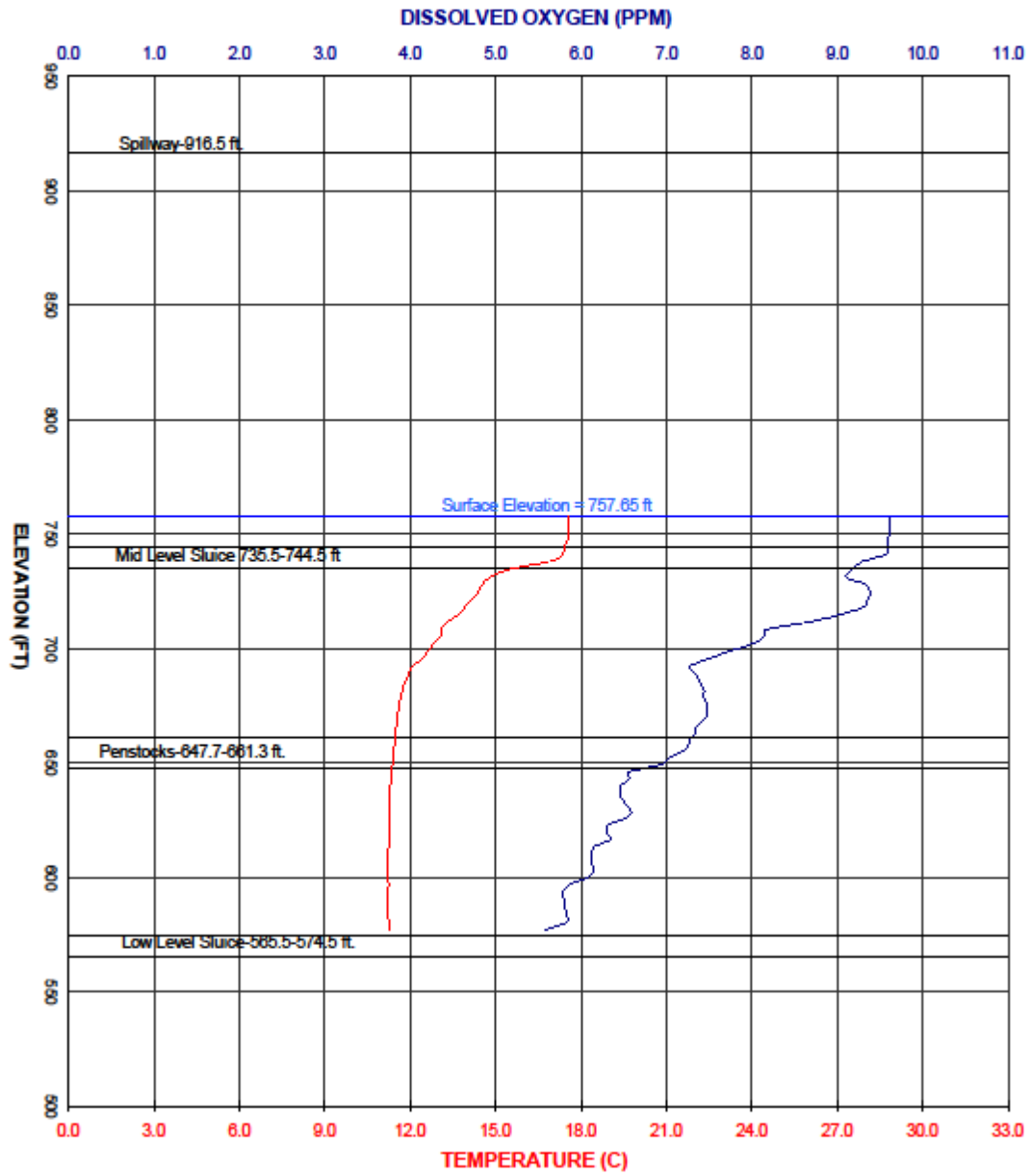
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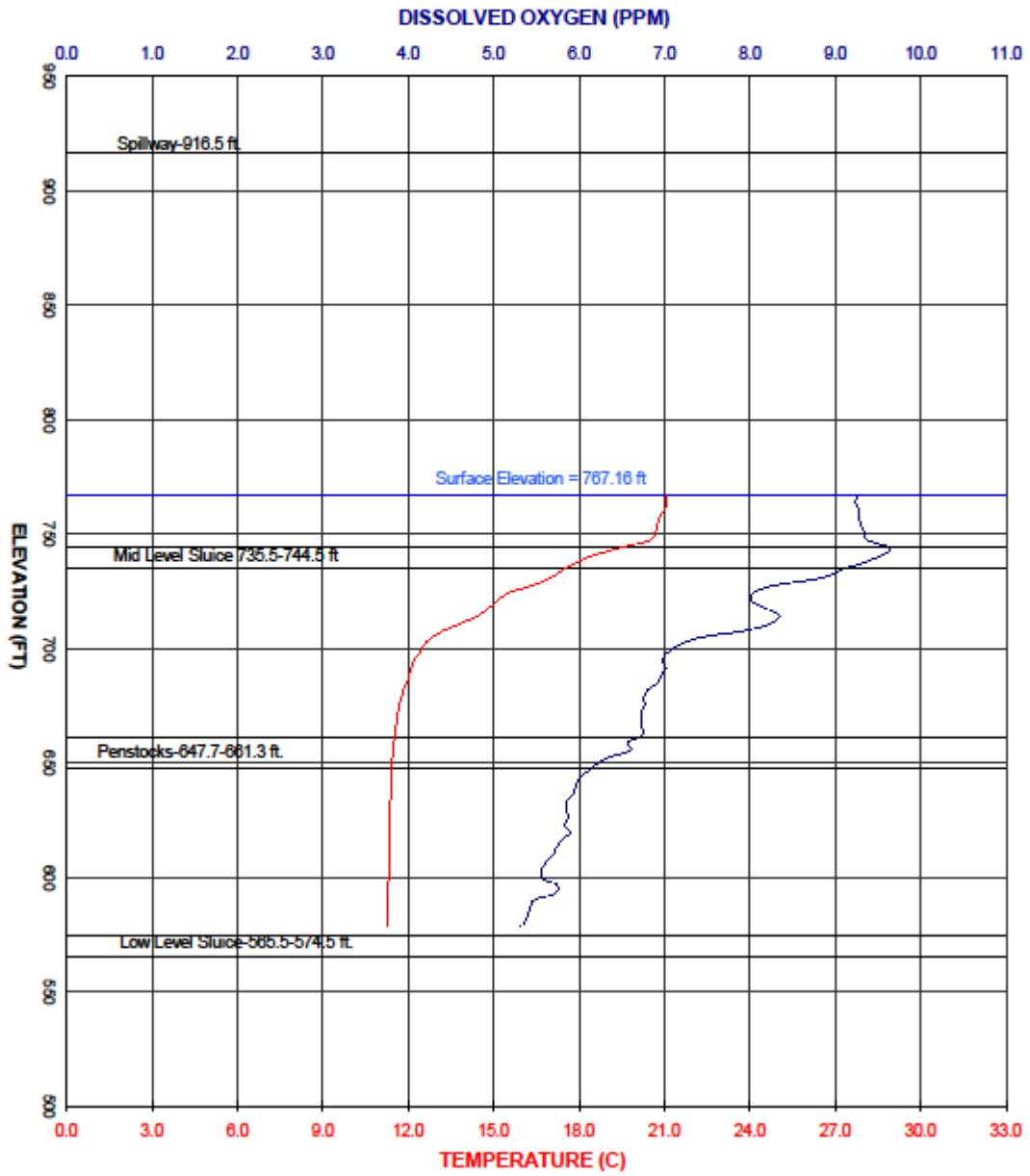
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 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 743.75



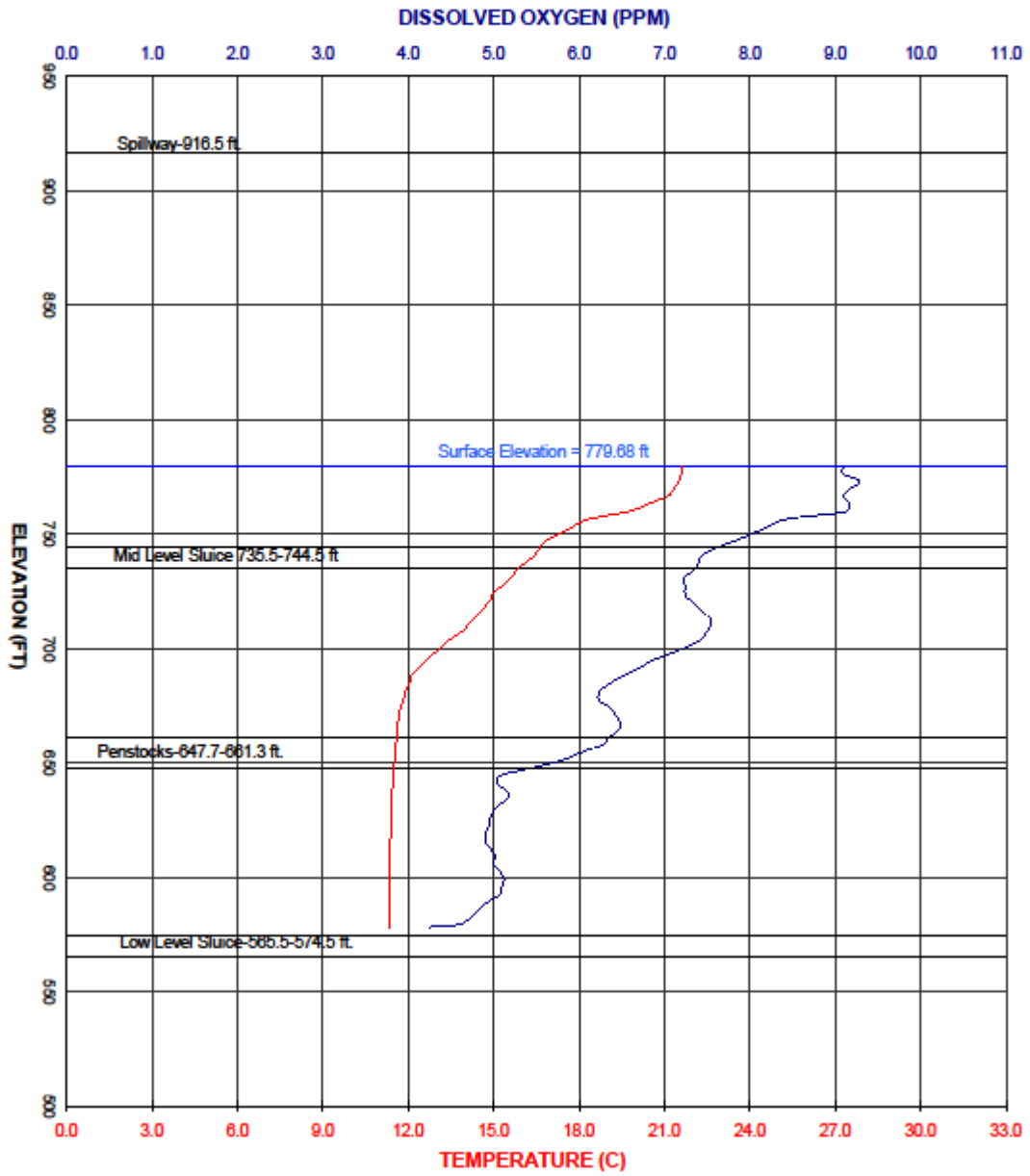
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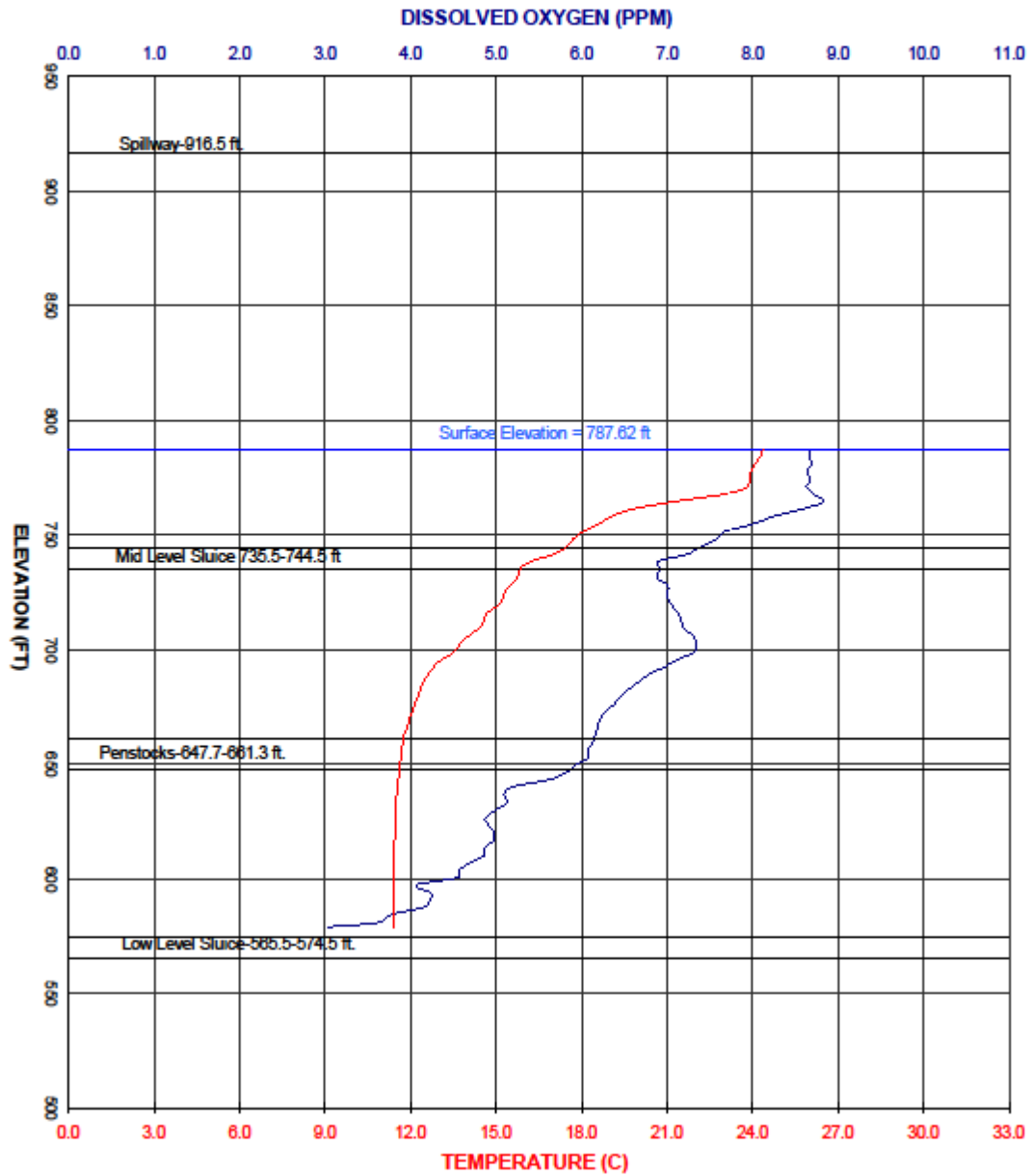
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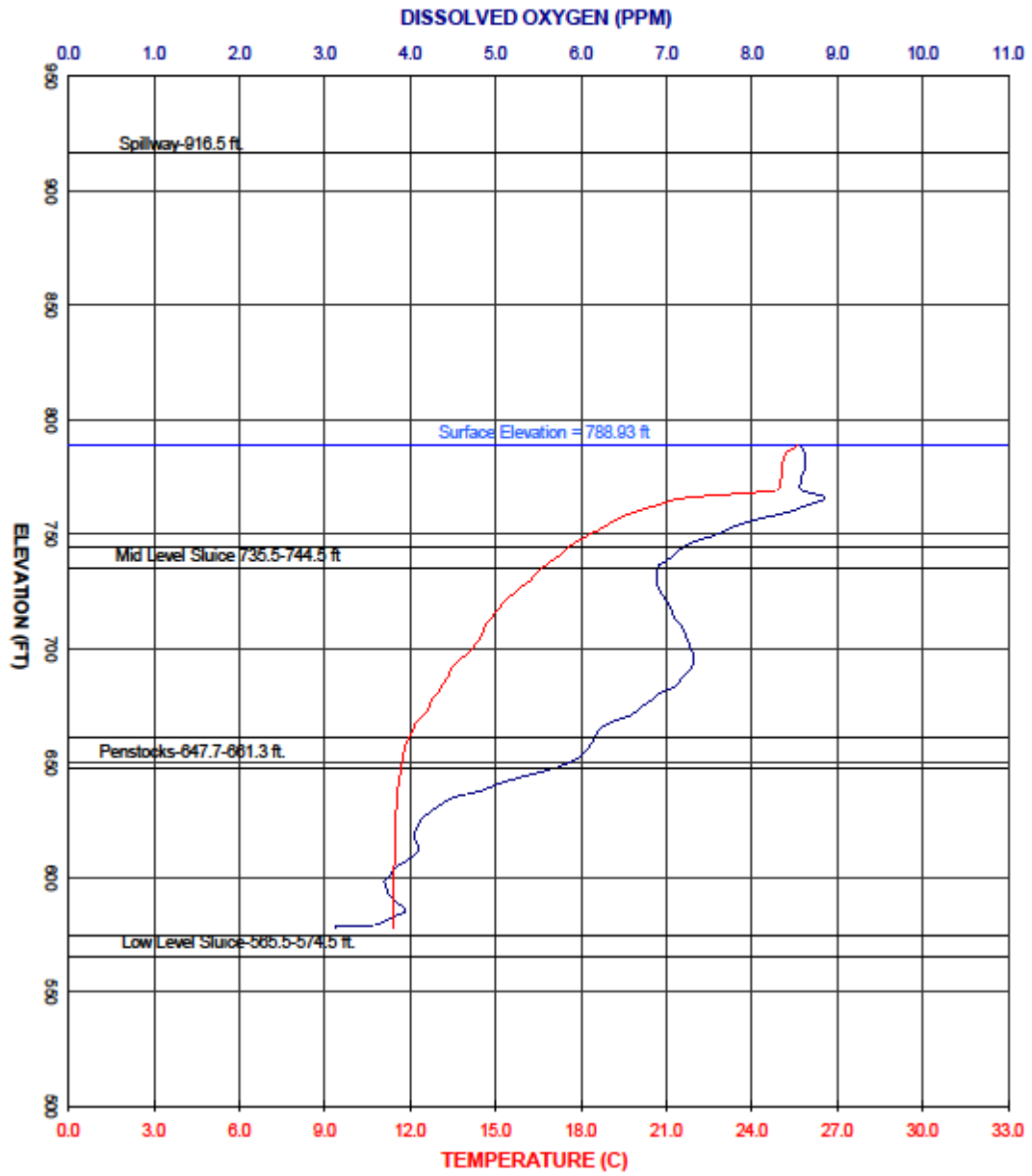
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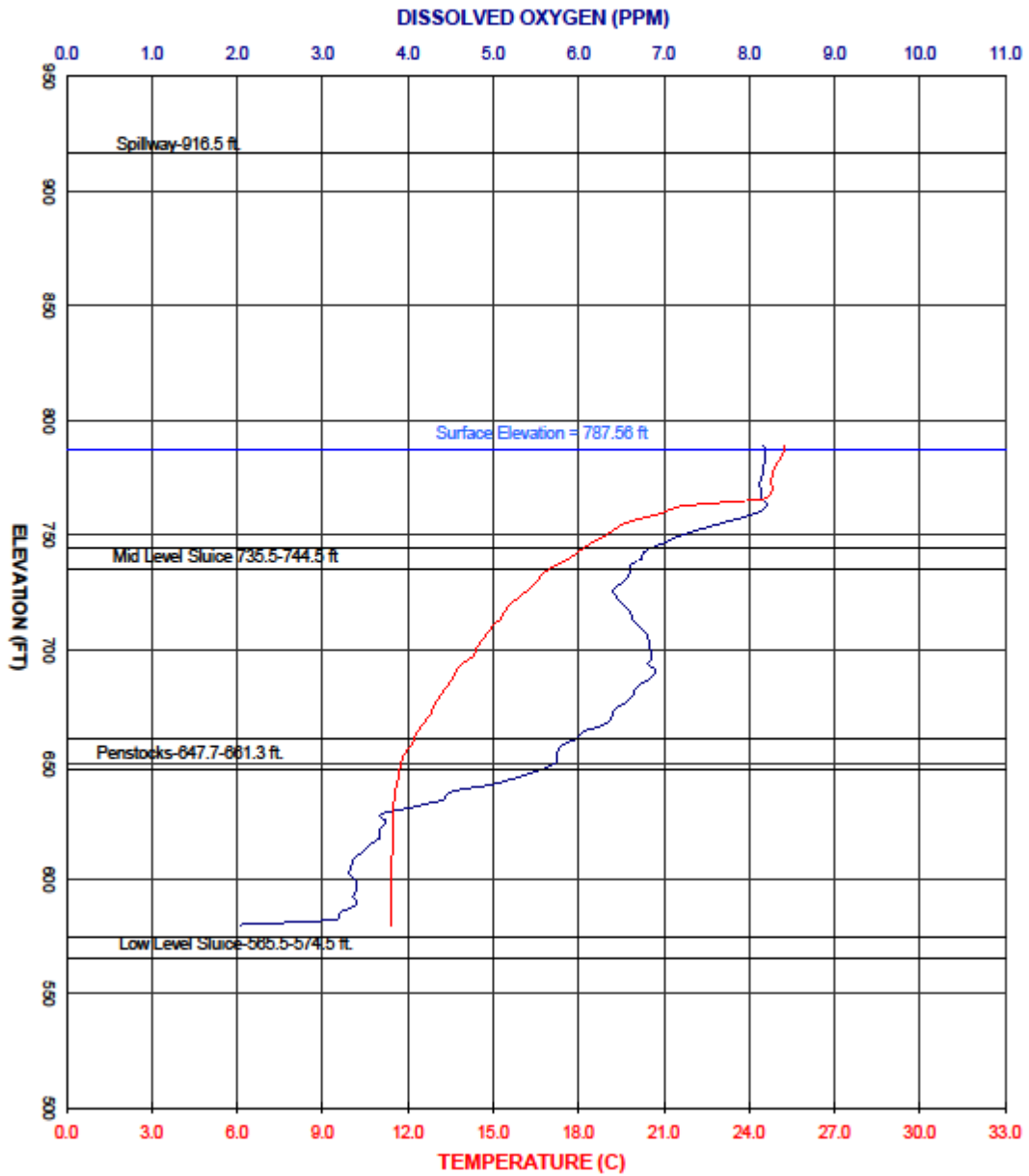
**PINE FLAT RESERVOIR 6/11/15 (Time: 1030-1130) New Buoy Line Placement
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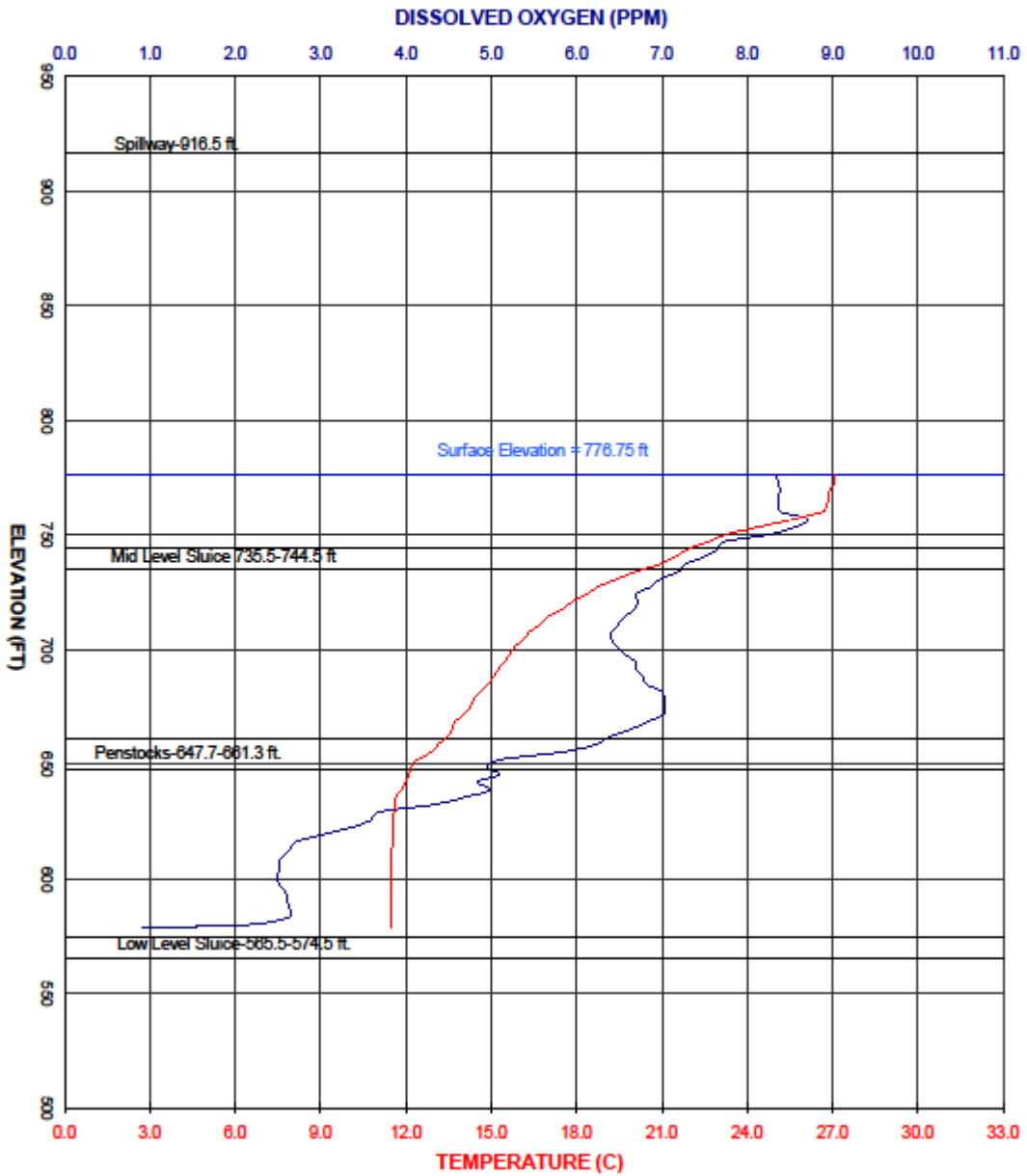
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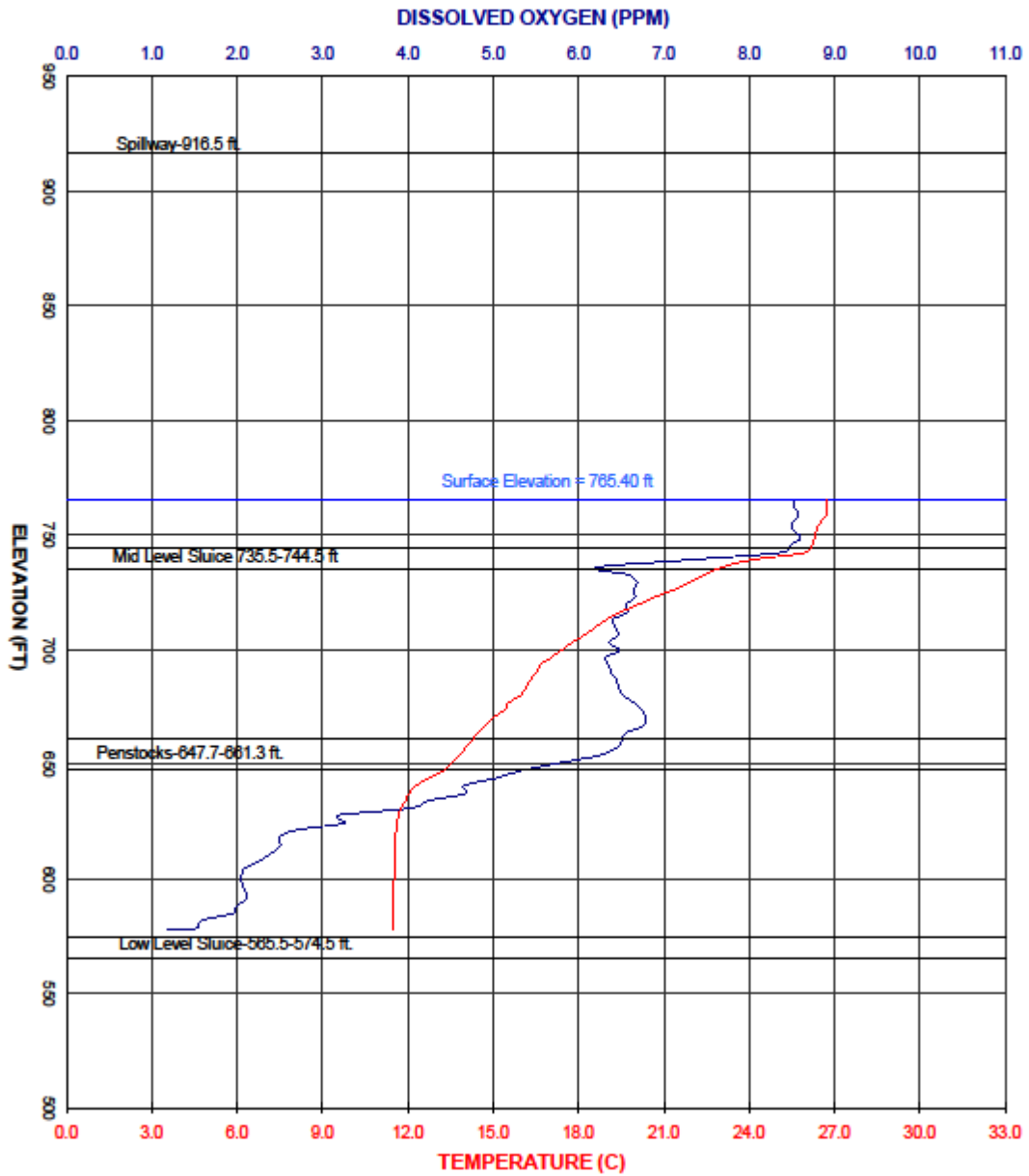
**PINE FLAT RESERVOIR 6/23/15 (Time: 1000-1100) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 787.56**



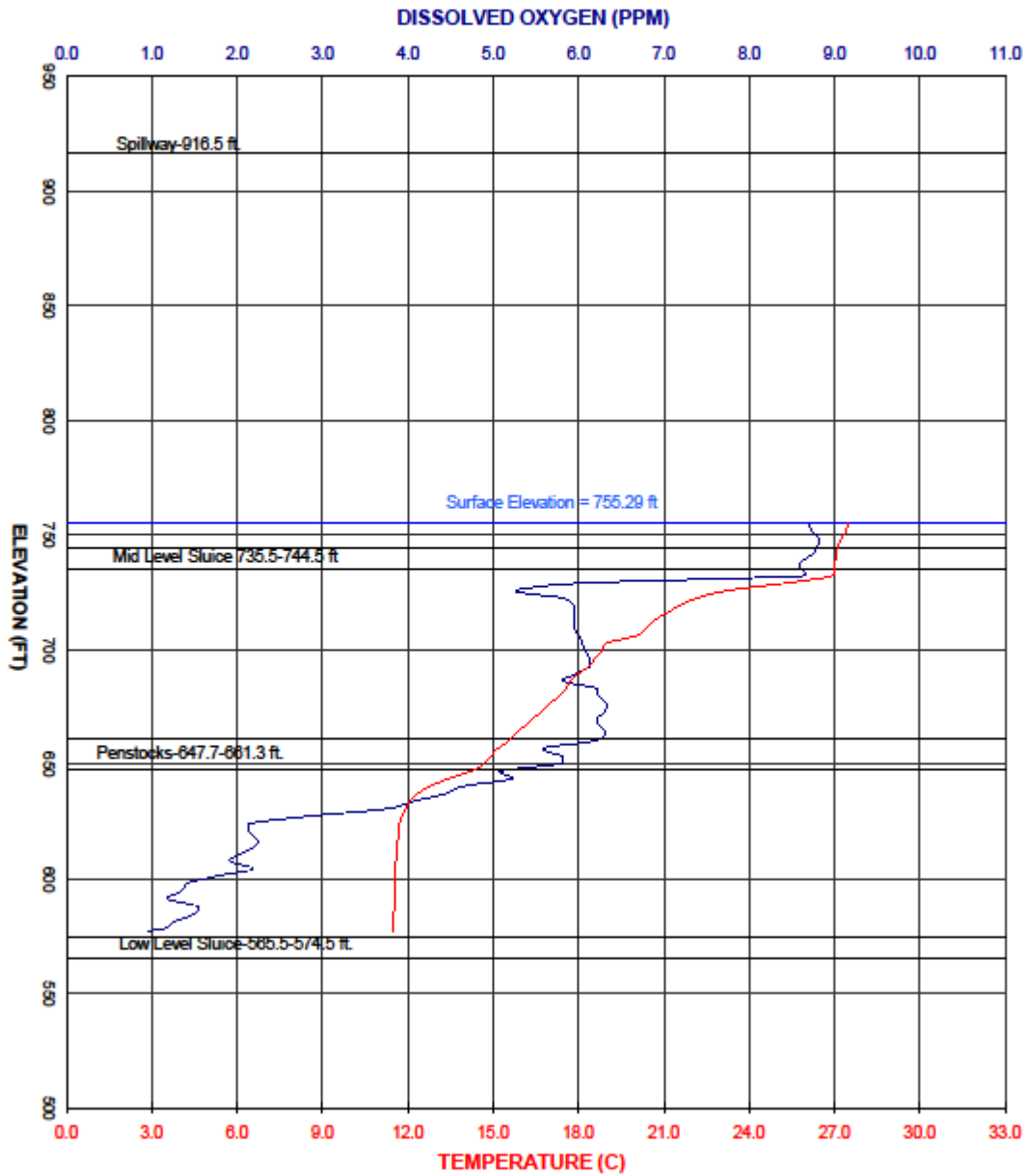
PINE FLAT RESERVOIR 07/07/15 (Time: 1000-1100) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 776.75



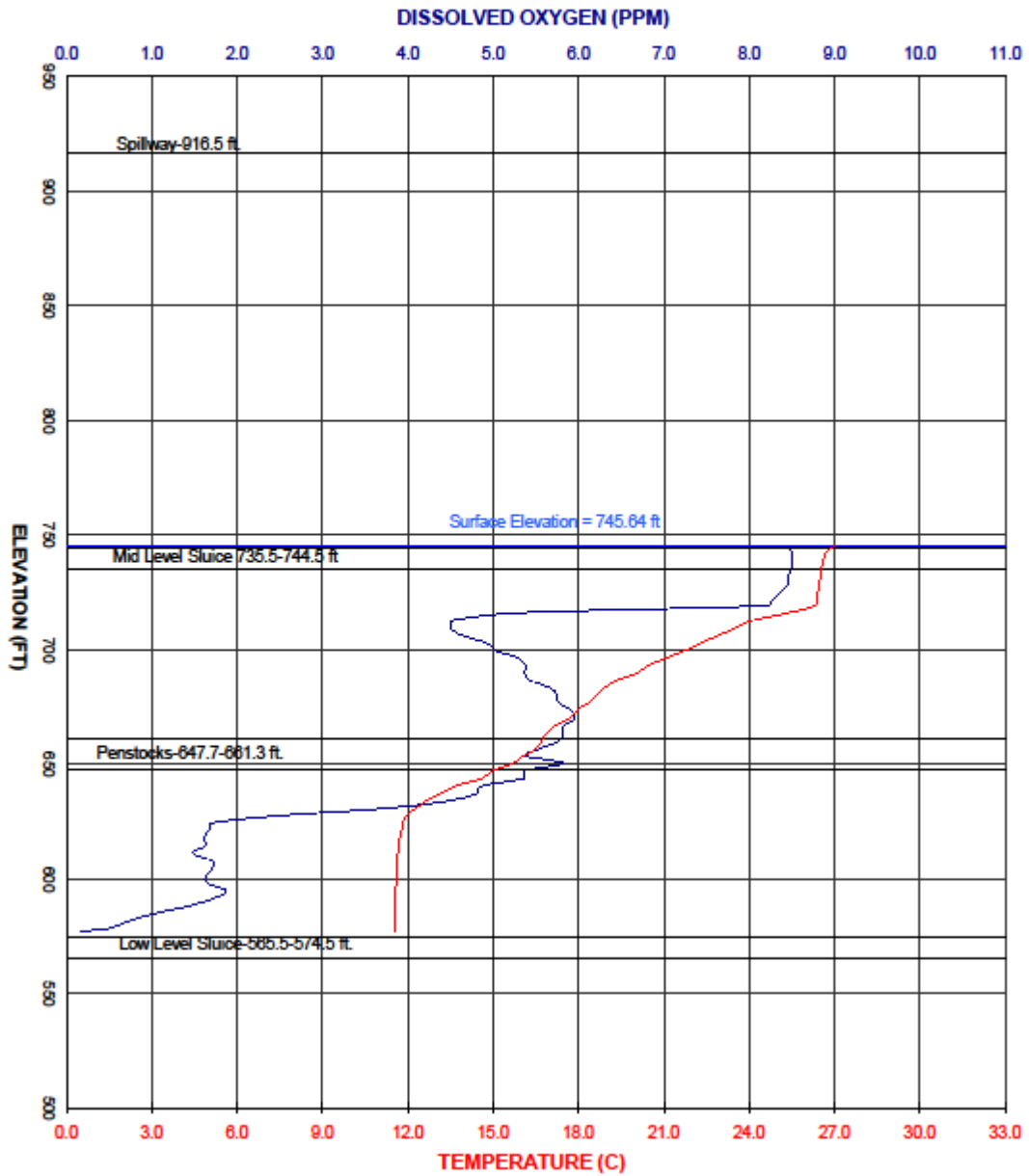
**PINE FLAT RESERVOIR 7/14/15 (Time: 1023-1112) New Buoy Line
Placement (0.57 miles upstream of Dam) Reservoir Elevation in Feet =
765.40**



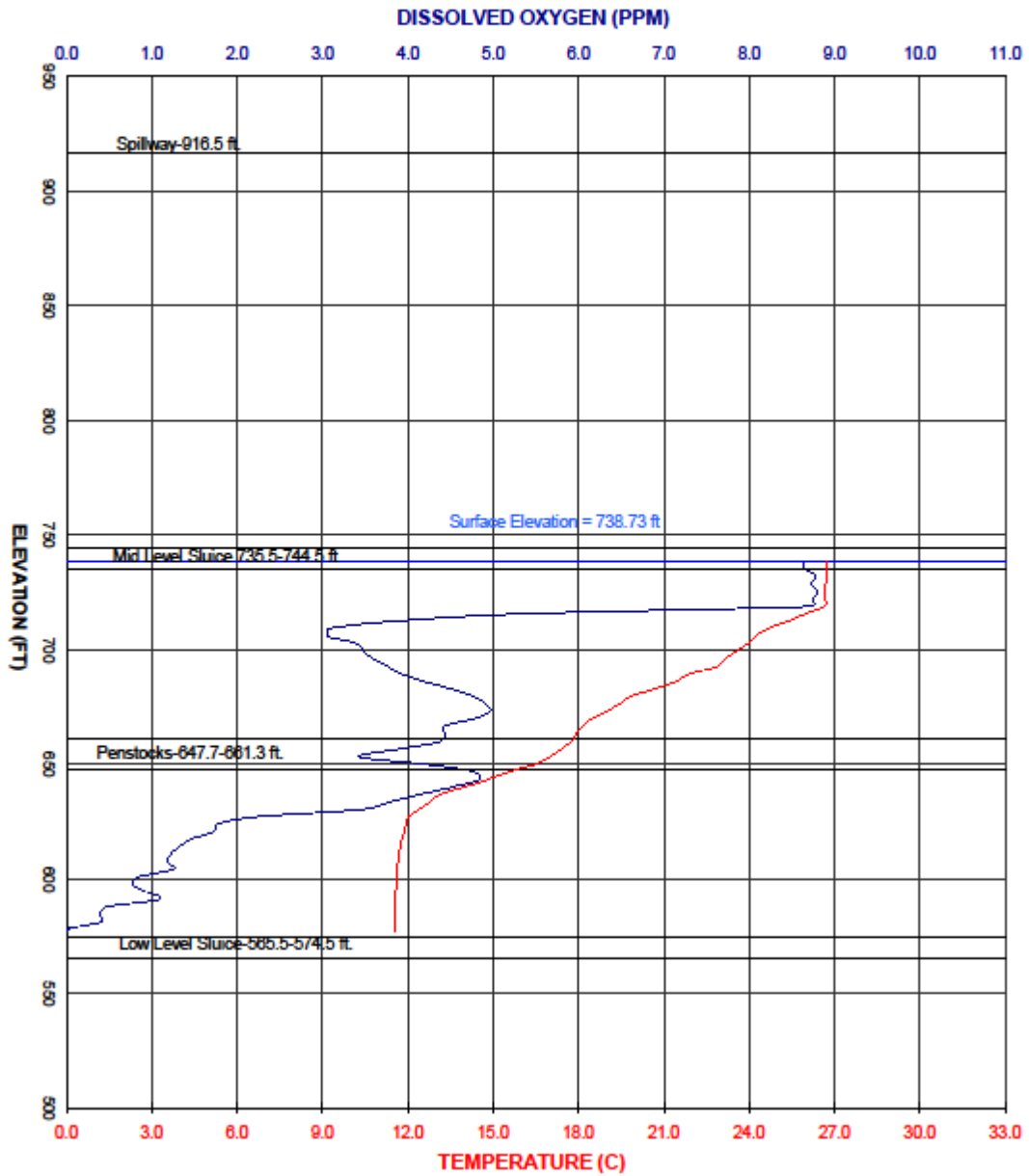
PINE FLAT RESERVOIR 7/21/15 (Time: 1012-1101) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 755.29



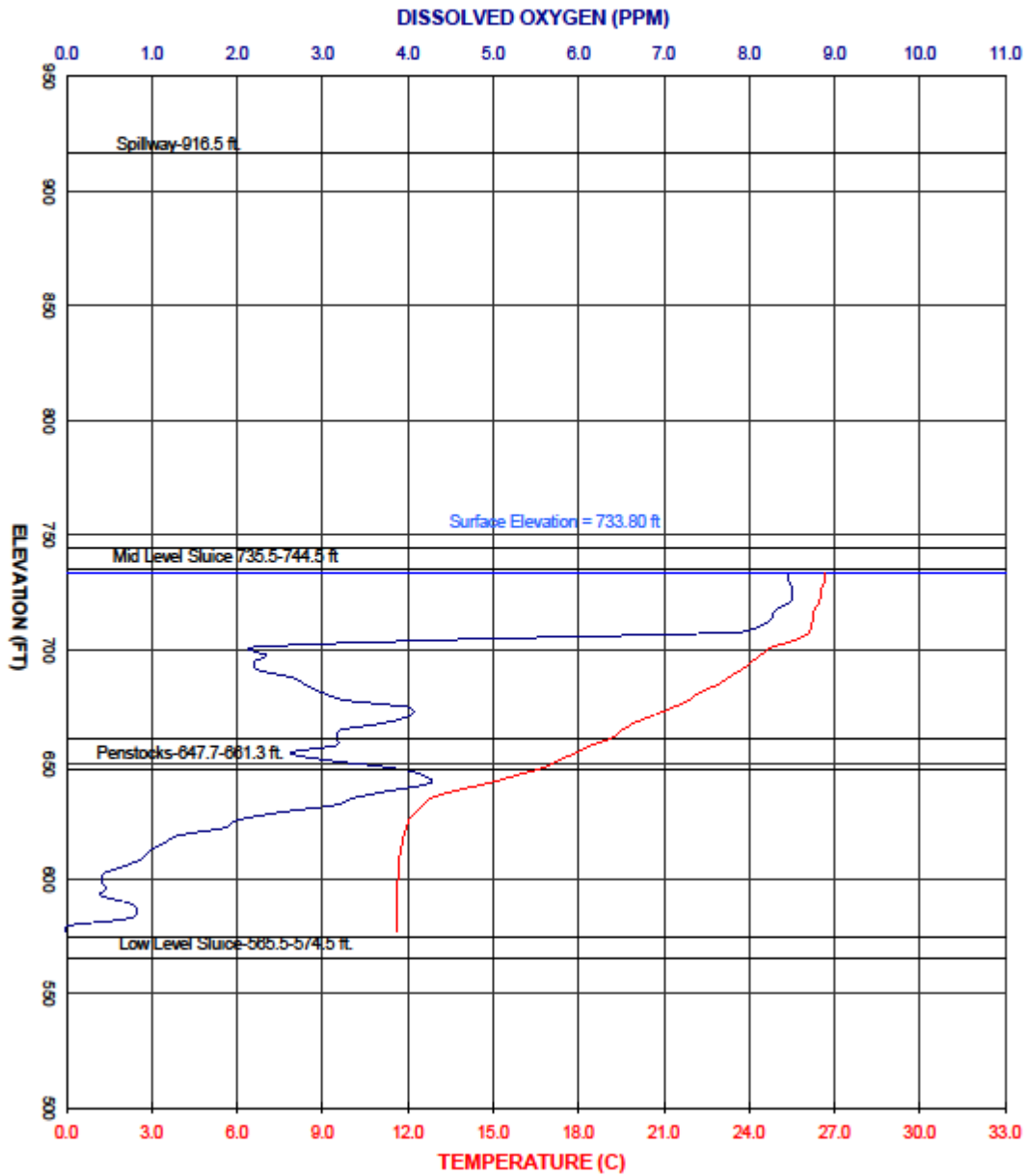
PINE FLAT RESERVOIR 7/28/15 (Time: 1015-1110) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 745.64



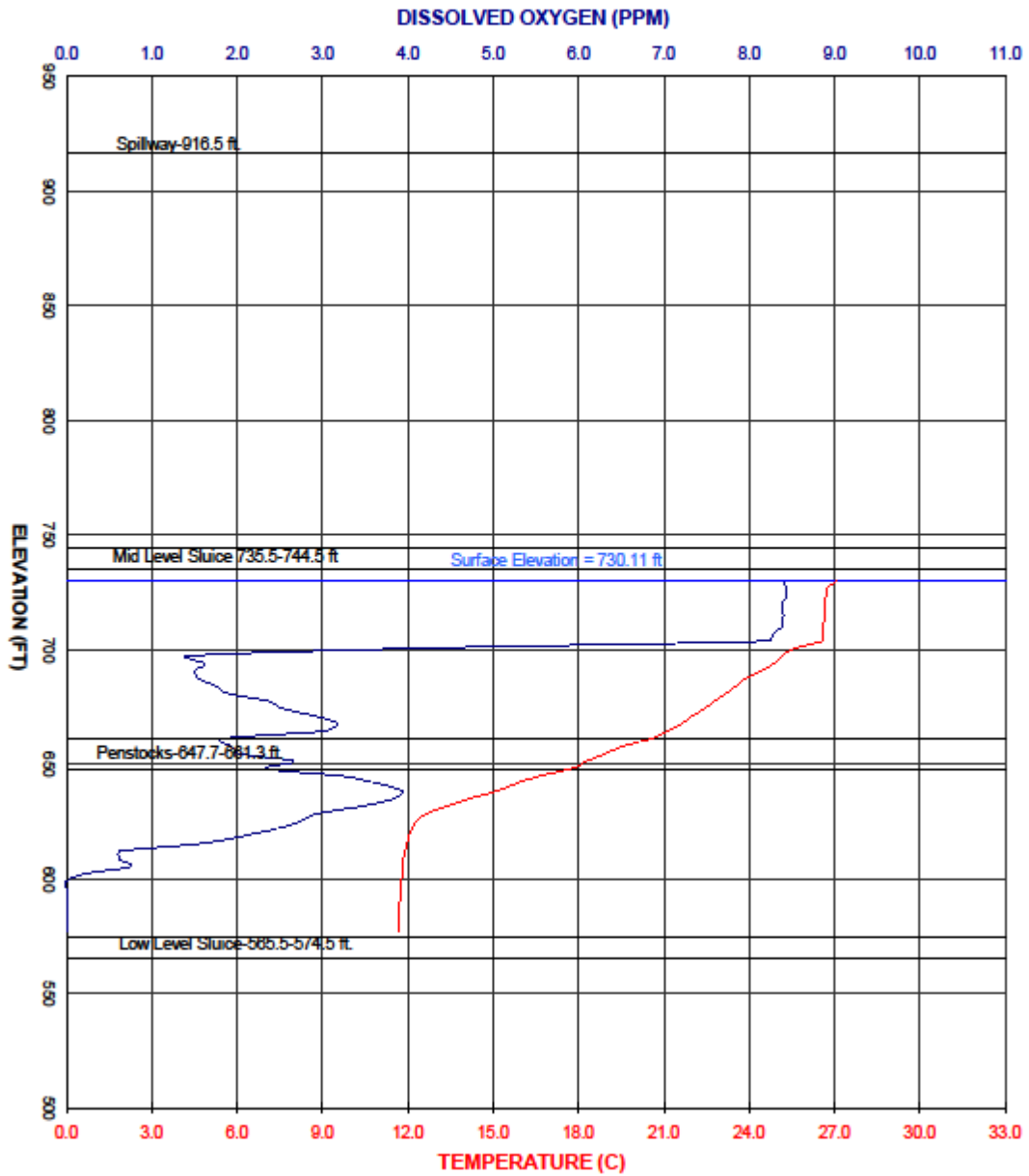
PINE FLAT RESERVOIR 8/4/15 (Time: 1040-1138) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 738.73



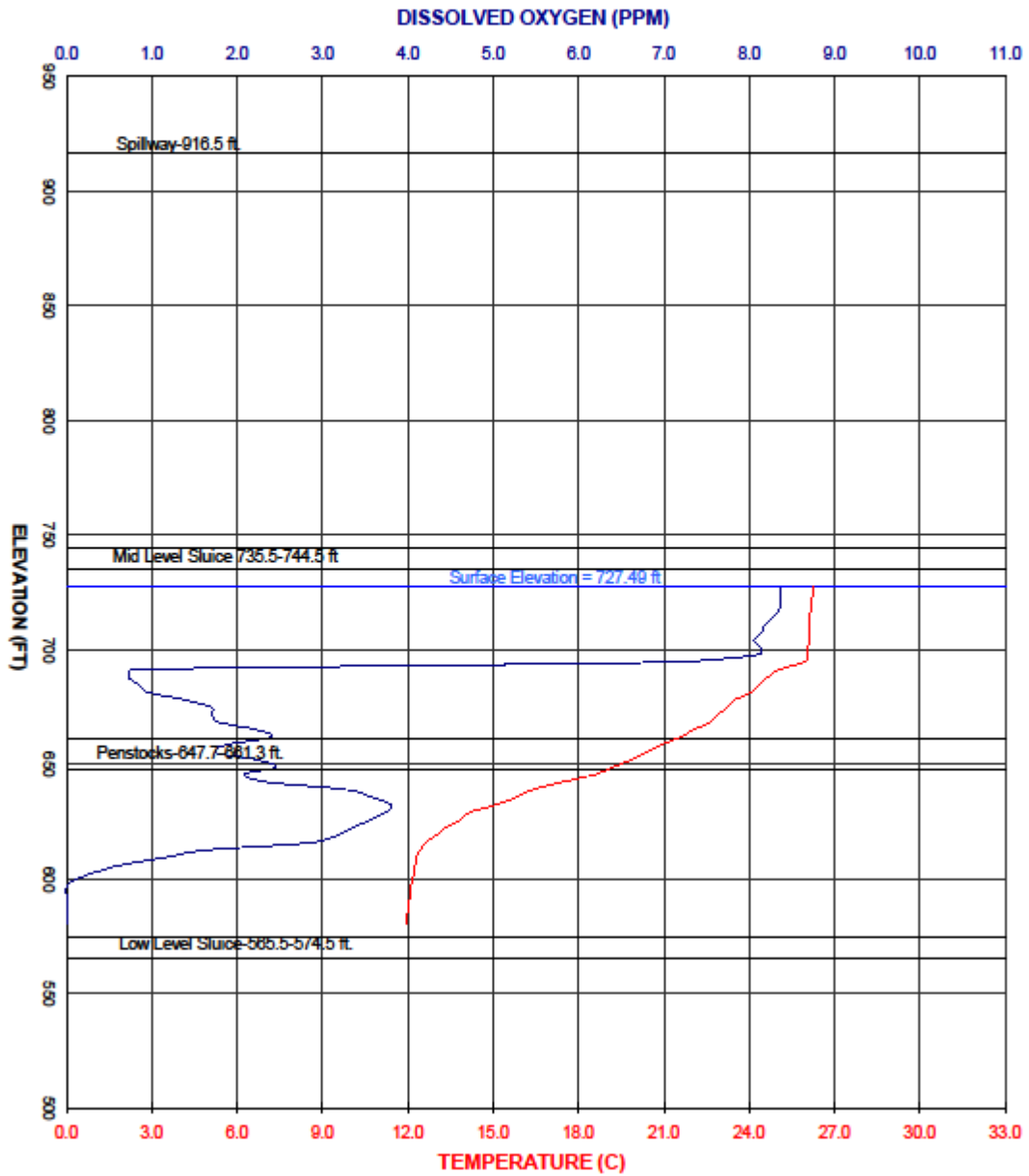
PINE FLAT RESERVOIR 8/11/15 (Time: 1035-1140) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 733.80



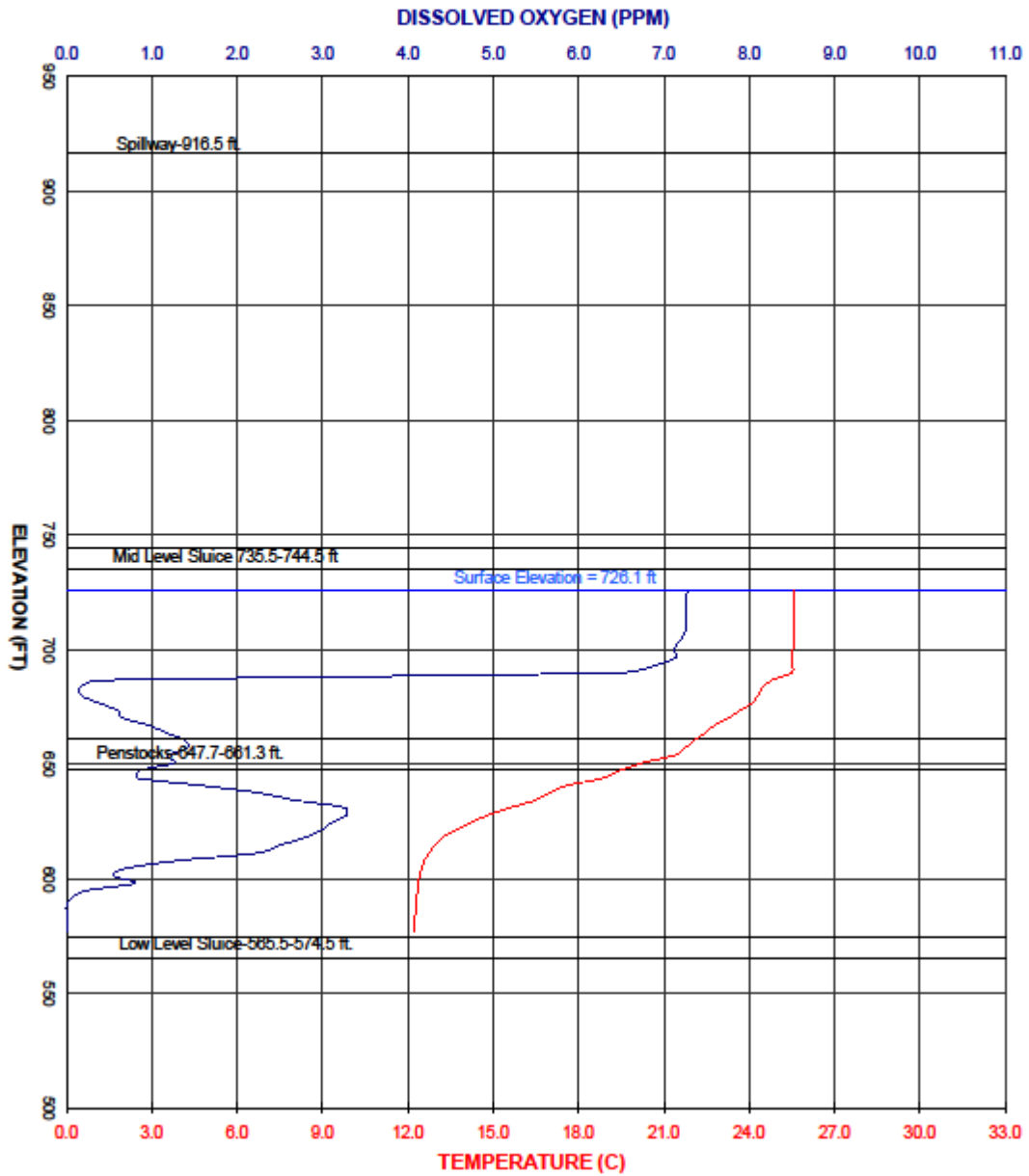
PINE FLAT RESERVOIR 8/18/15 (Time: 1034-1148) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 730.11



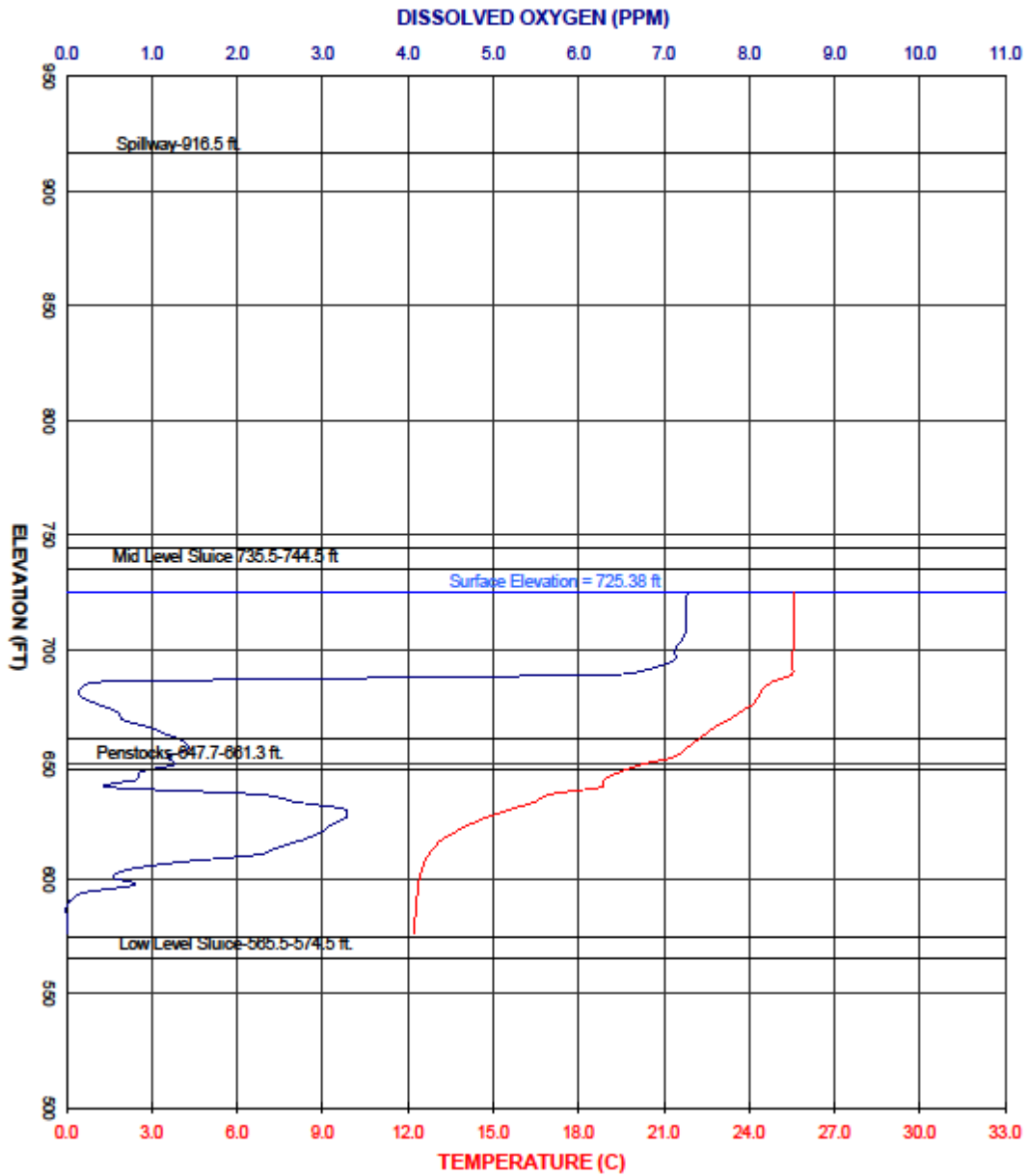
**PINE FLAT RESERVOIR 8/25/15 (Time: 1002-1124) New Buoy Line
Placement (0.57 miles upstream of Dam) Reservoir Elevation in Feet =
727.49**



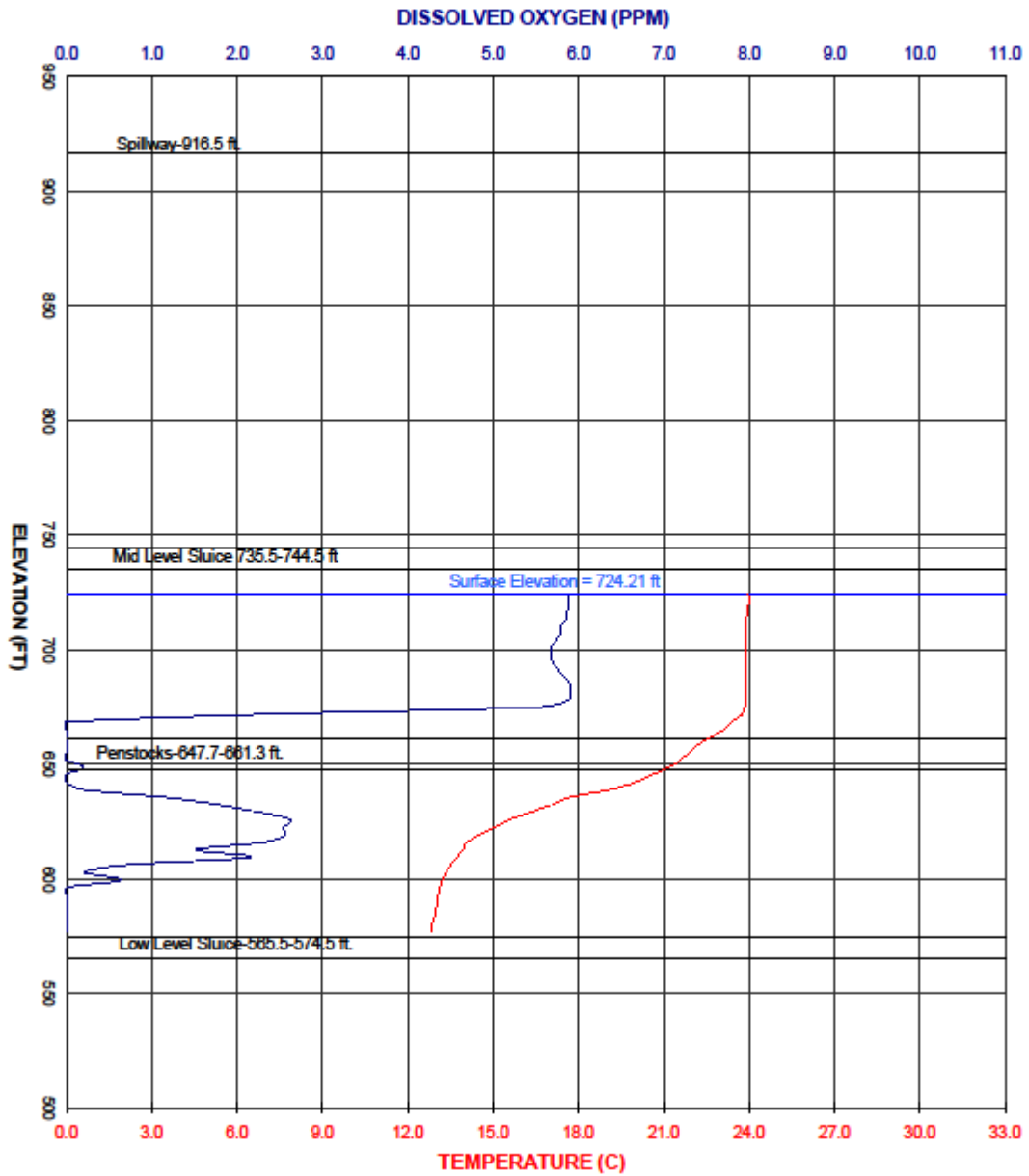
PINE FLAT RESERVOIR 9/03/15 (Time: 1010-1105) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 726.1



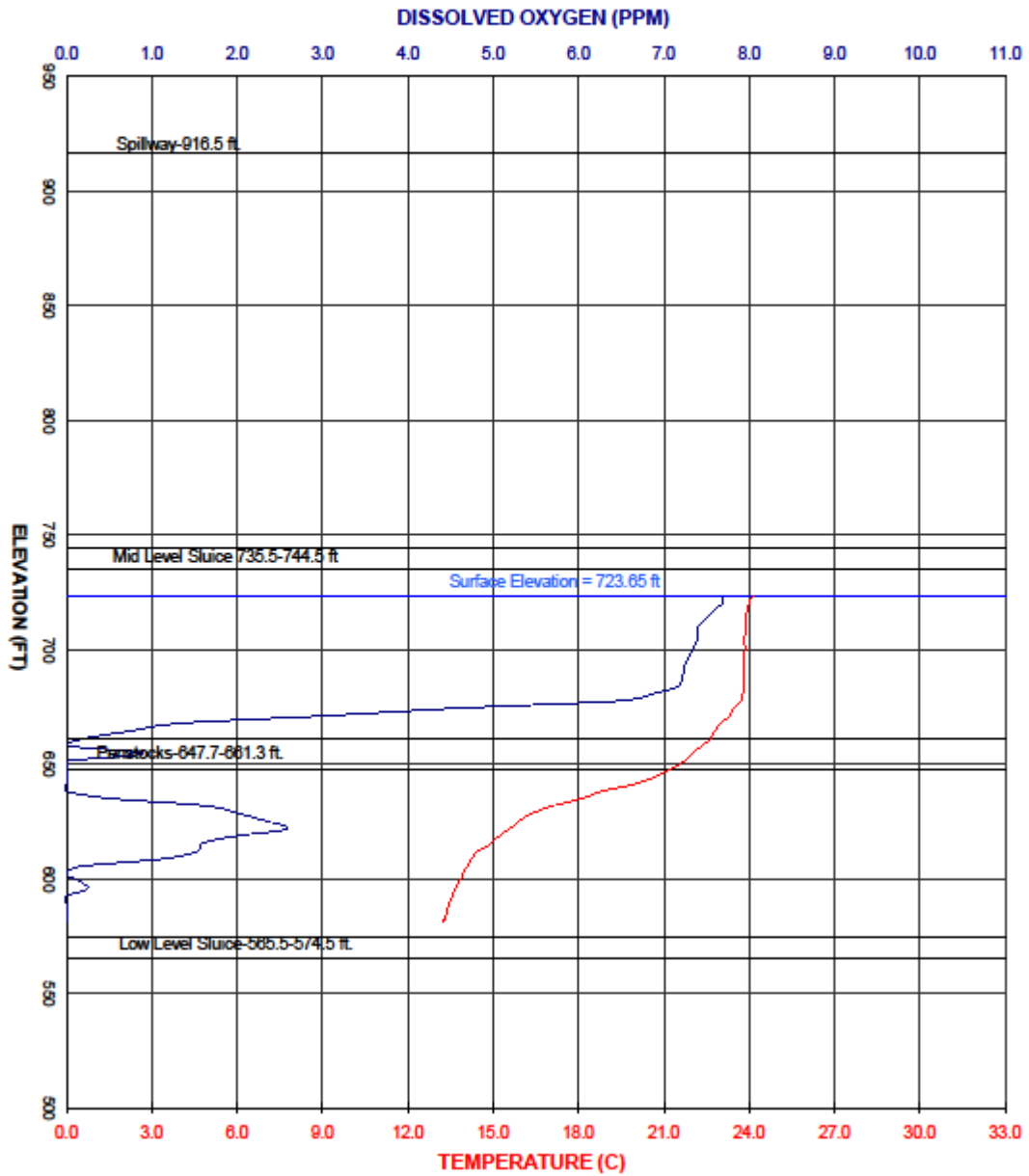
PINE FLAT RESERVOIR 9/10/15 (Time: 1000-1102) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 725.38



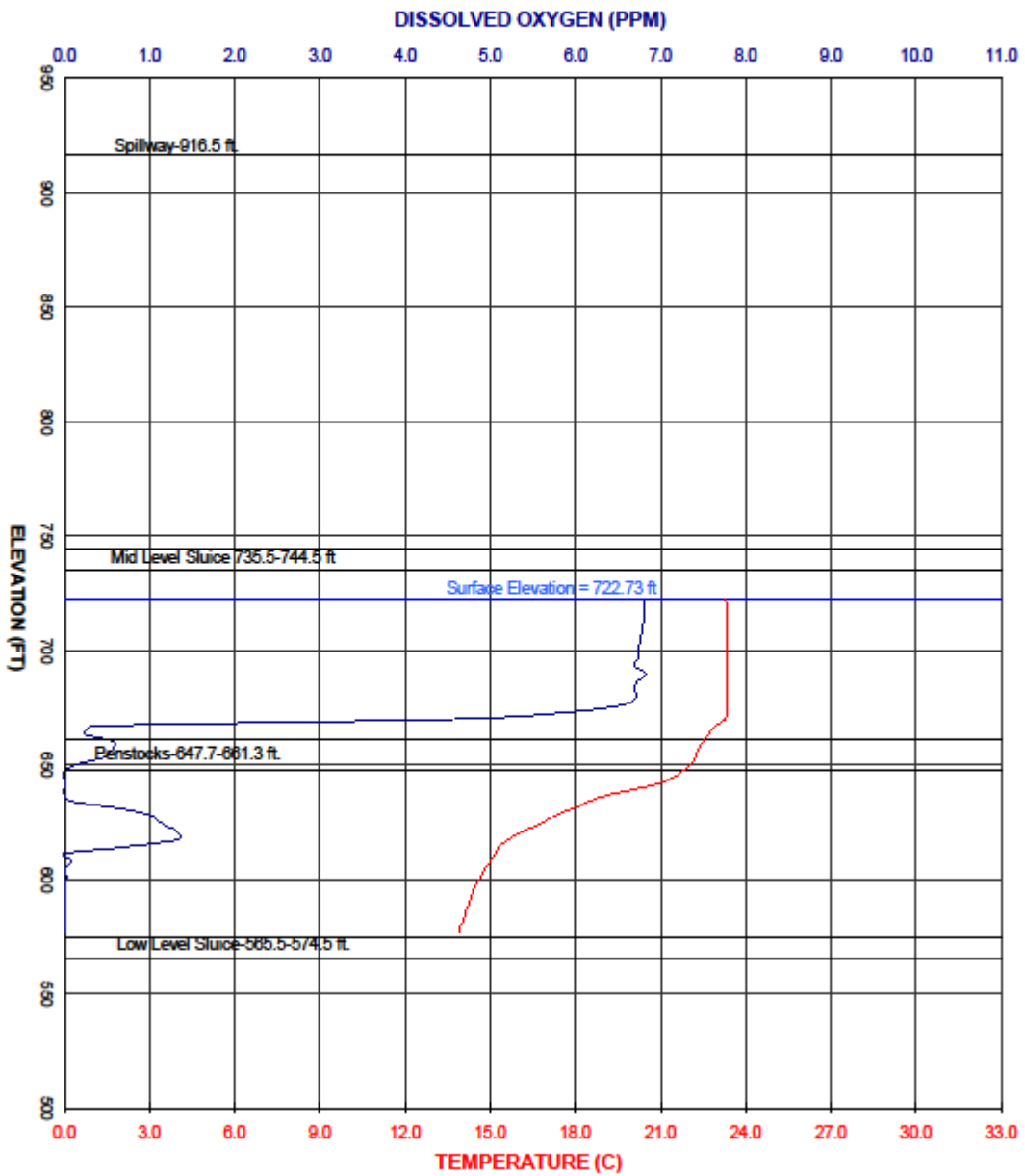
PINE FLAT RESERVOIR 9/17/15 (Time: 1020-1112) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 724.21



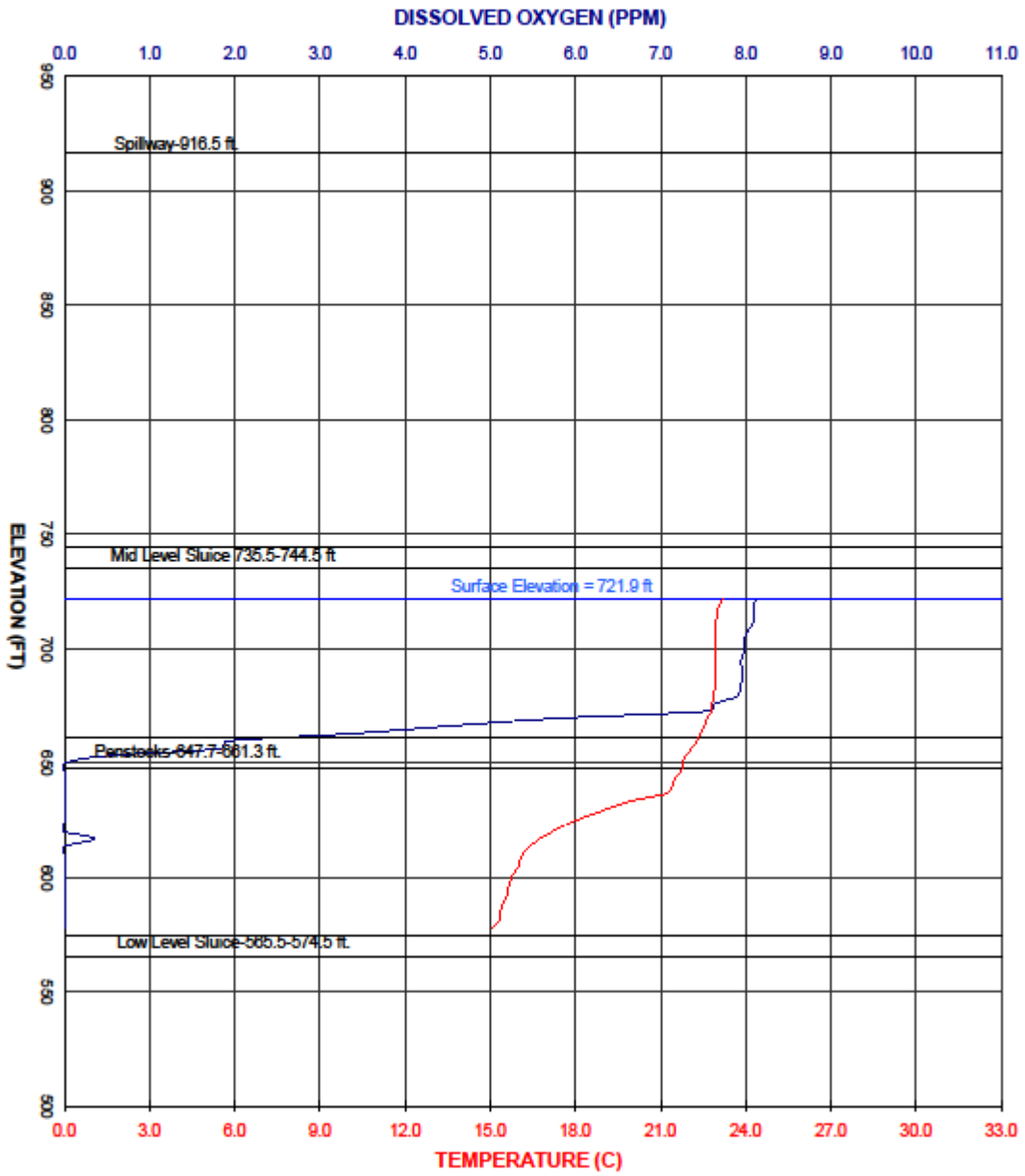
PINE FLAT RESERVOIR 9/22/15 (Time: 1010-1104) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 723.65



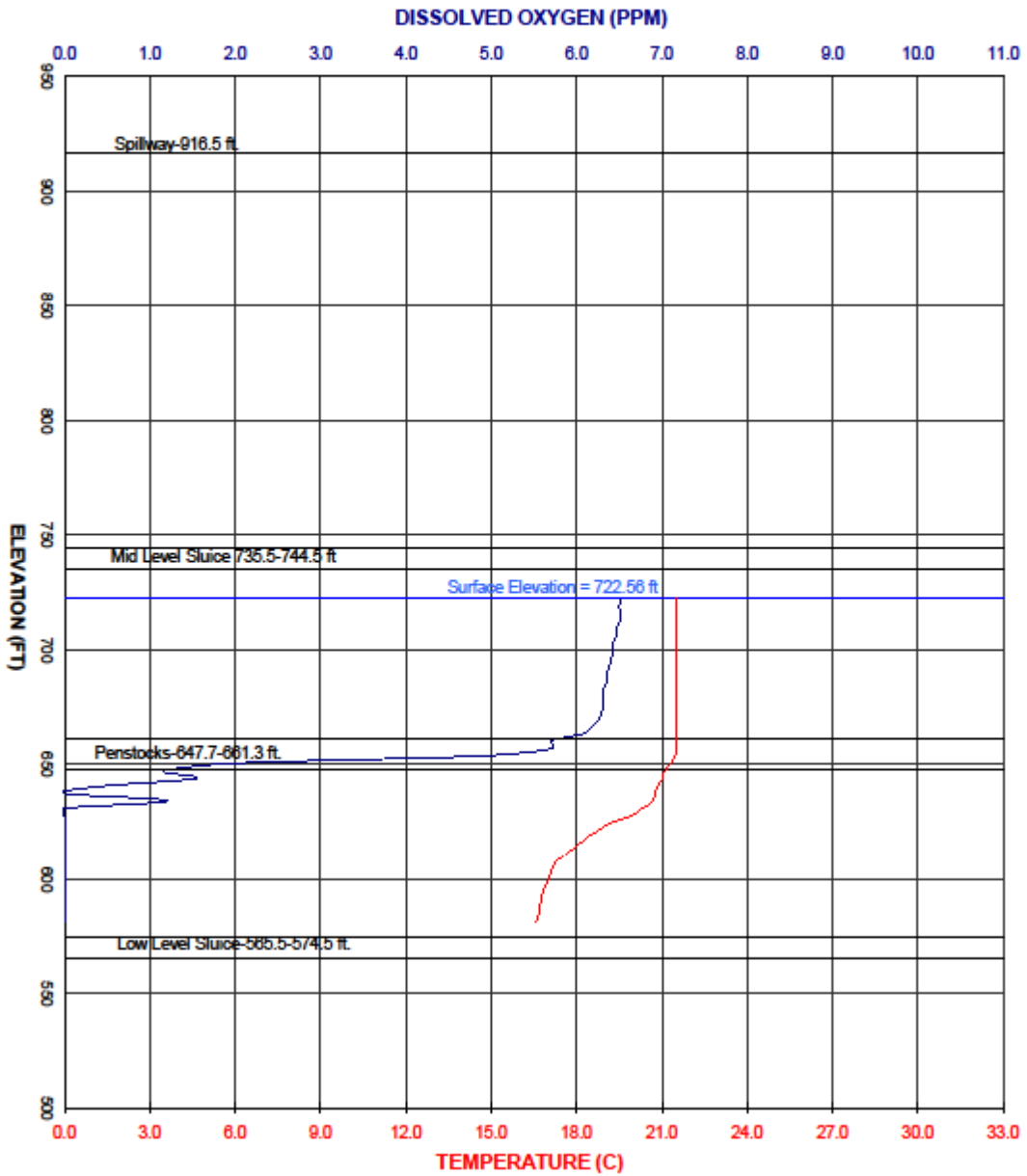
PINE FLAT RESERVOIR 10/01/15 (Time: 1020-1116) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 722.73



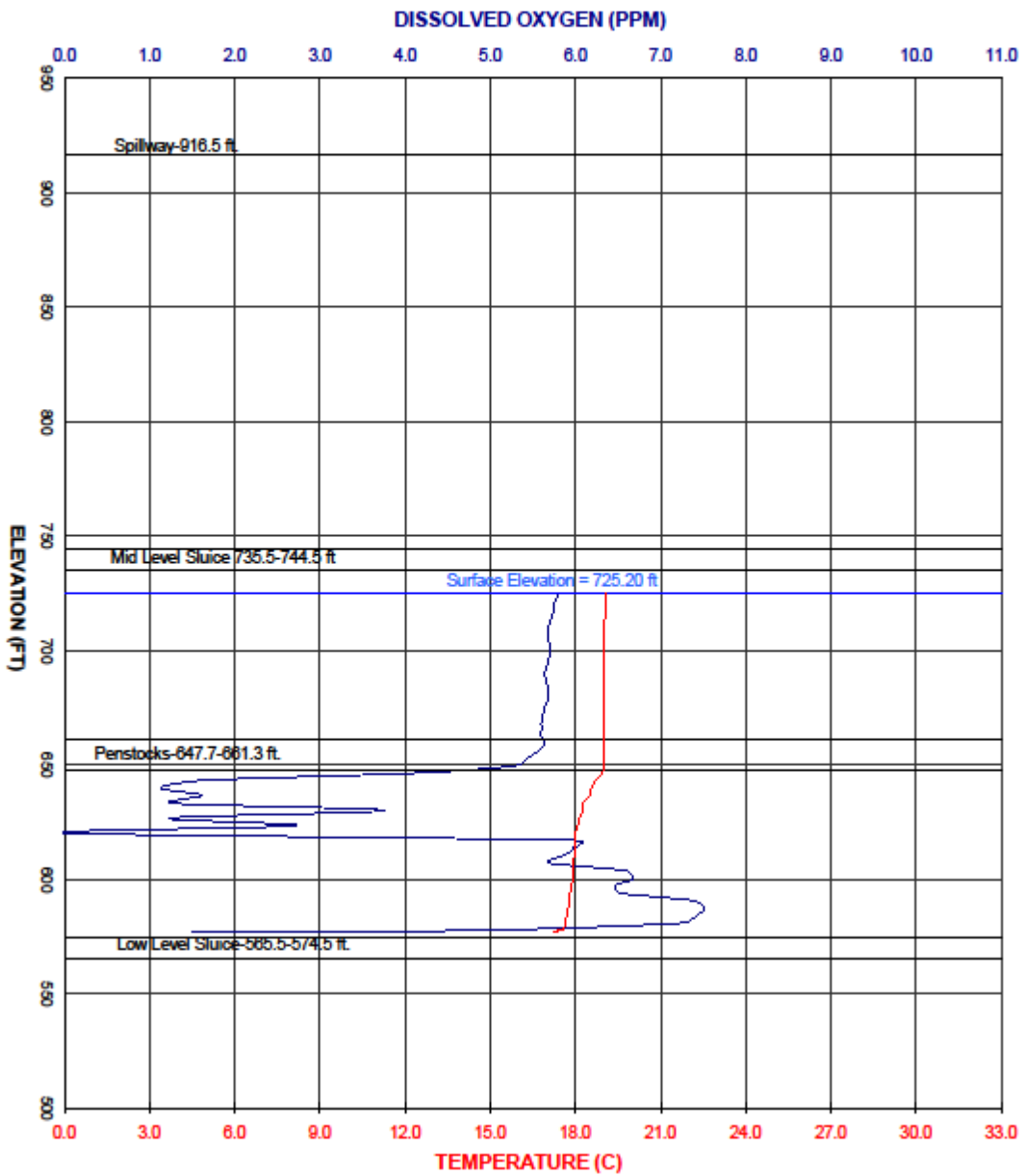
**PINE FLAT RESERVOIR 10/13/15 (Time: 1015-1111) New Buoy Line
Placement (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 721.9**



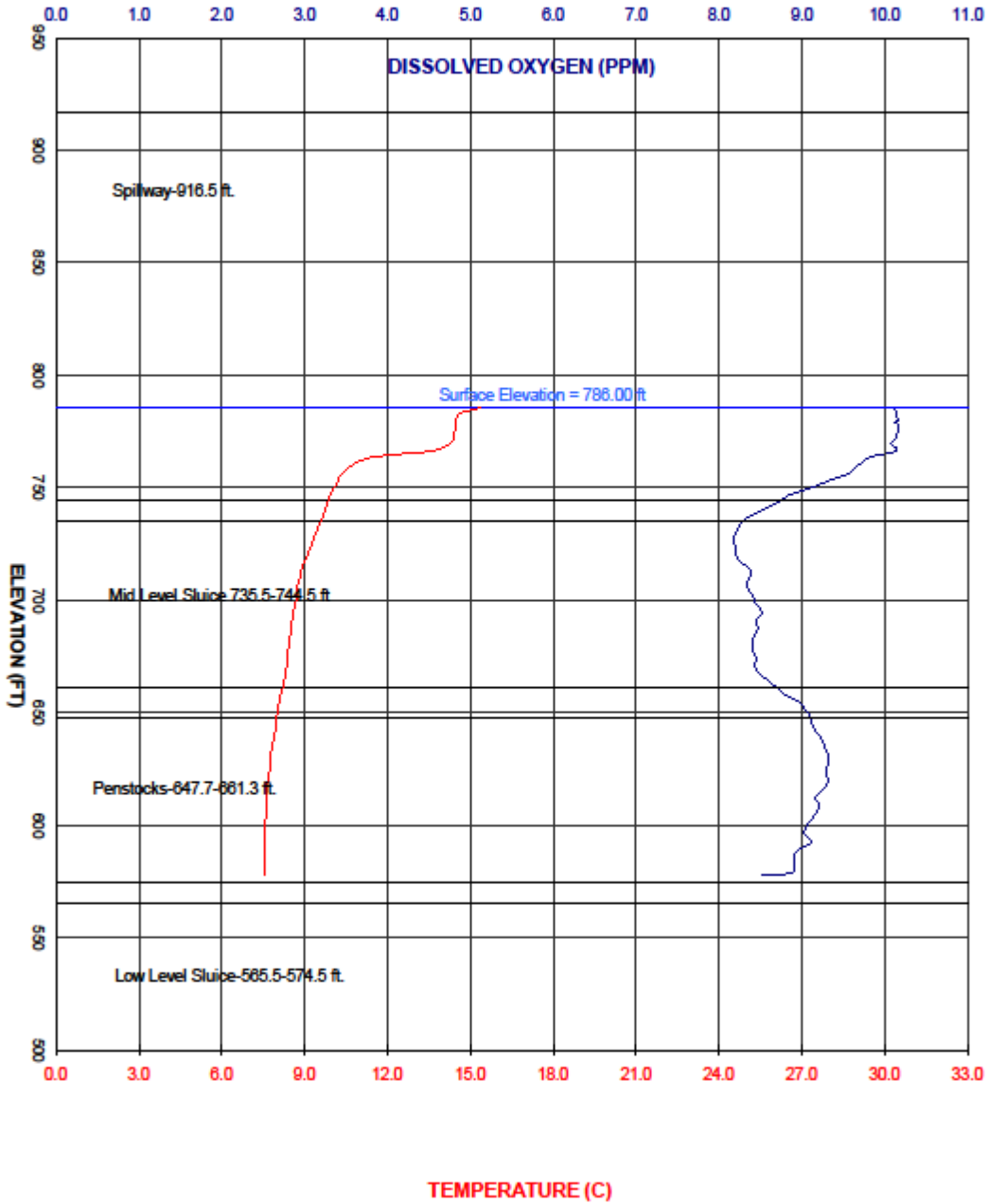
PINE FLAT RESERVOIR 10/27/15 (Time: 1018-1140) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 722.56



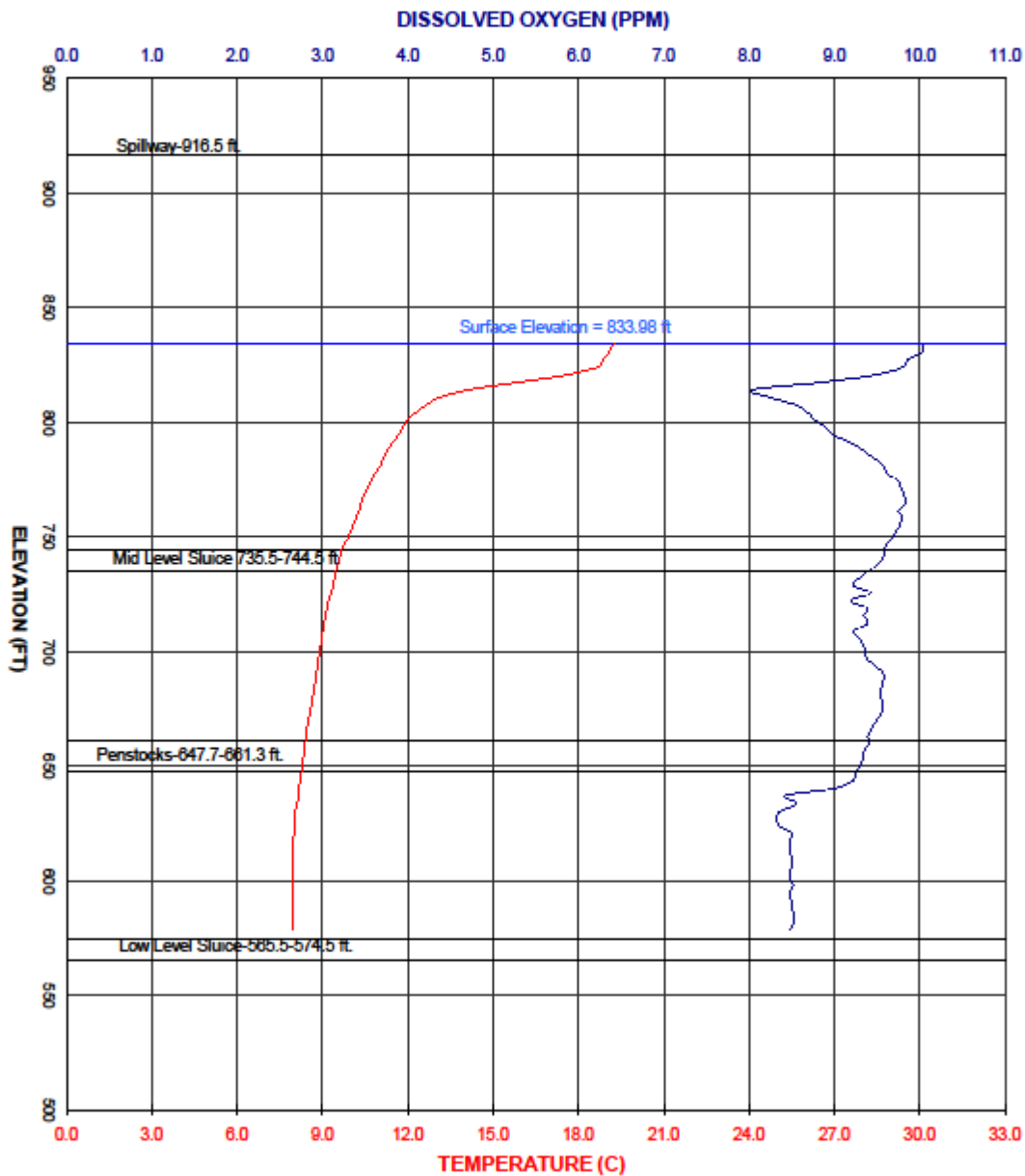
PINE FLAT RESERVOIR 11/10/15 (Time: 1000-1112) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 725.20



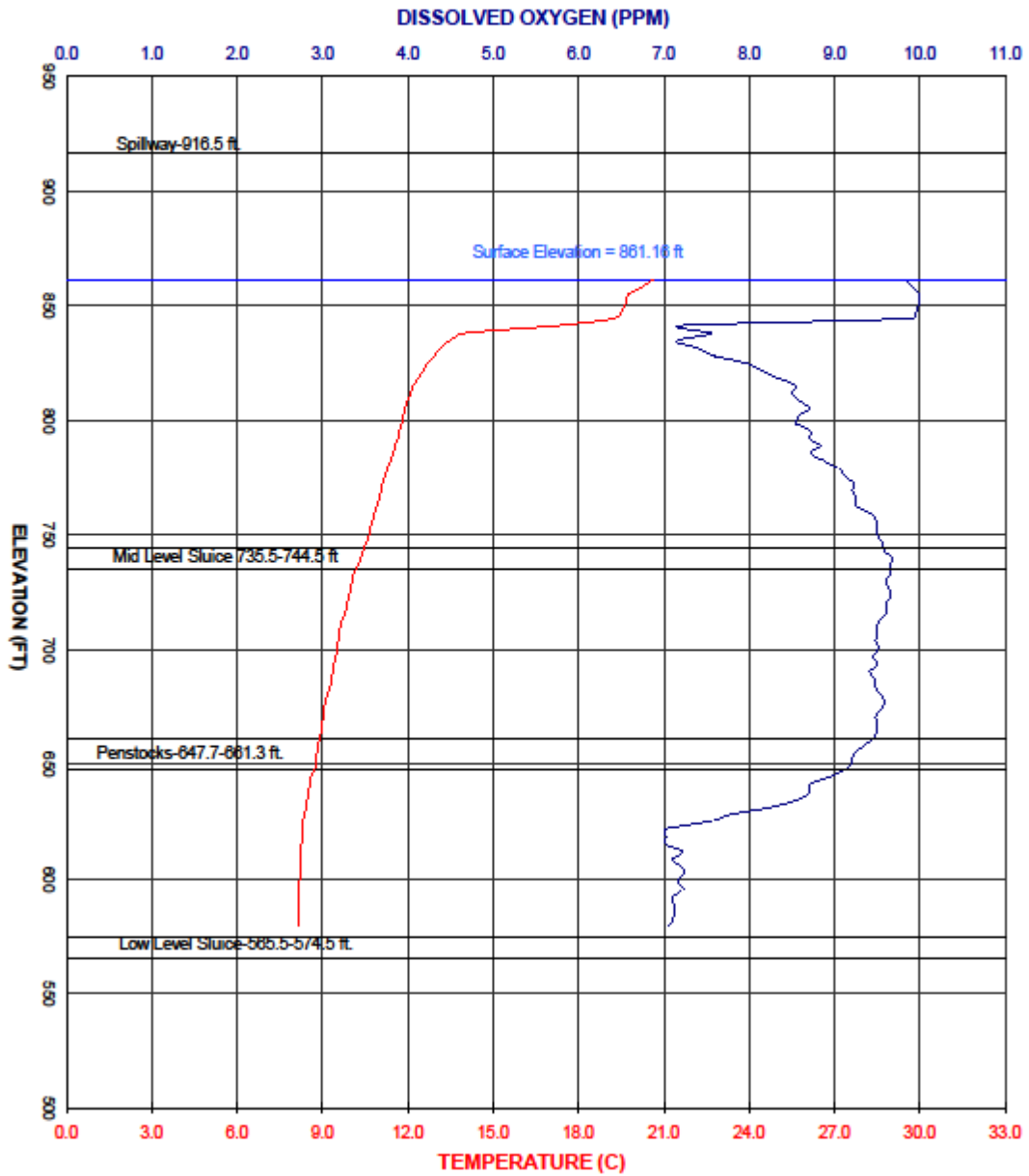
**PINE FLAT RESERVOIR 03/02/2016 (Time: 1120-1204) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 786.00**



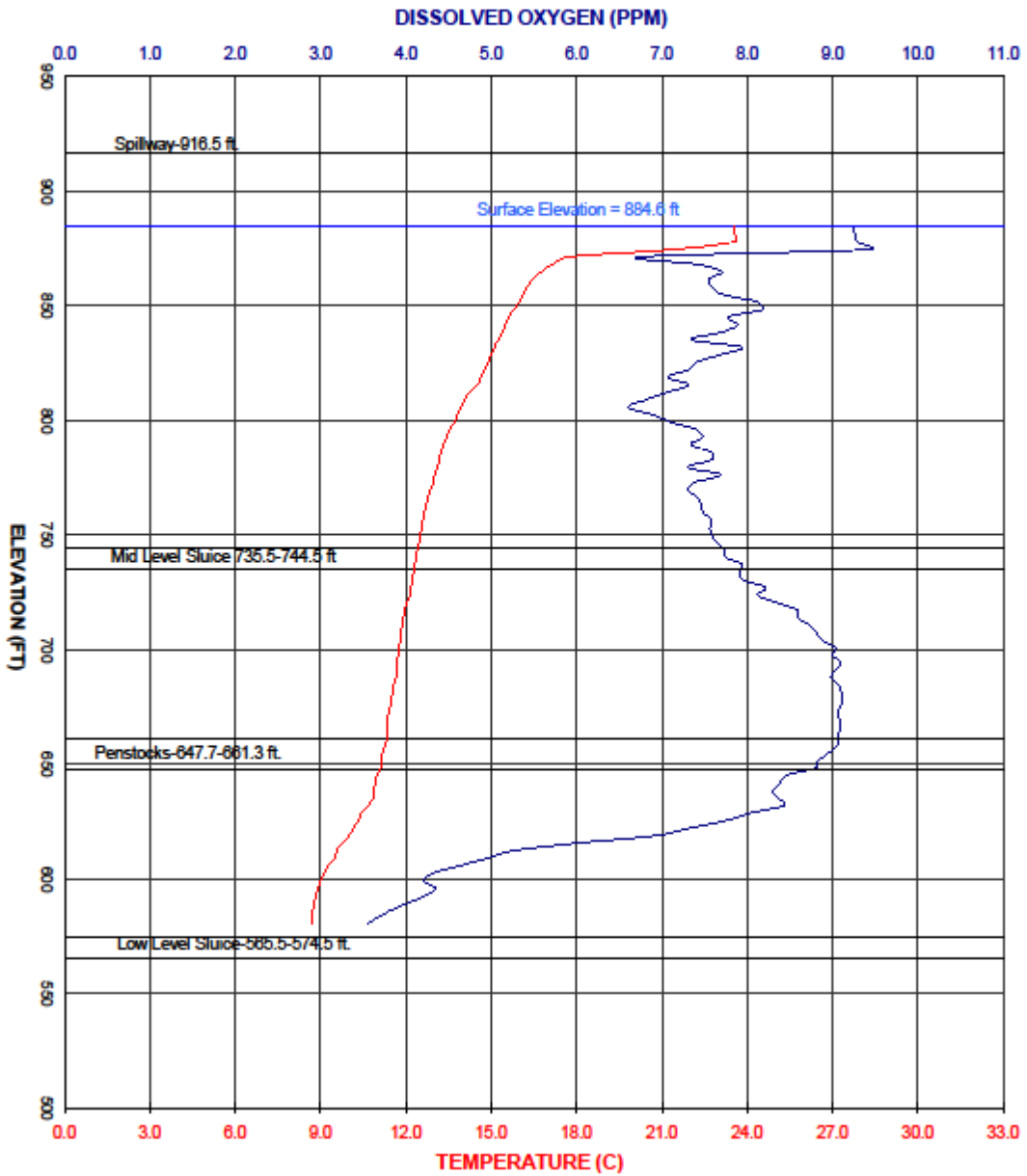
PINE FLAT RESERVOIR 04/12/16 (Time: 1000-1112) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 833.98



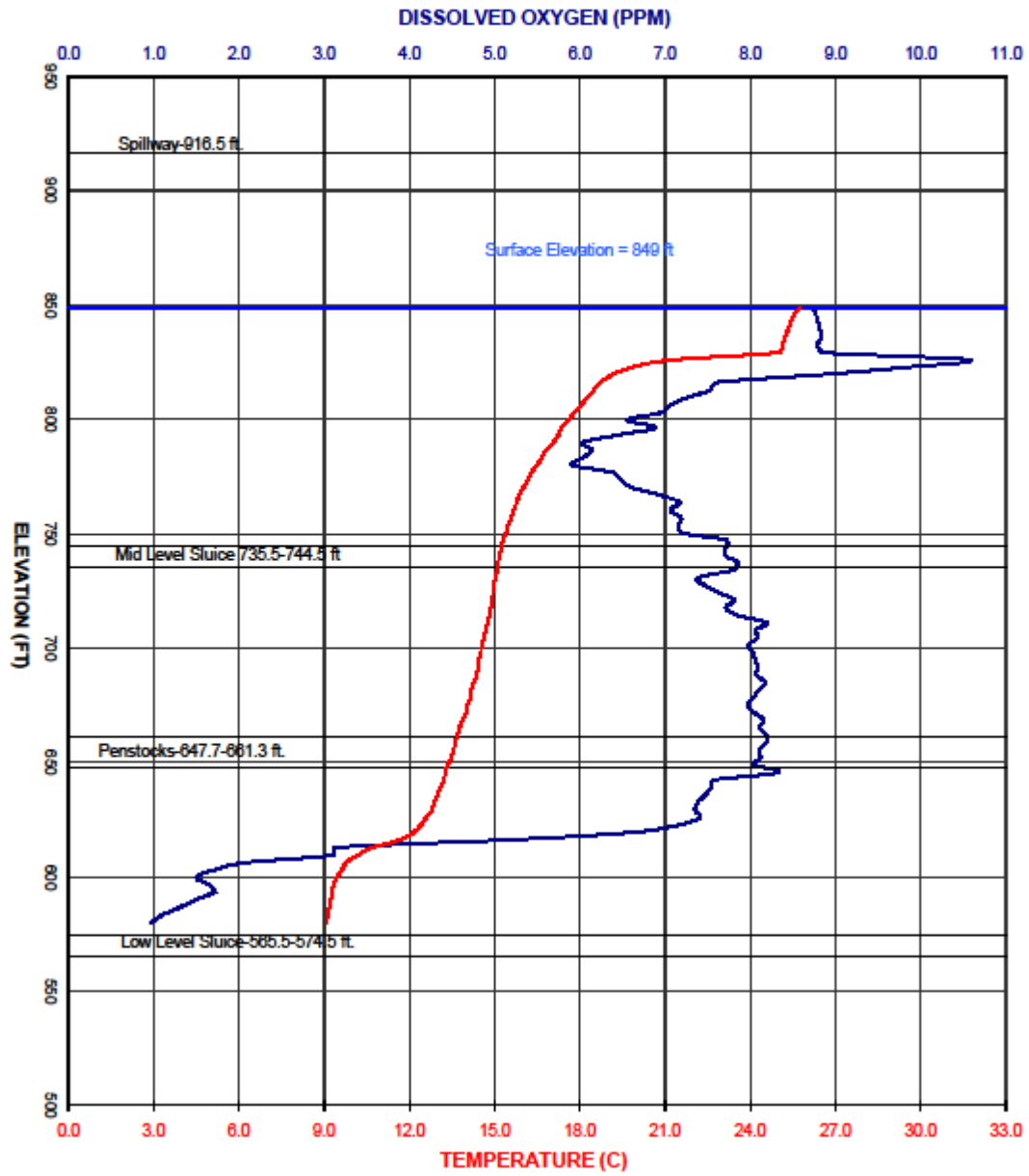
PINE FLAT RESERVOIR 5/10/16 (Time: 1030-1200) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 861.16



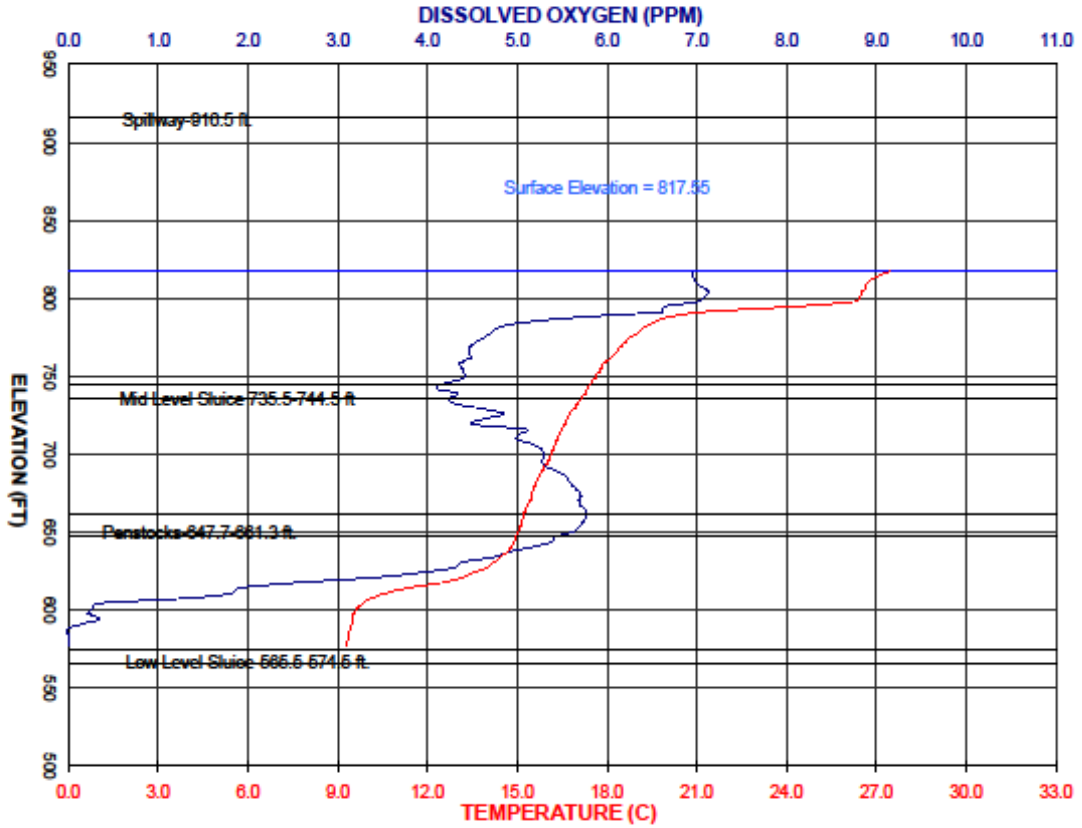
**PINE FLAT RESERVOIR 6/14/16(Time: 1045-1223) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 884.6**



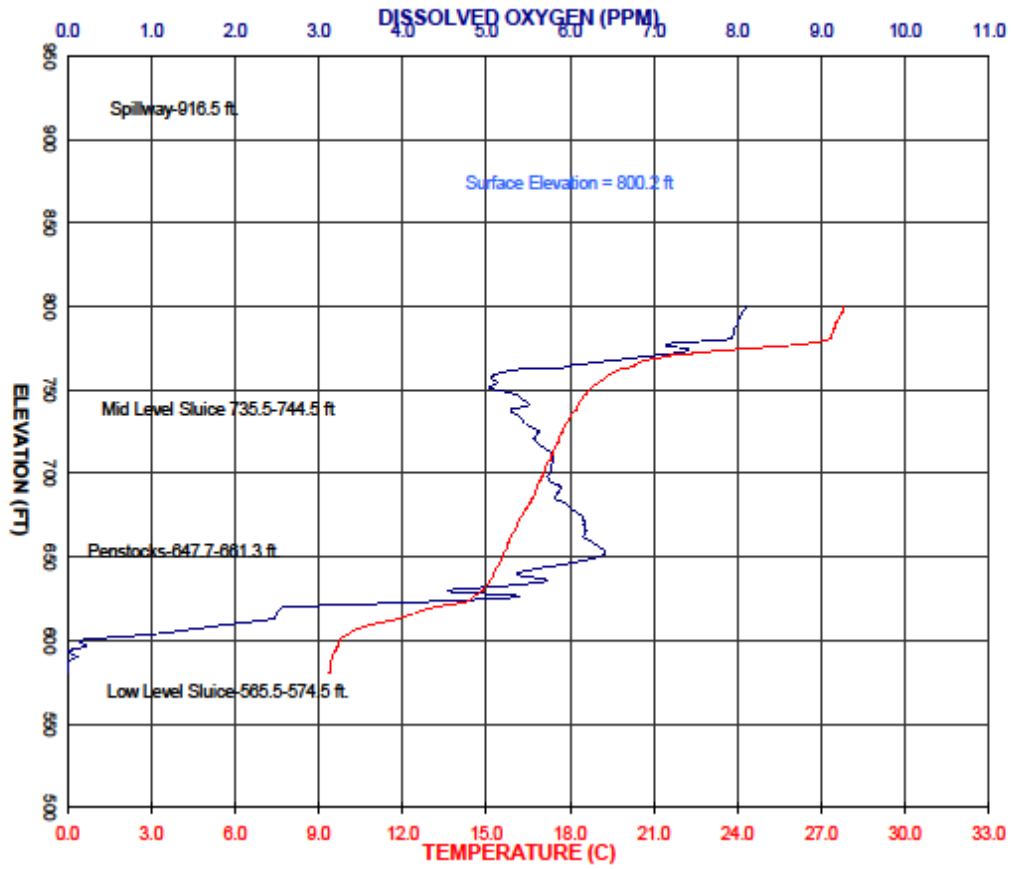
PINE FLAT RESERVOIR 7/12/16 (Time: 1020-1200) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 849



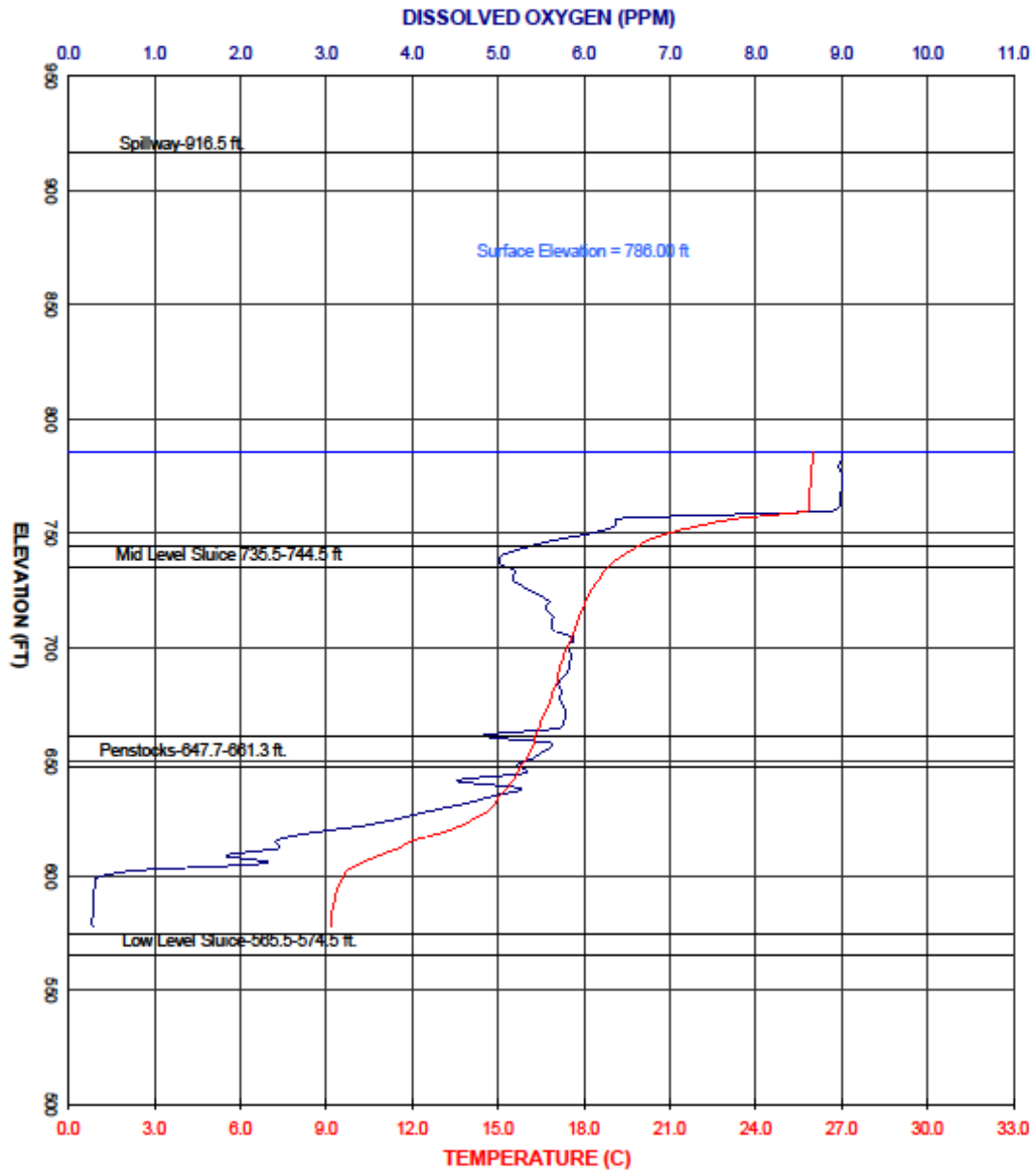
PINE FLAT RESERVOIR 7/26/16 (Time: 1130-1300) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 817.55



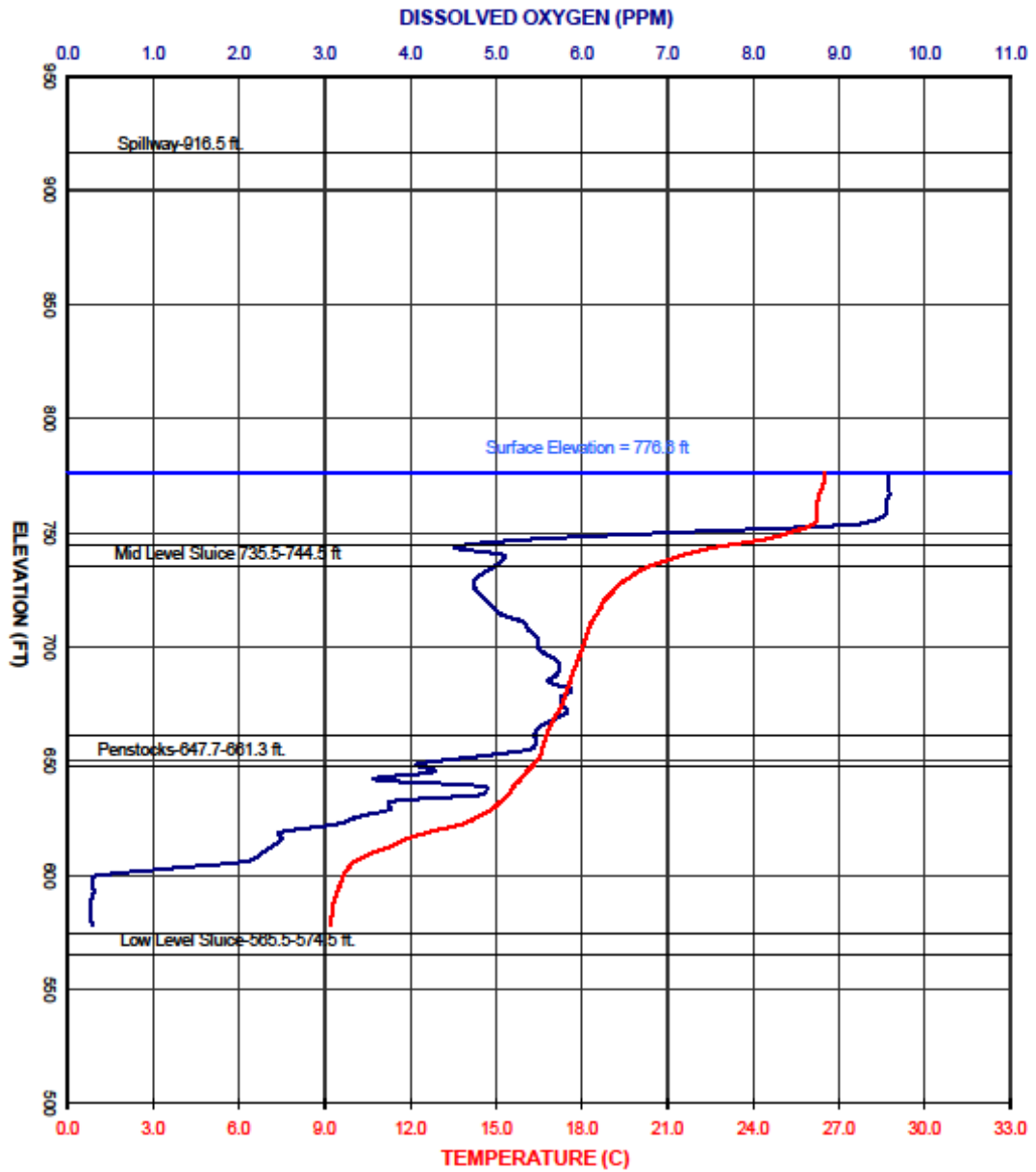
**PINE FLAT RESERVOIR 08/02/16 (Time: 1000-1115) New Buoy Line
Placement (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 800.2**



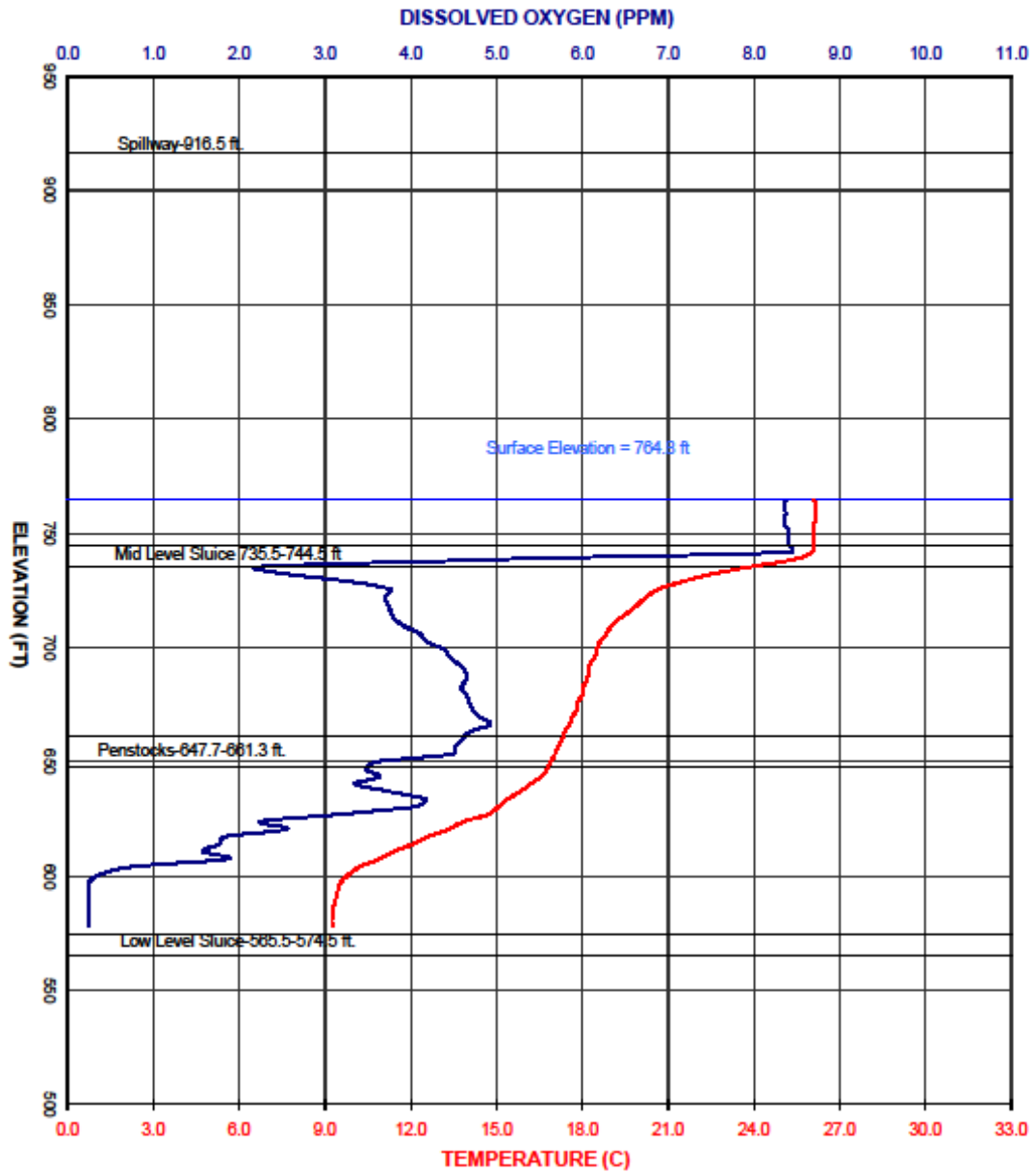
PINE FLAT RESERVOIR 08/10/16 (Time: 0912-1008) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 786.00



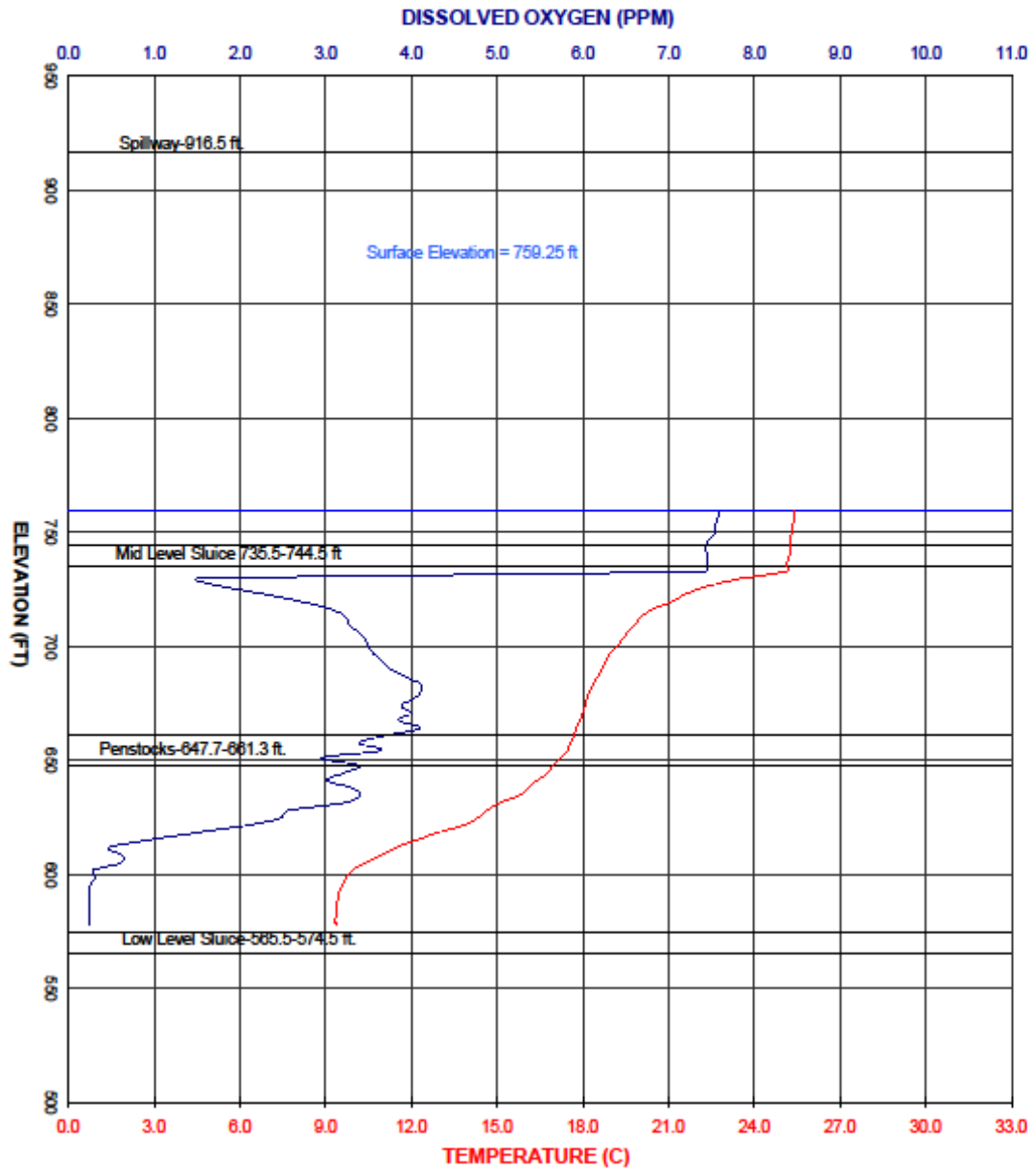
PINE FLAT RESERVOIR 08/16/16 (Time: 0924-1032) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 776.6



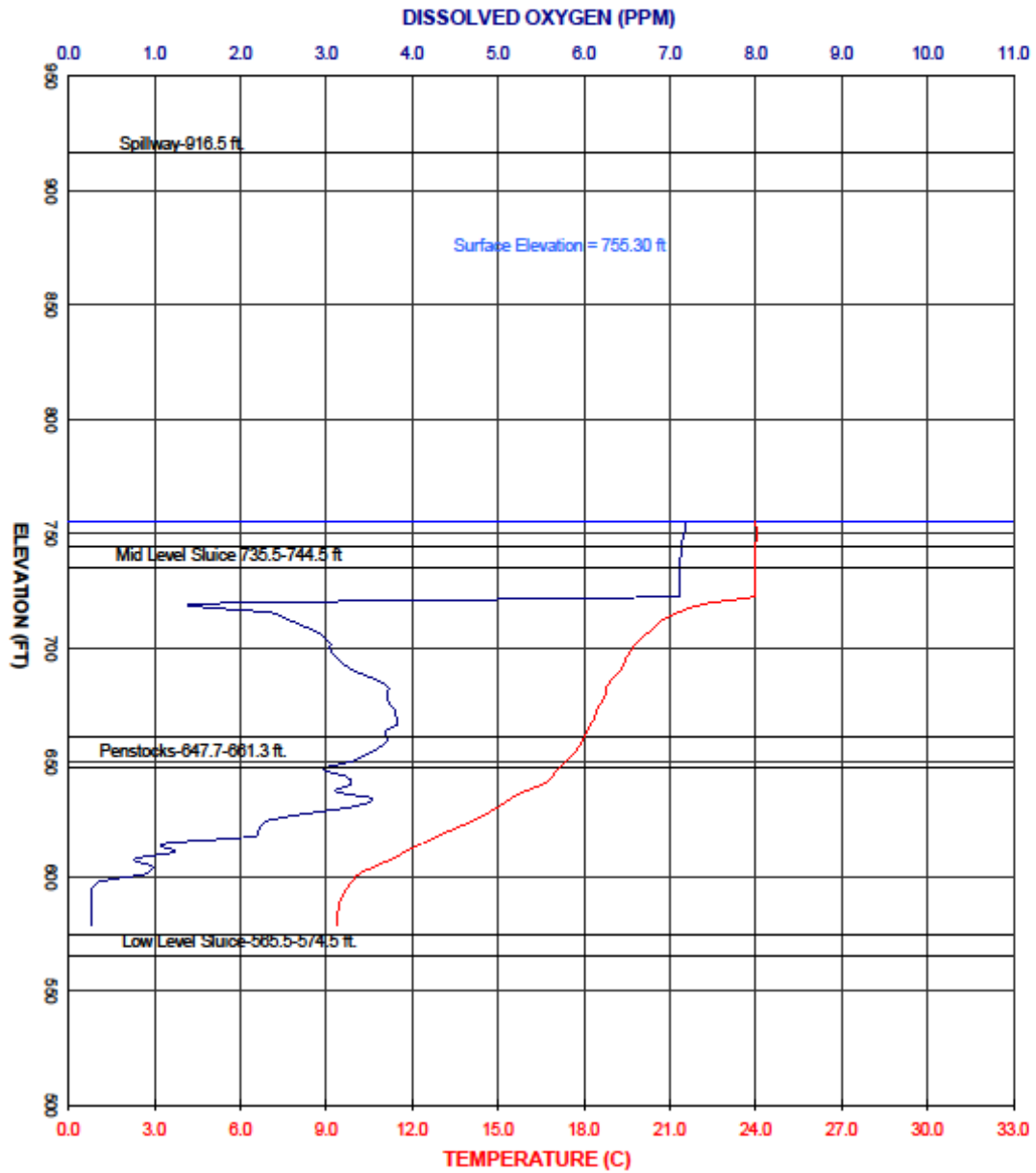
PINE FLAT RESERVOIR 08/23/16 (Time: 0920-1030) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 764.8



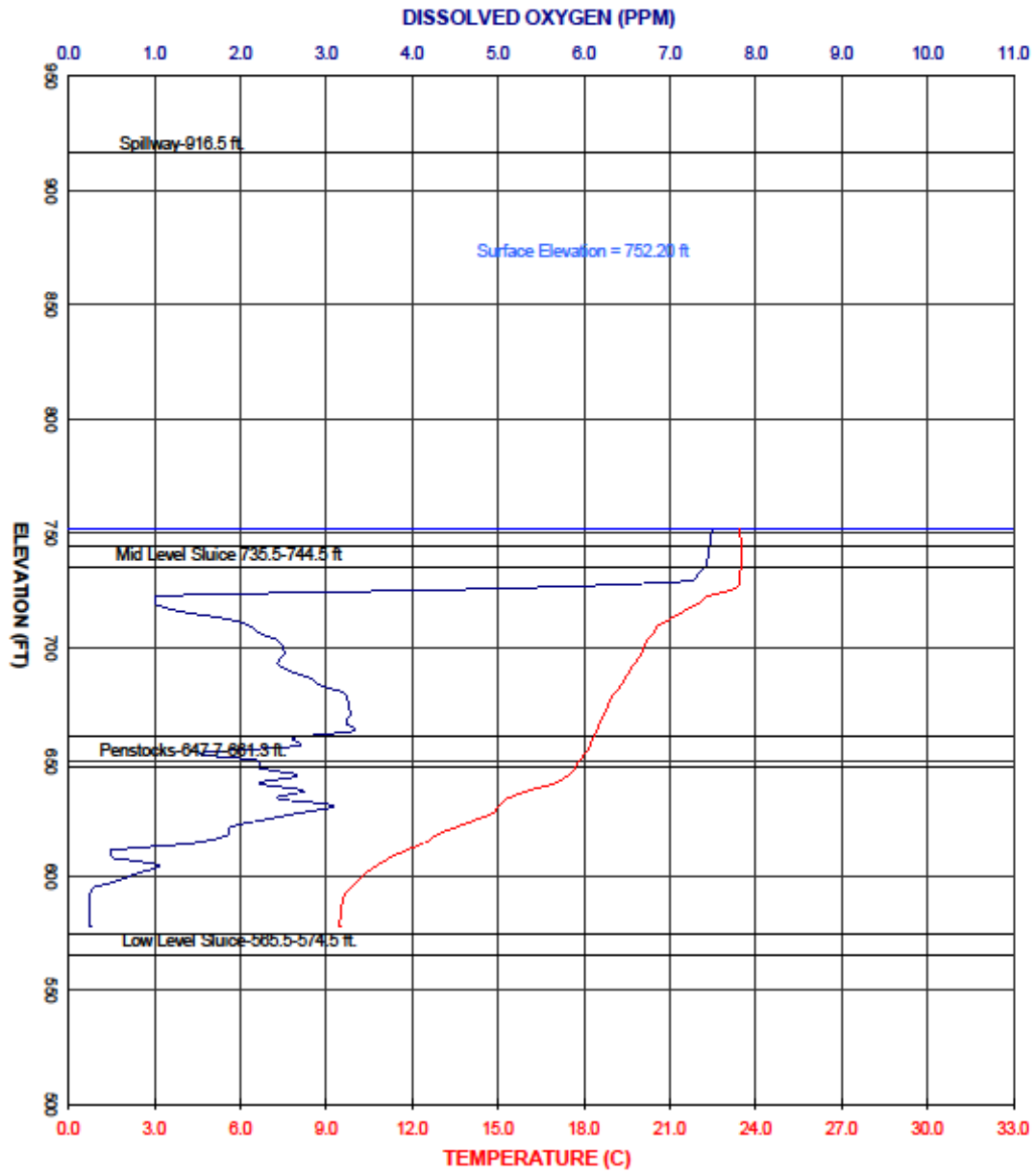
PINE FLAT RESERVOIR 08/30/2016 (Time: 0924-1020) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 759.25



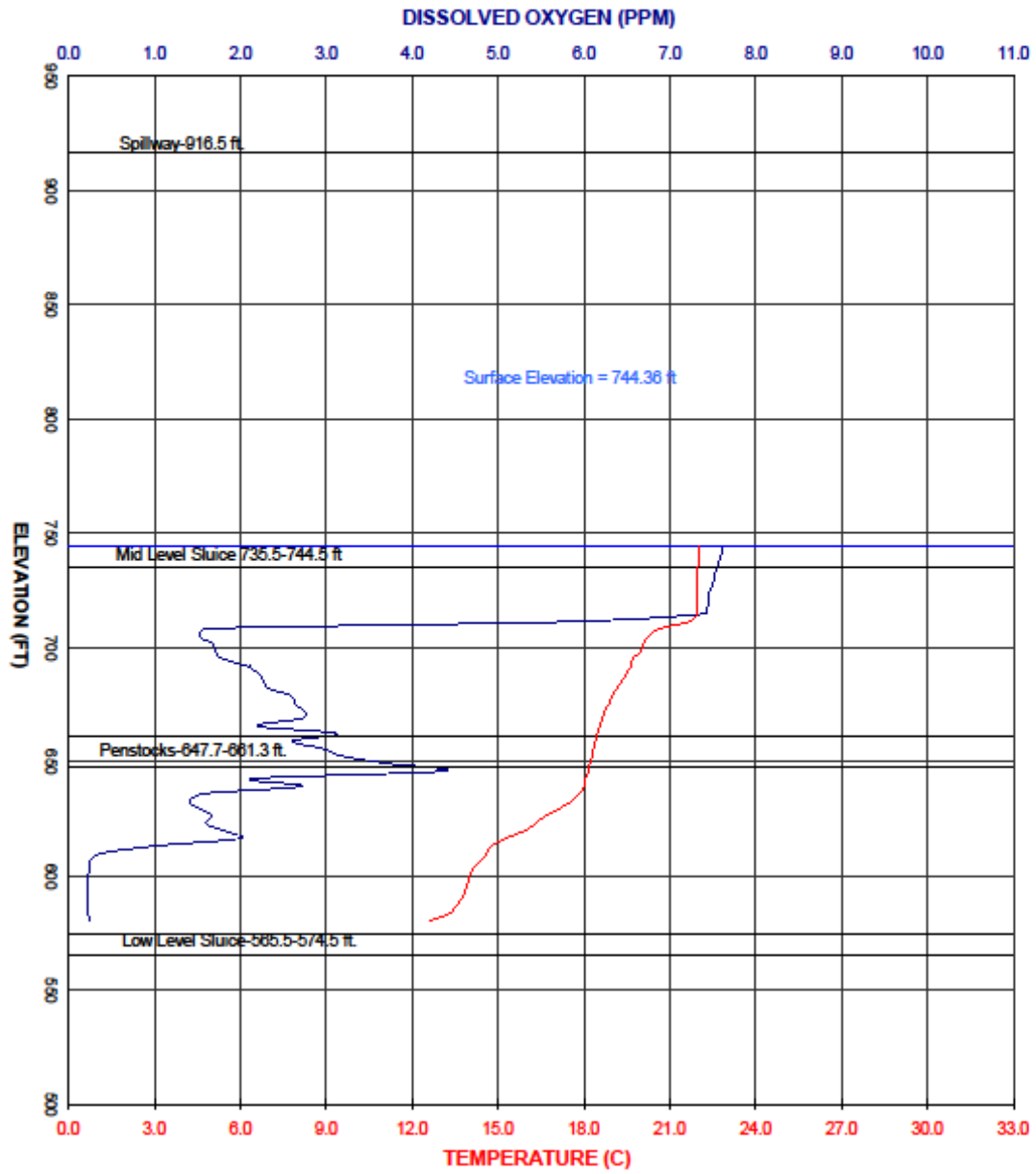
**PINE FLAT RESERVOIR 09/06/16 (Time: 0915-1005) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 755.30**



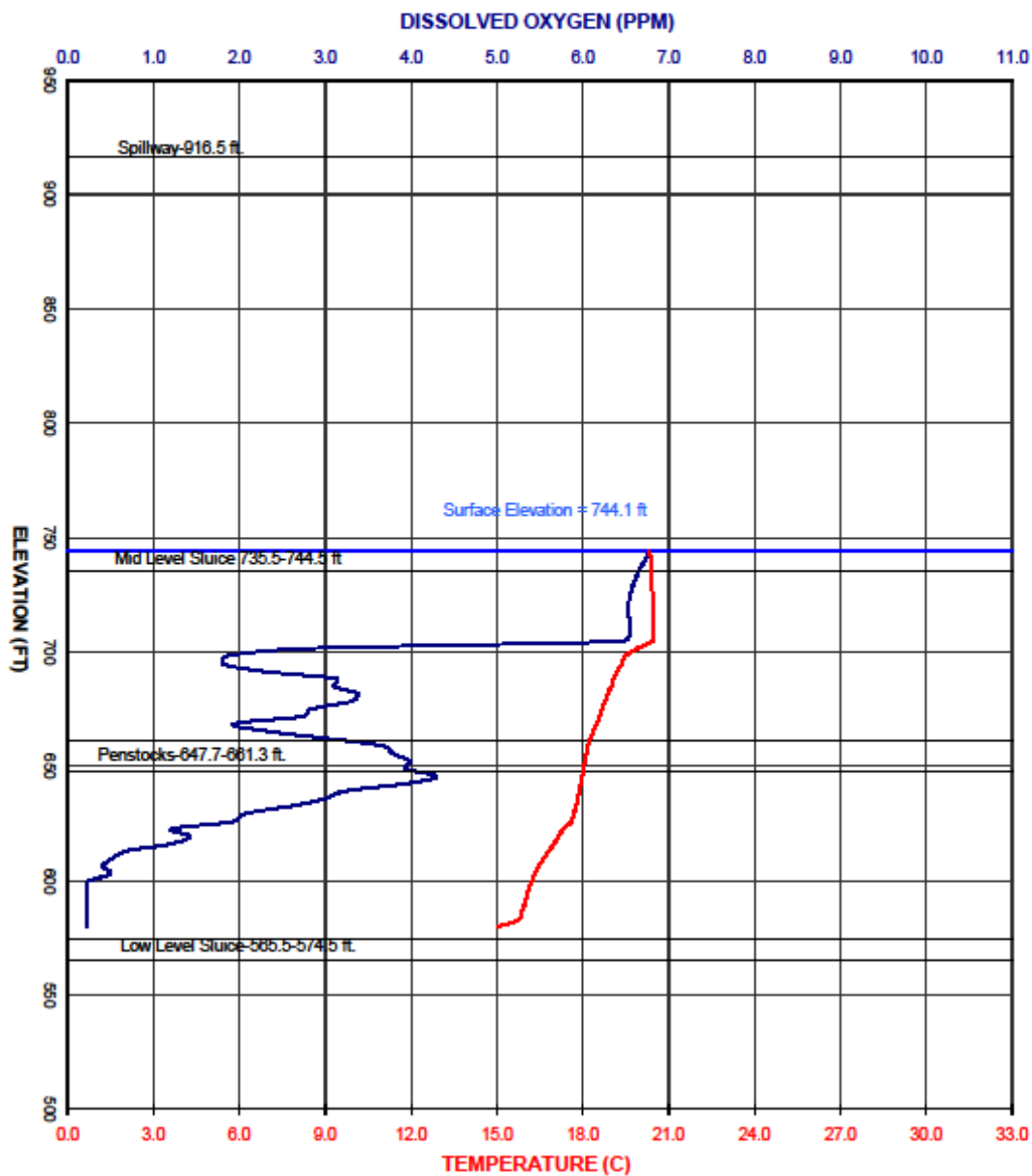
PINE FLAT RESERVOIR 09/13/16 (Time: 0858-0953) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 752.20



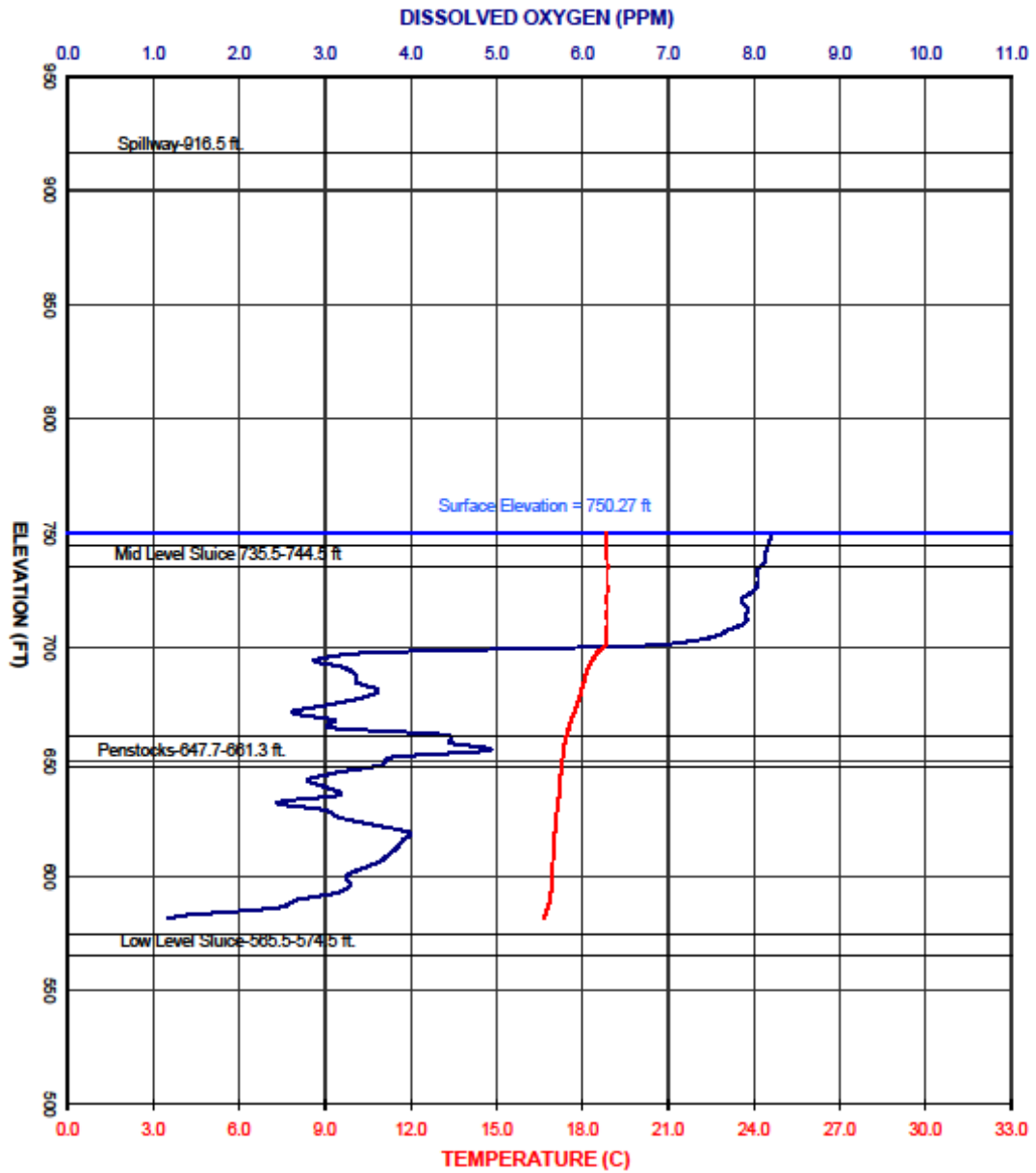
PINE FLAT RESERVOIR 09/27/16 (Time: 0933-1028) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 744.36



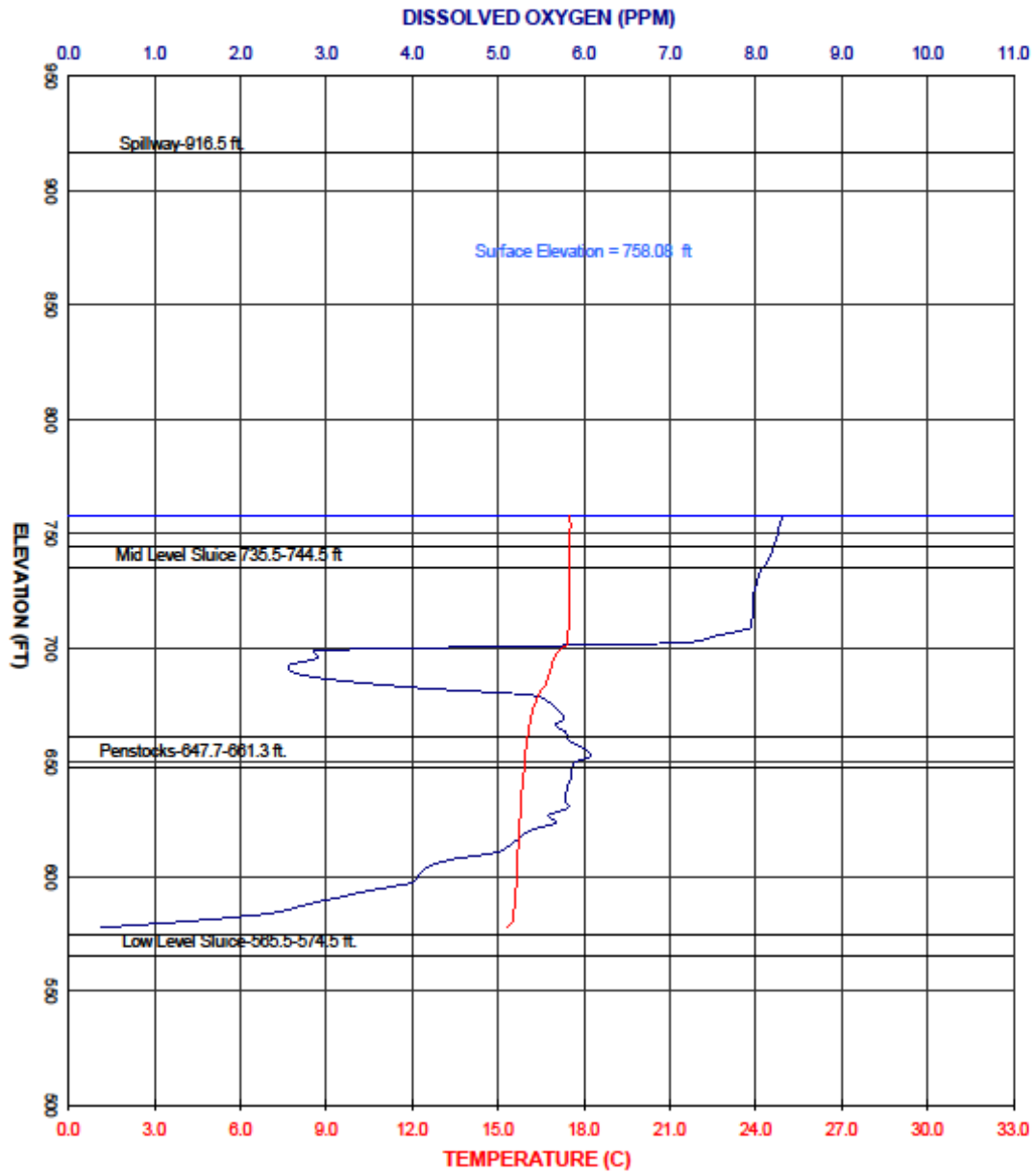
**PINE FLAT RESERVOIR 10/5/16 (Time: 0953-1043) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 744.1**



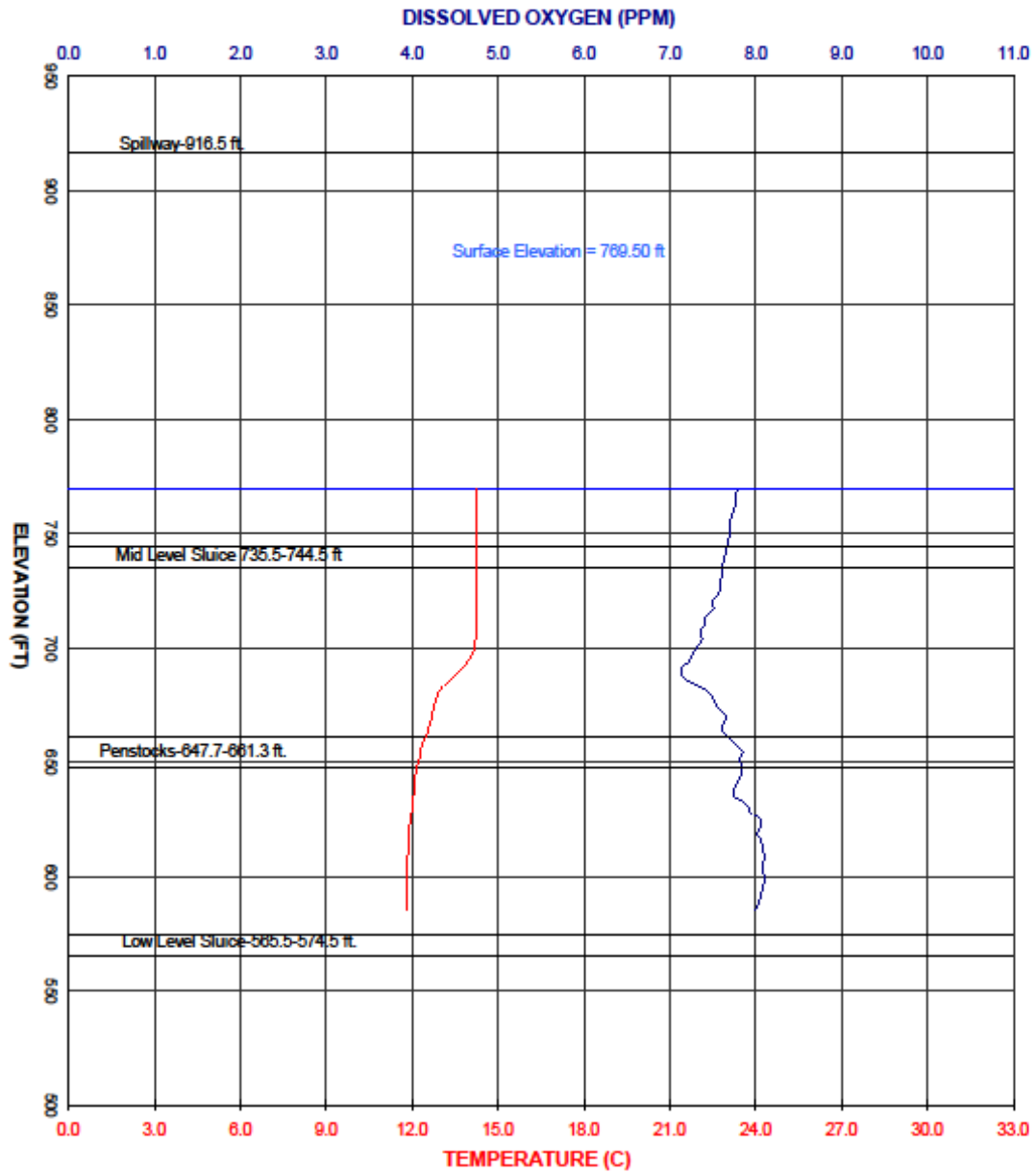
**PINE FLAT RESERVOIR 10/25/16 (Time: 1012-1105) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 750.27**



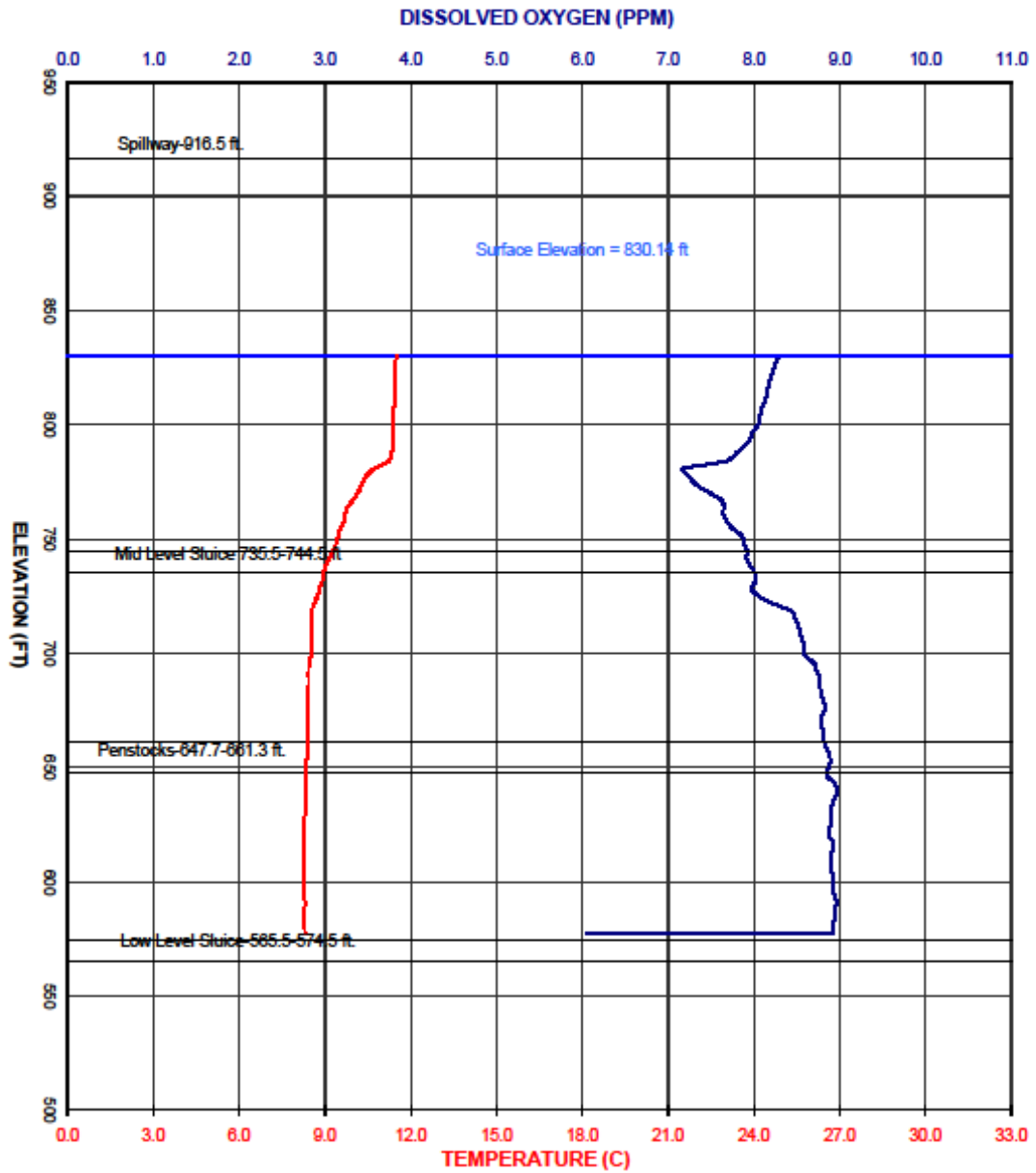
**PINE FLAT RESERVOIR 11/16/16 (Time: 1333-1418) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 758.08**



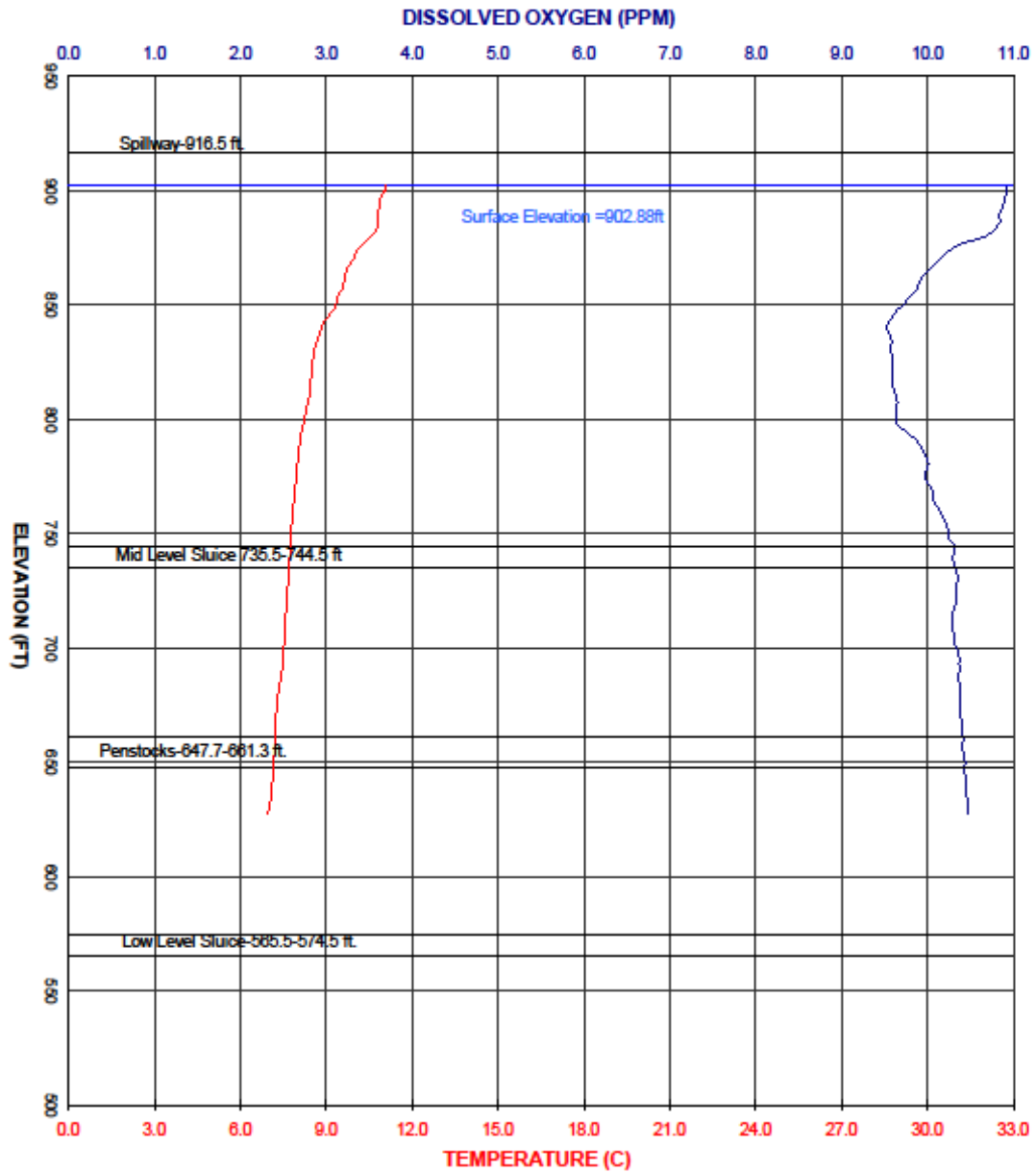
**PINE FLAT RESERVOIR 12/14/16 (Time: 1001-1042) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 769.50**



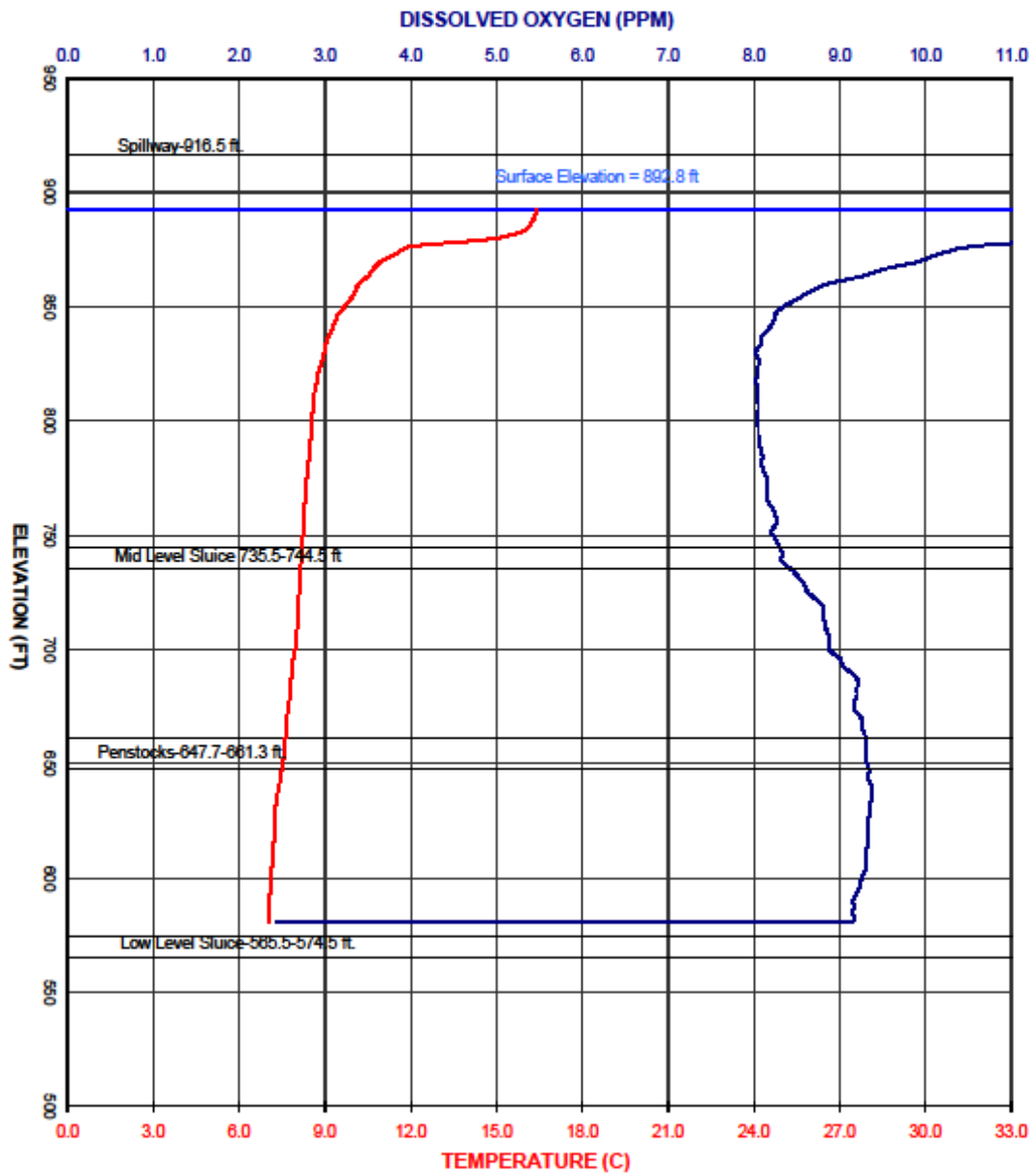
PINE FLAT RESERVOIR 1/10/2017 (Time: 1127-1238) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 830.14



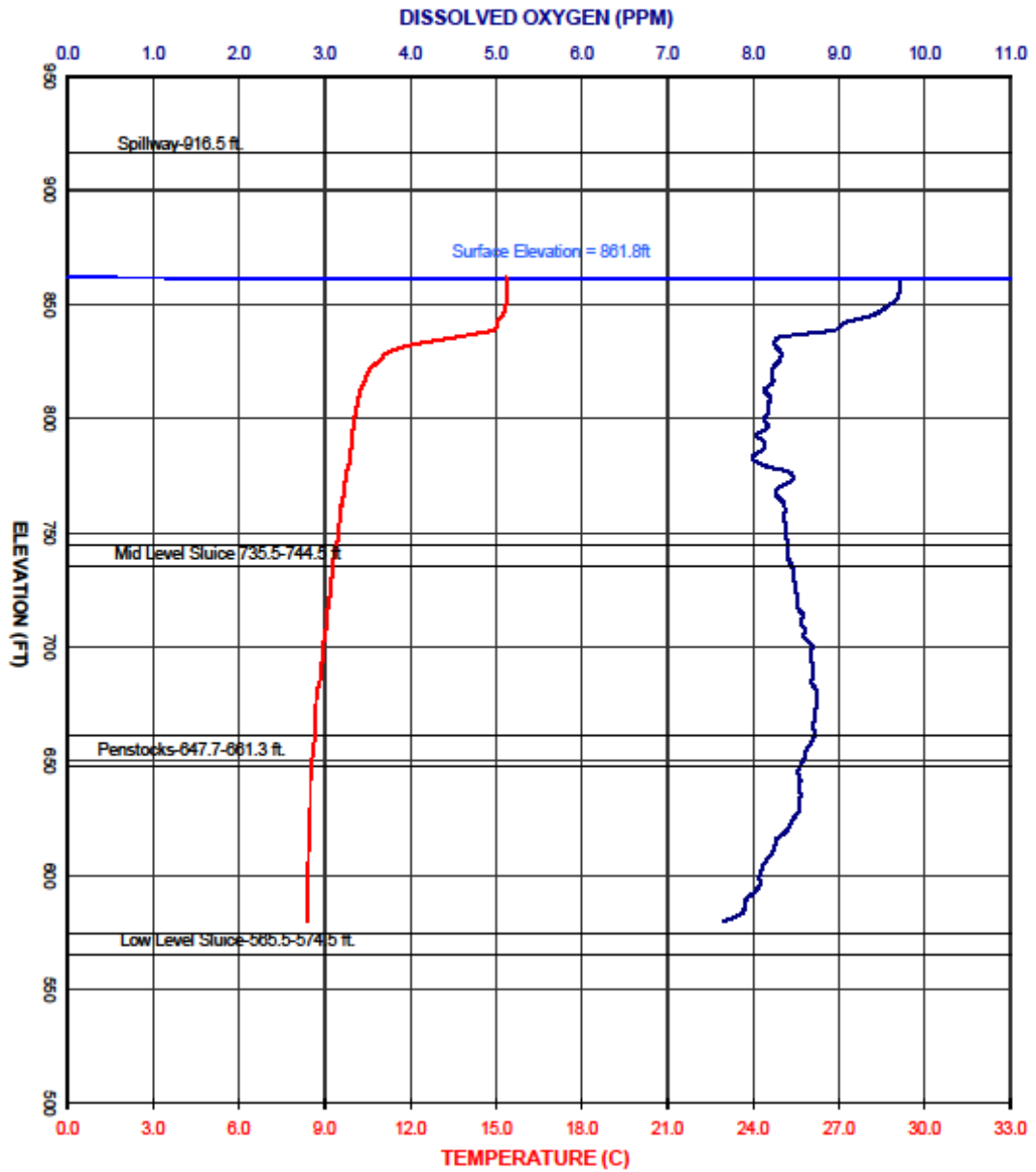
PINE FLAT RESERVOIR 02/14/2017 (Time: 1015-1148) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 902.88



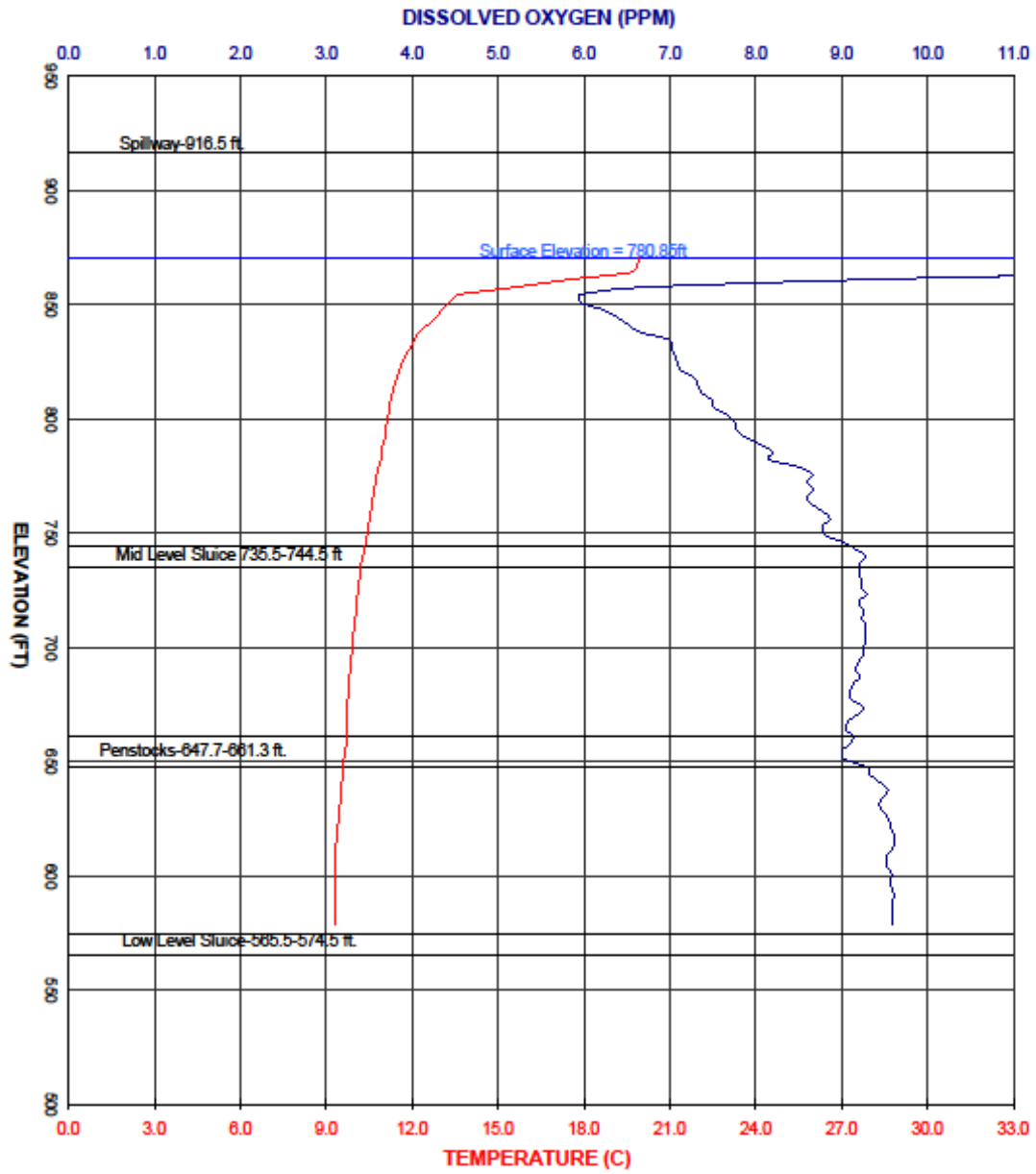
PINE FLAT RESERVOIR 03/16/2017 (Time: 0939-1051) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 892.80



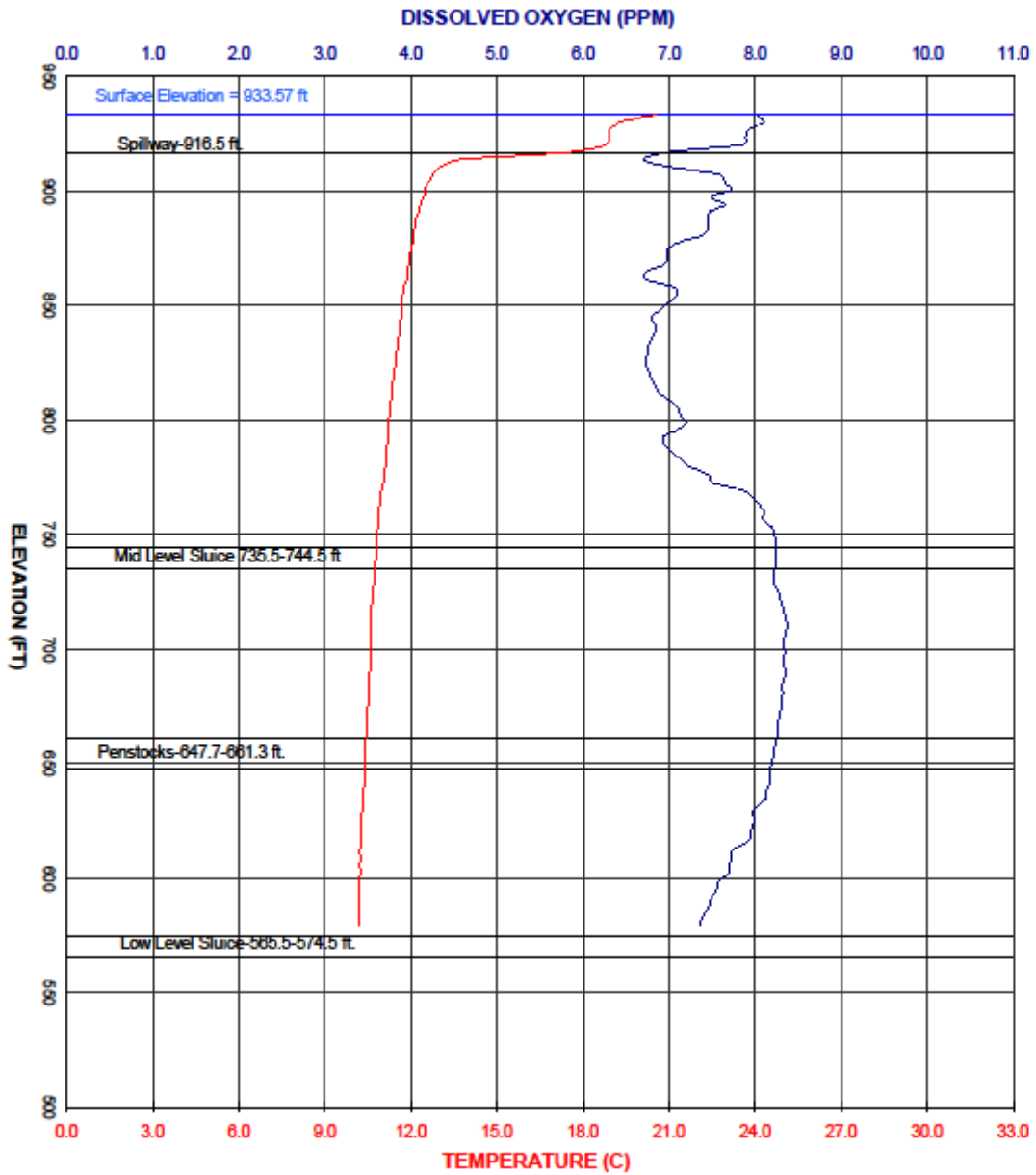
PINE FLAT RESERVOIR 04/11/17 (Time: 0905-1027) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 861.8



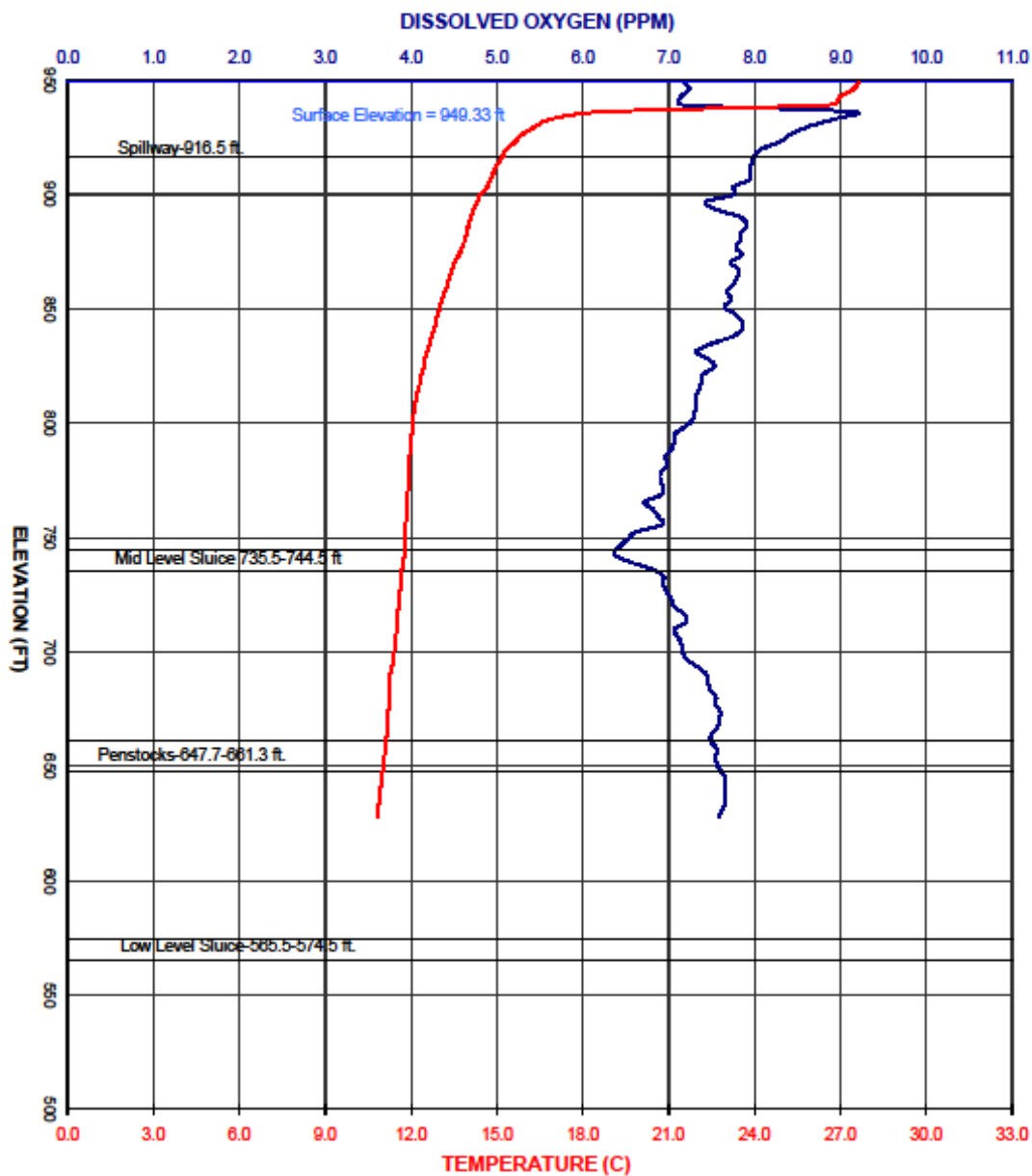
PINE FLAT RESERVOIR 5/11/17 (Time: 1026-1142) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 780.85



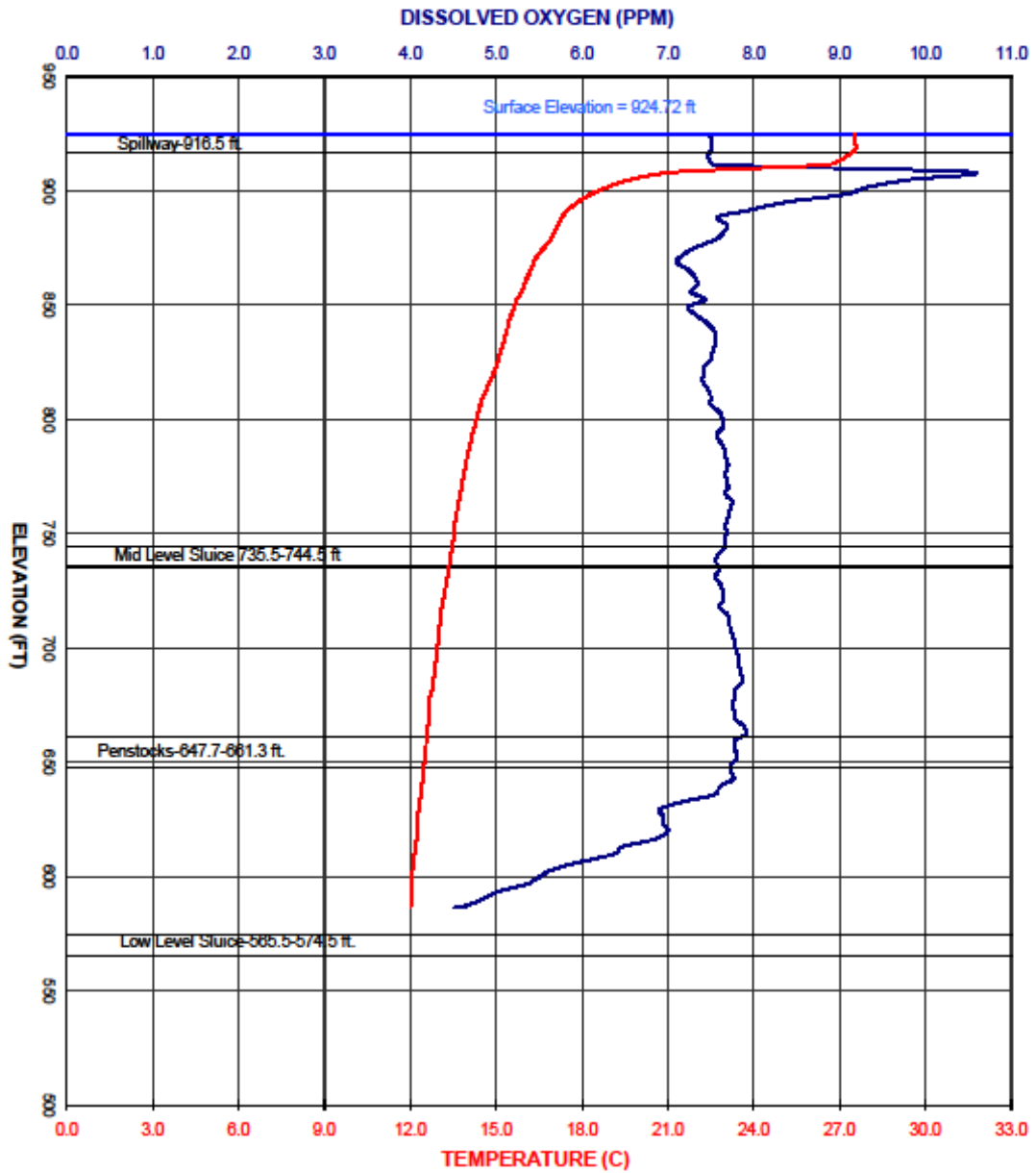
**PINE FLAT RESERVOIR 6/14/17 (Time: 1023-1151) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 933.57**



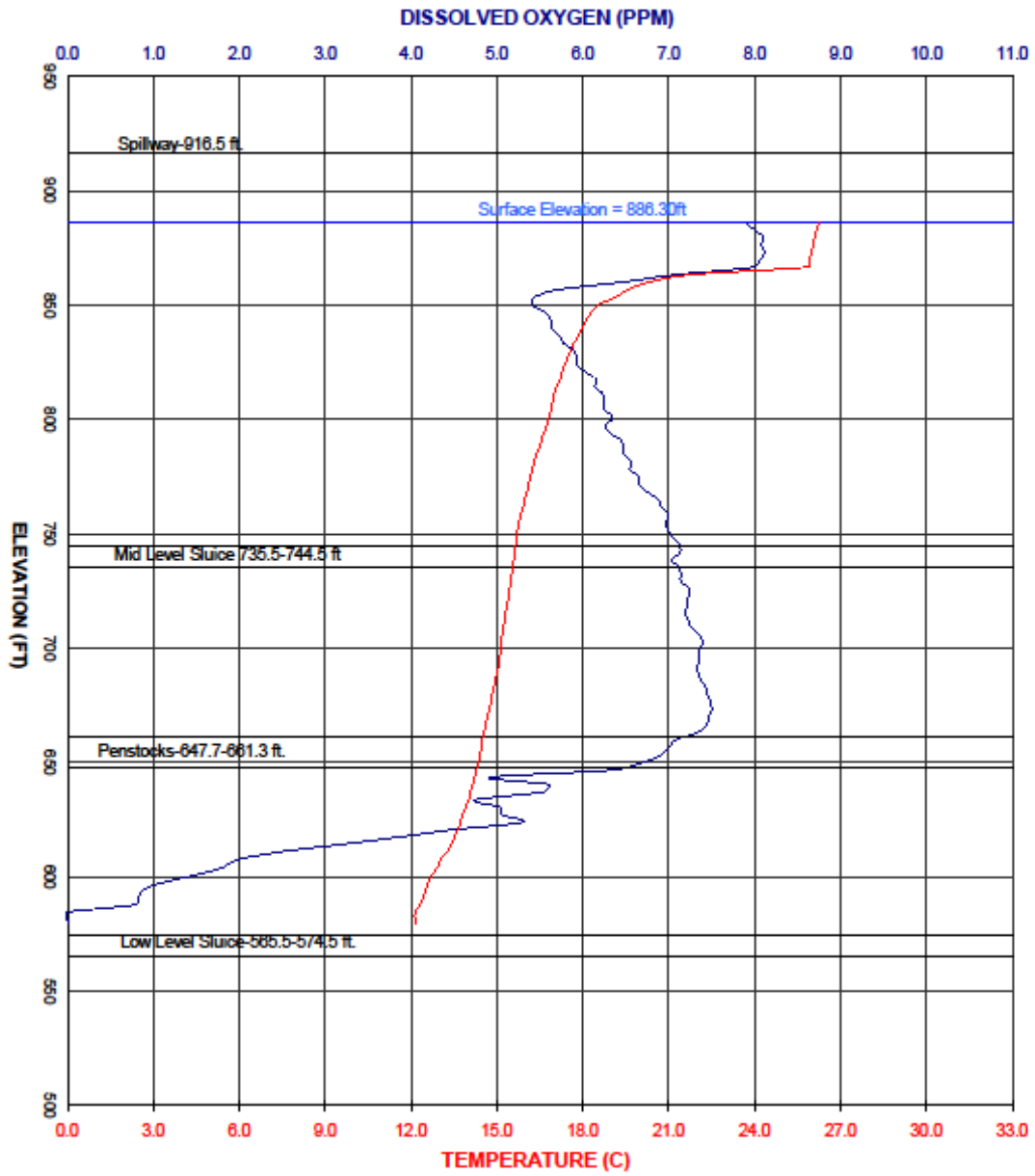
**PINE FLAT RESERVOIR 7/11/17 (Time: 1030-1200) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 949.33**



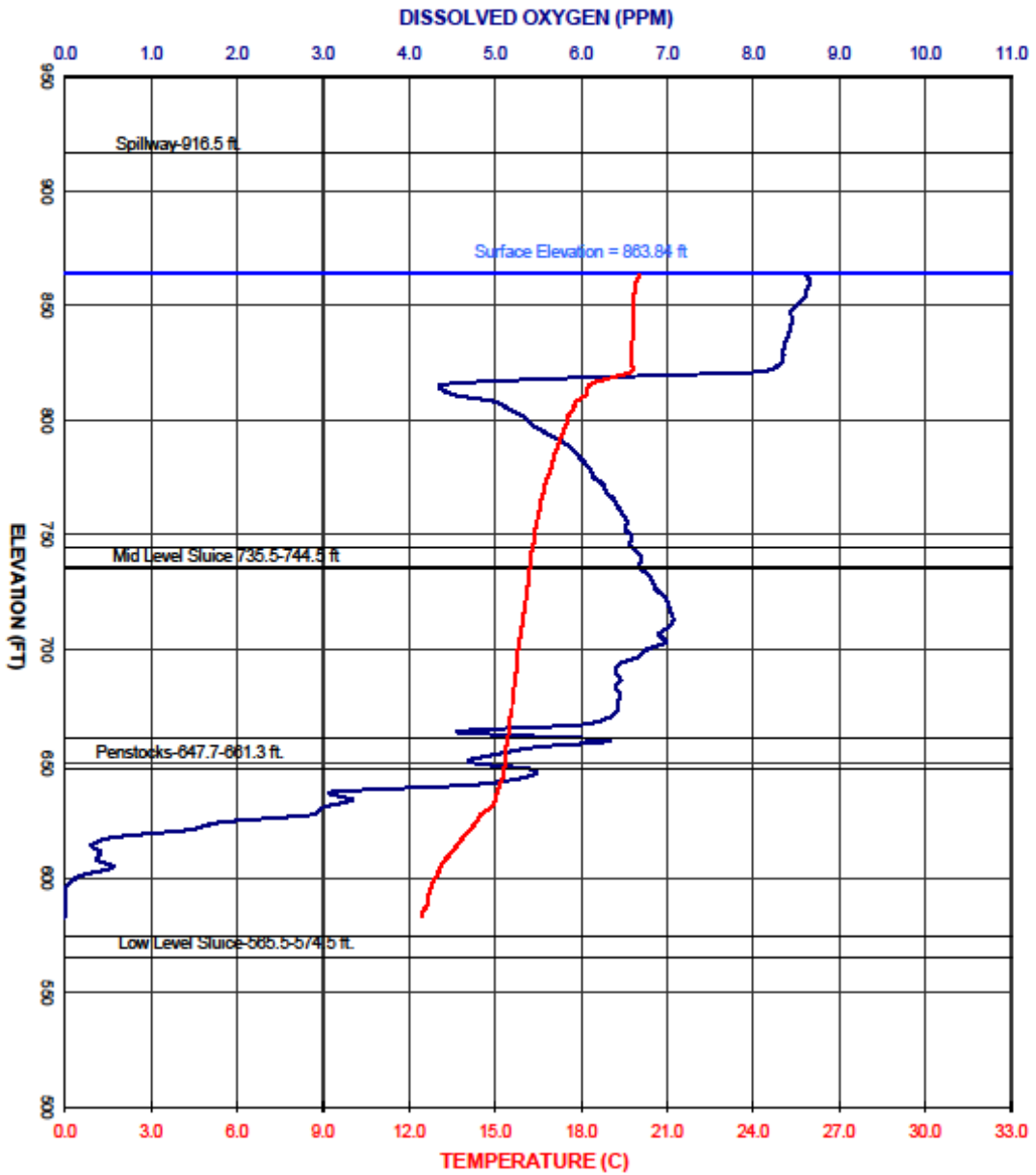
PINE FLAT RESERVOIR 08/8/2017 (Time: 1051-1222) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 924.72



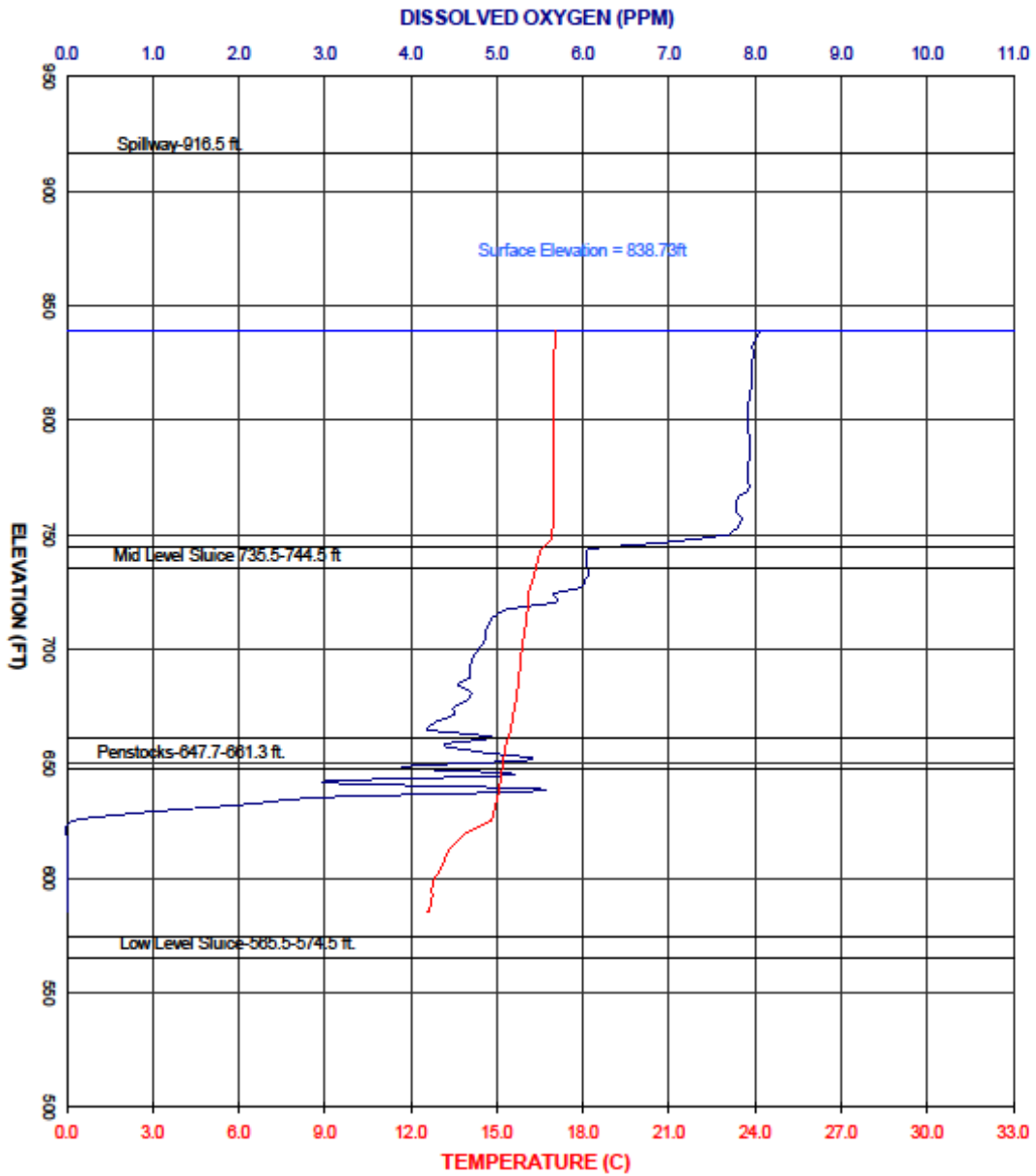
**PINE FLAT RESERVOIR 9/12/2007 (Time: 1000-1123) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 886.30**



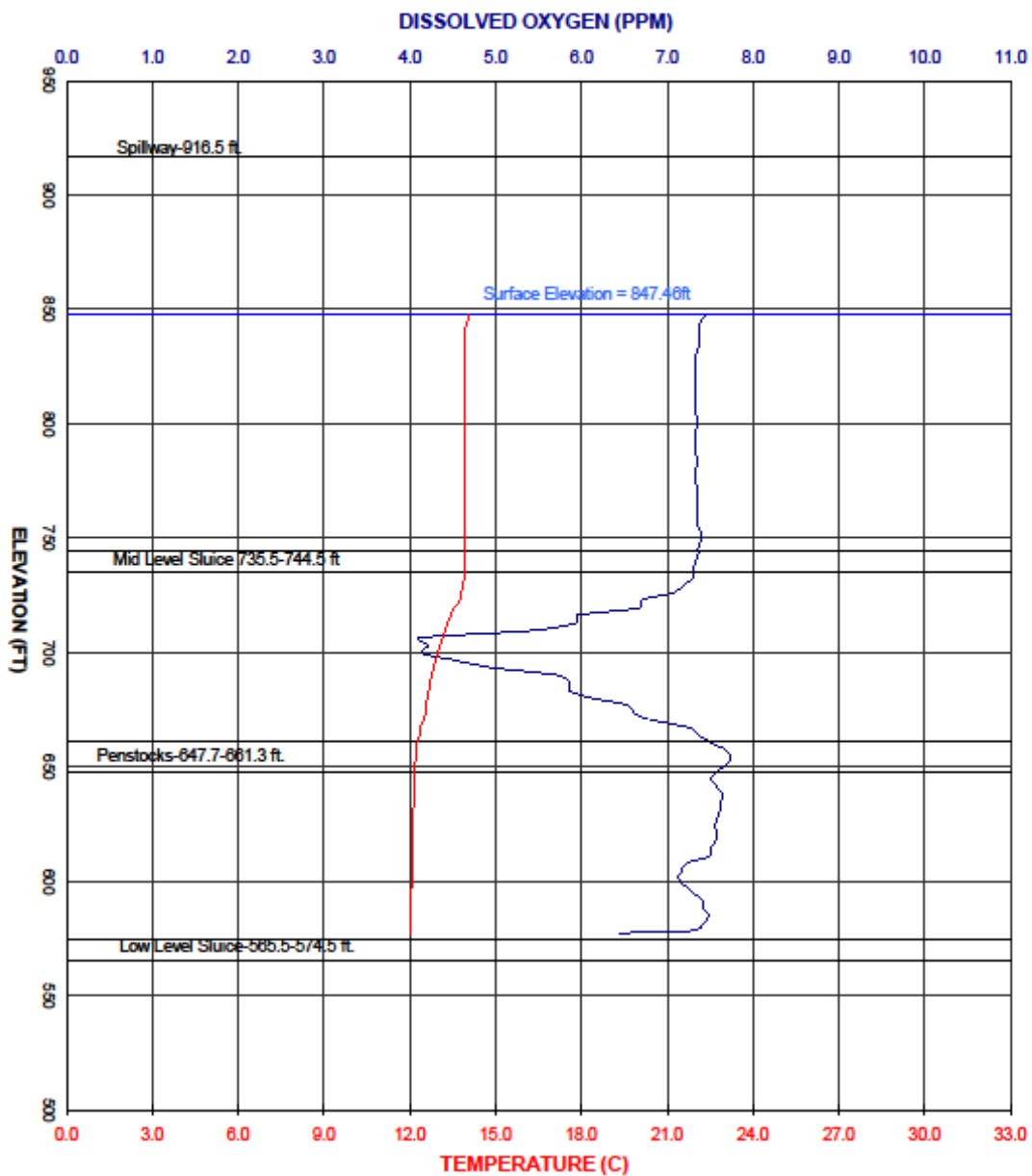
**PINE FLAT RESERVOIR 10/10/17 (Time: 1114-1229) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 863.84**



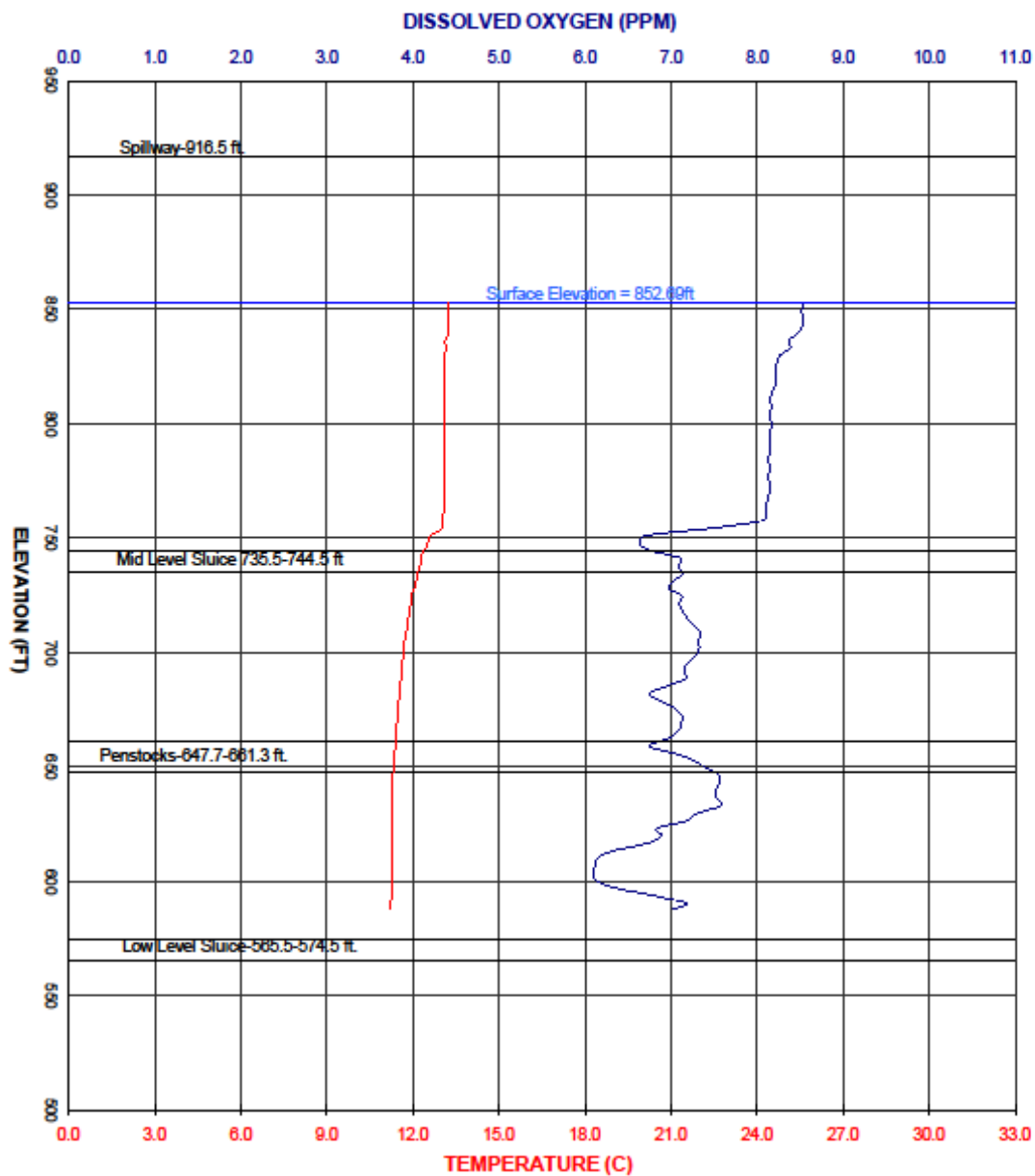
**PINE FLAT RESERVOIR 11/14/17 (Time: 1027-1143) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 838.73**



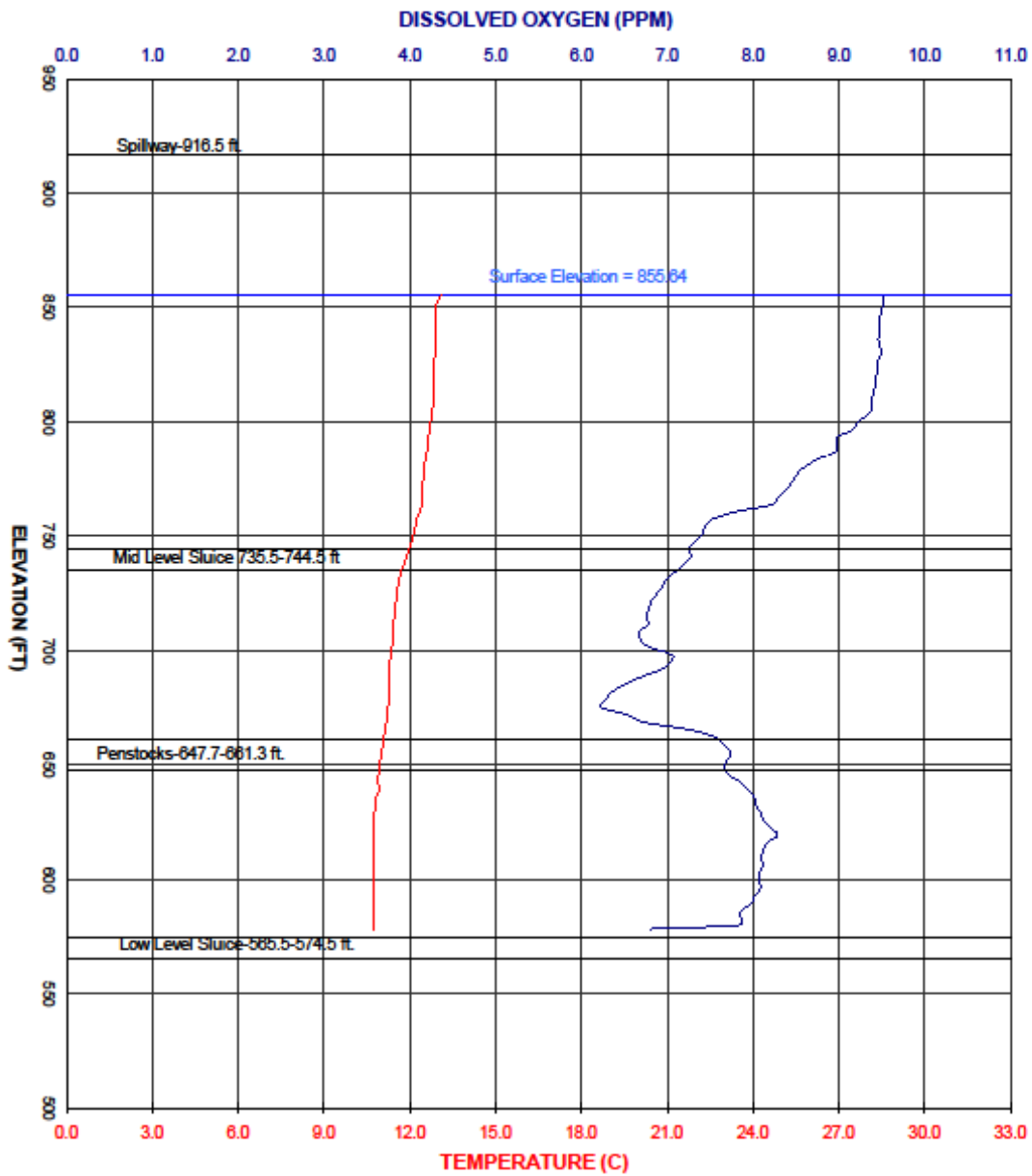
PINE FLAT RESERVOIR 12/22/17 (Time: 1300-1344) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 847.46



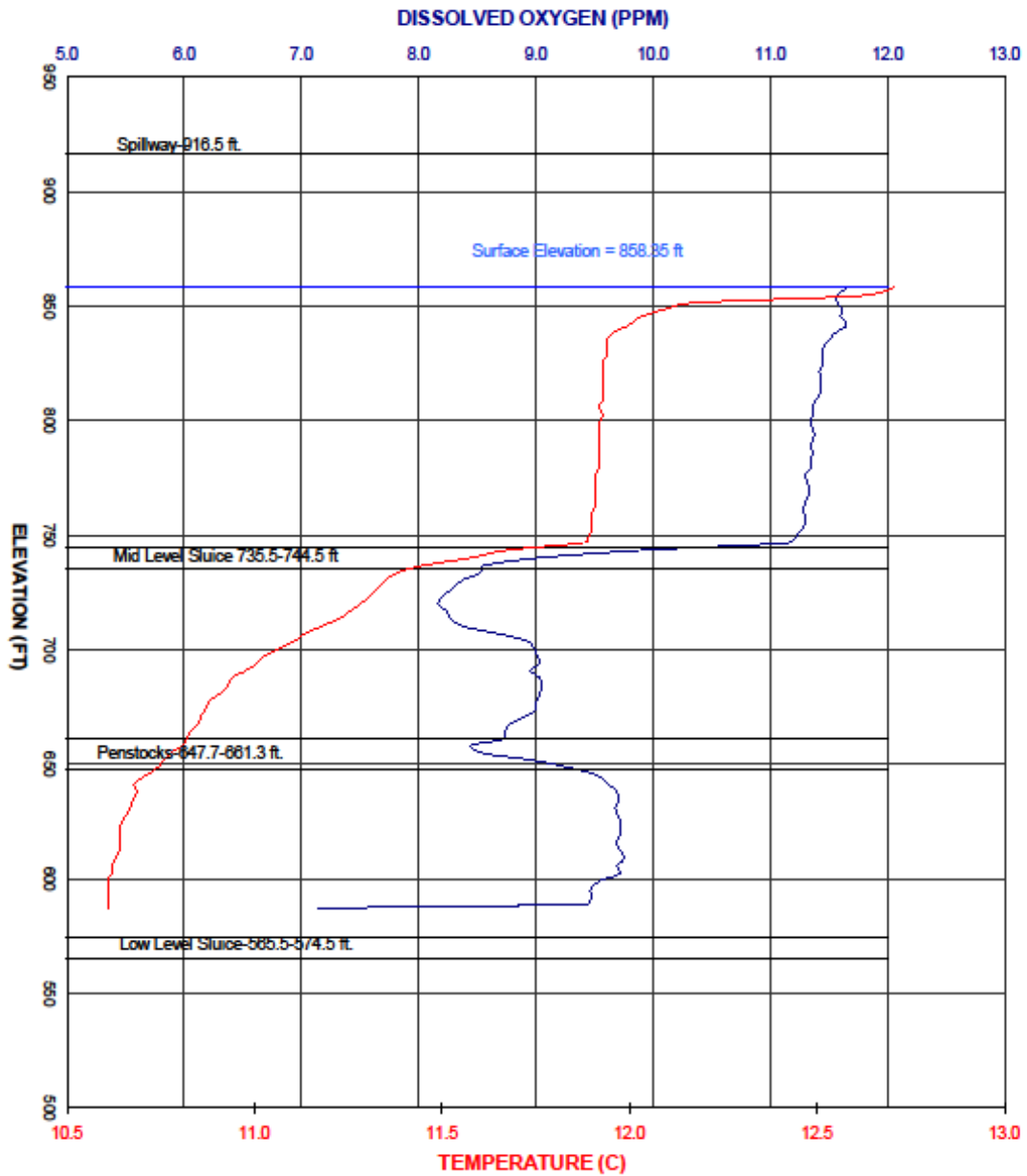
PINE FLAT RESERVOIR 01/16/18 (Time: 1105-1148) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 852.69



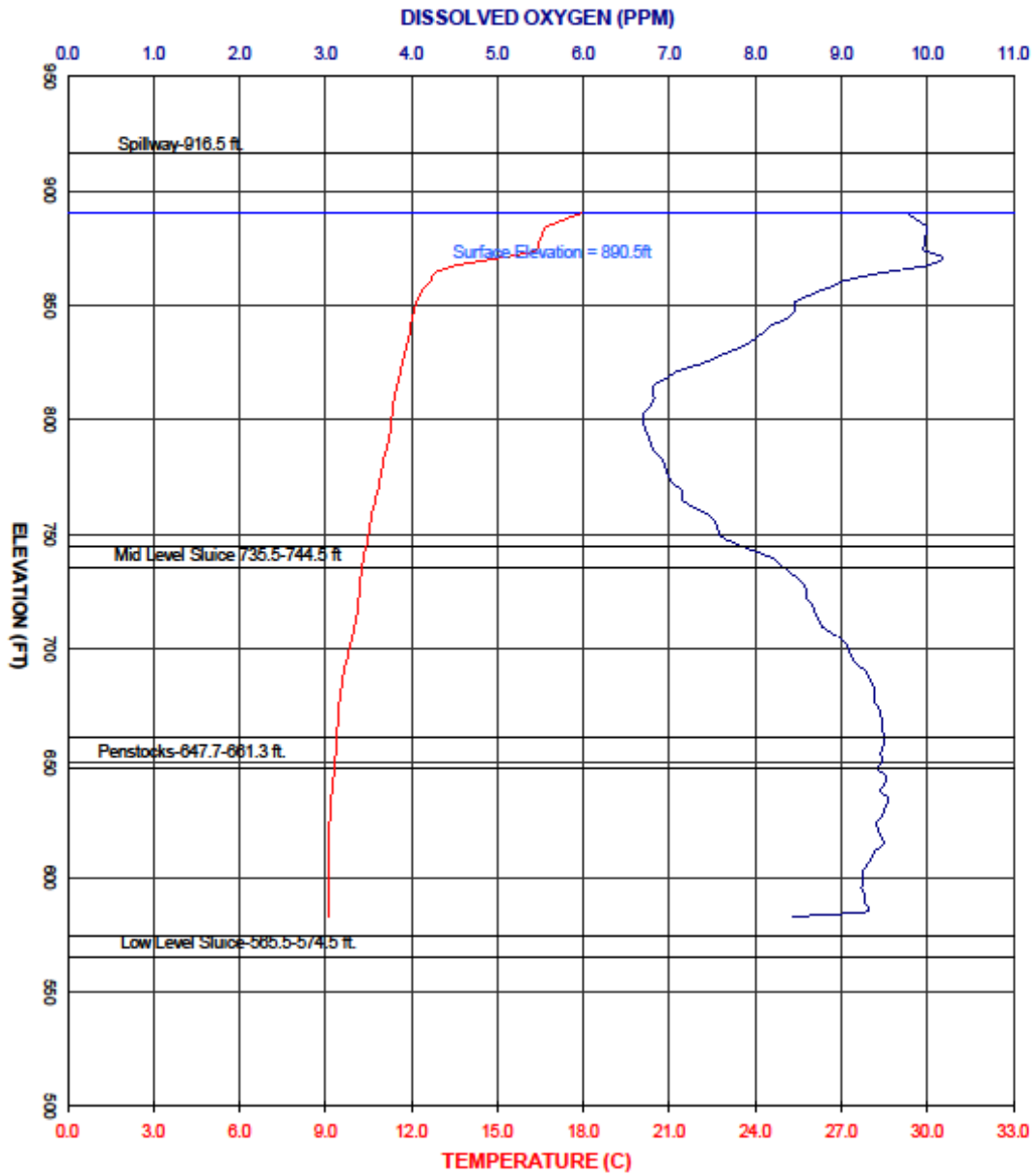
PINE FLAT RESERVOIR 02/06/18 (Time: 1100-1155) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 855.64



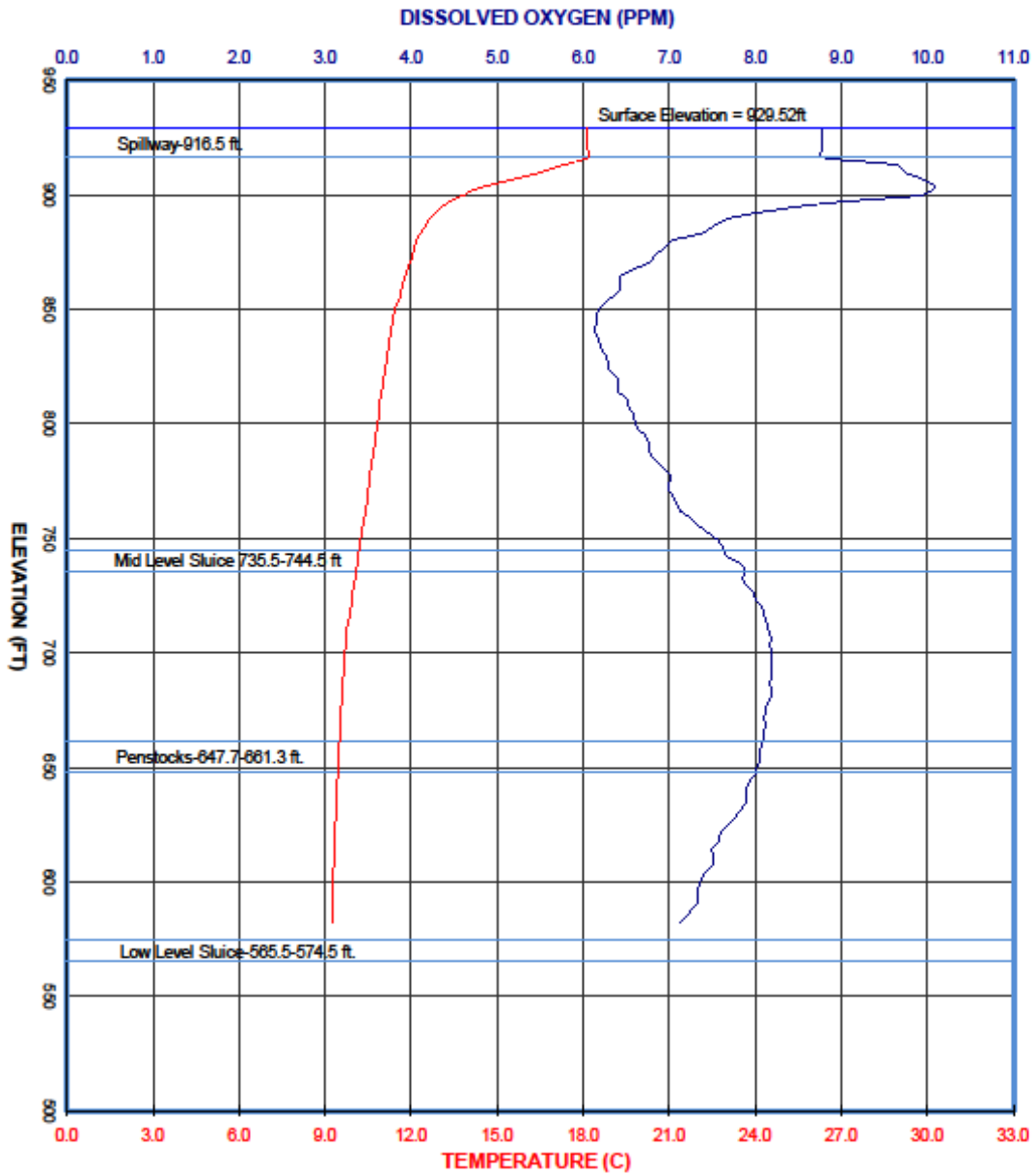
PINE FLAT RESERVOIR 03/06/18 (Time: 1146-12136) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 858.35



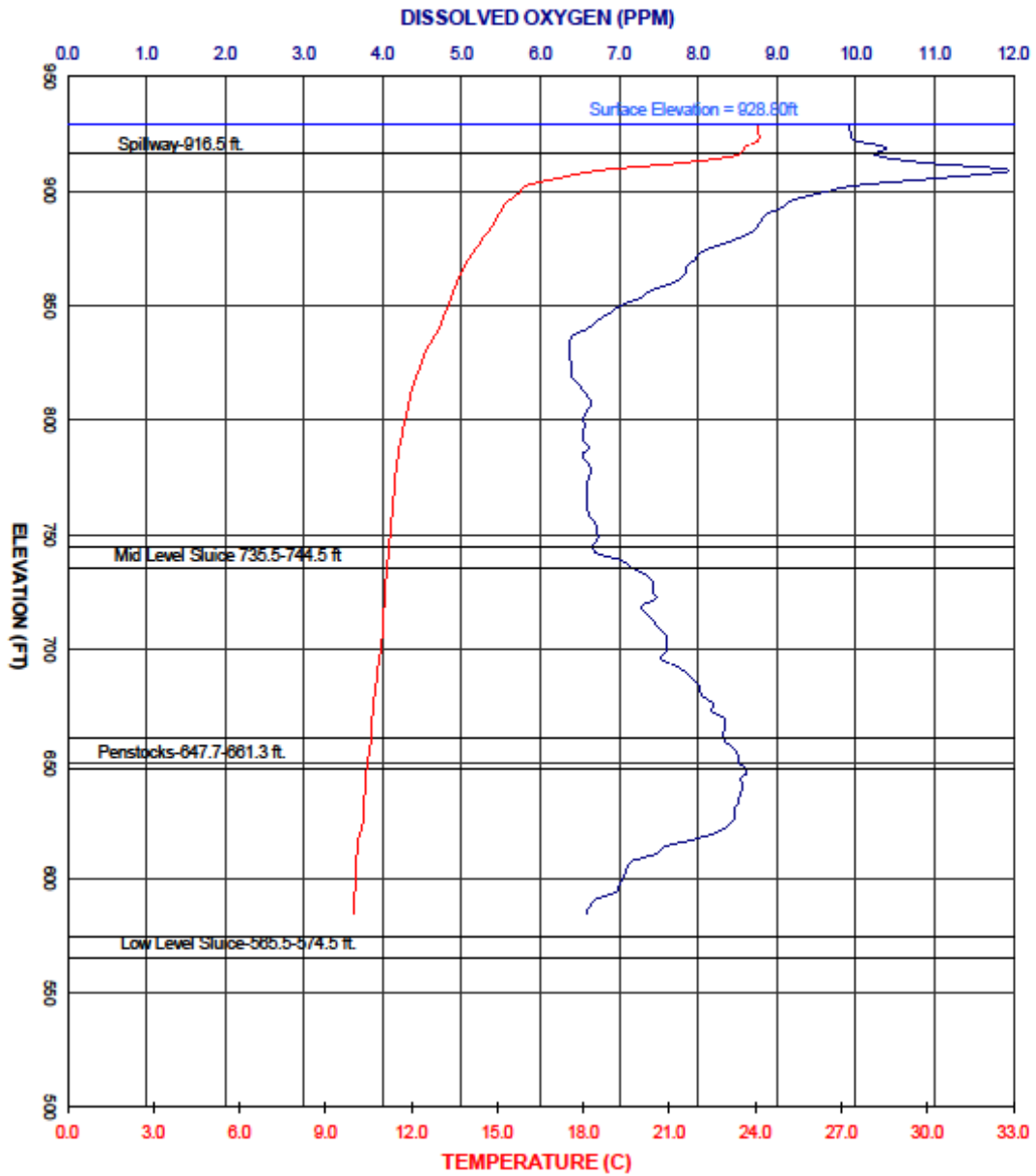
**PINE FLAT RESERVOIR 04/03/2018 (Time: 1343-1439) New Buoy Line Placement
(0.57 miles upstream of Dam) Reservoir Elevation in Feet = 890.5**



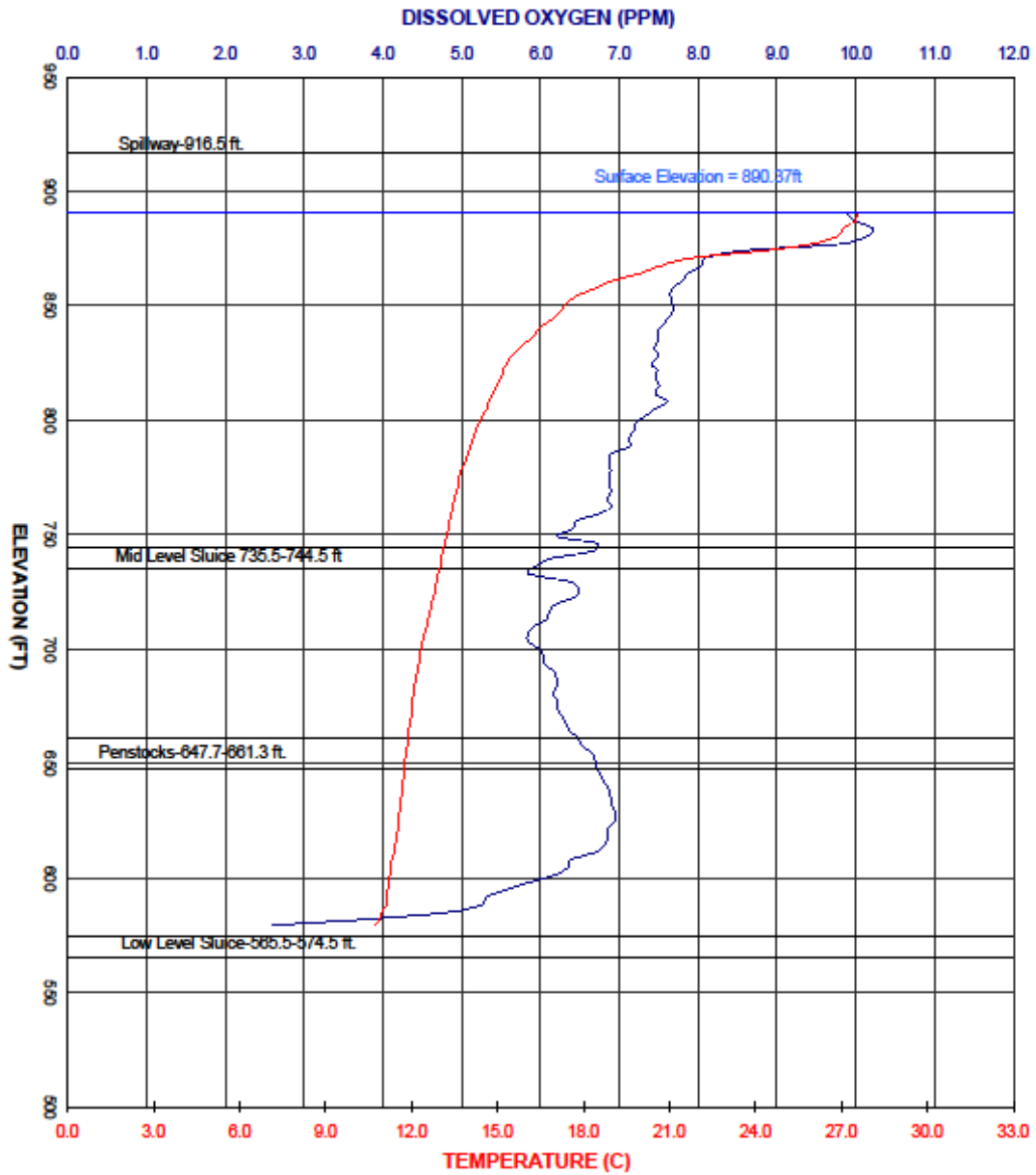
**PINE FLAT RESERVOIR 05/01/18 (Time: 1006-1112) New Buoy Line
Placement (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 929.52**



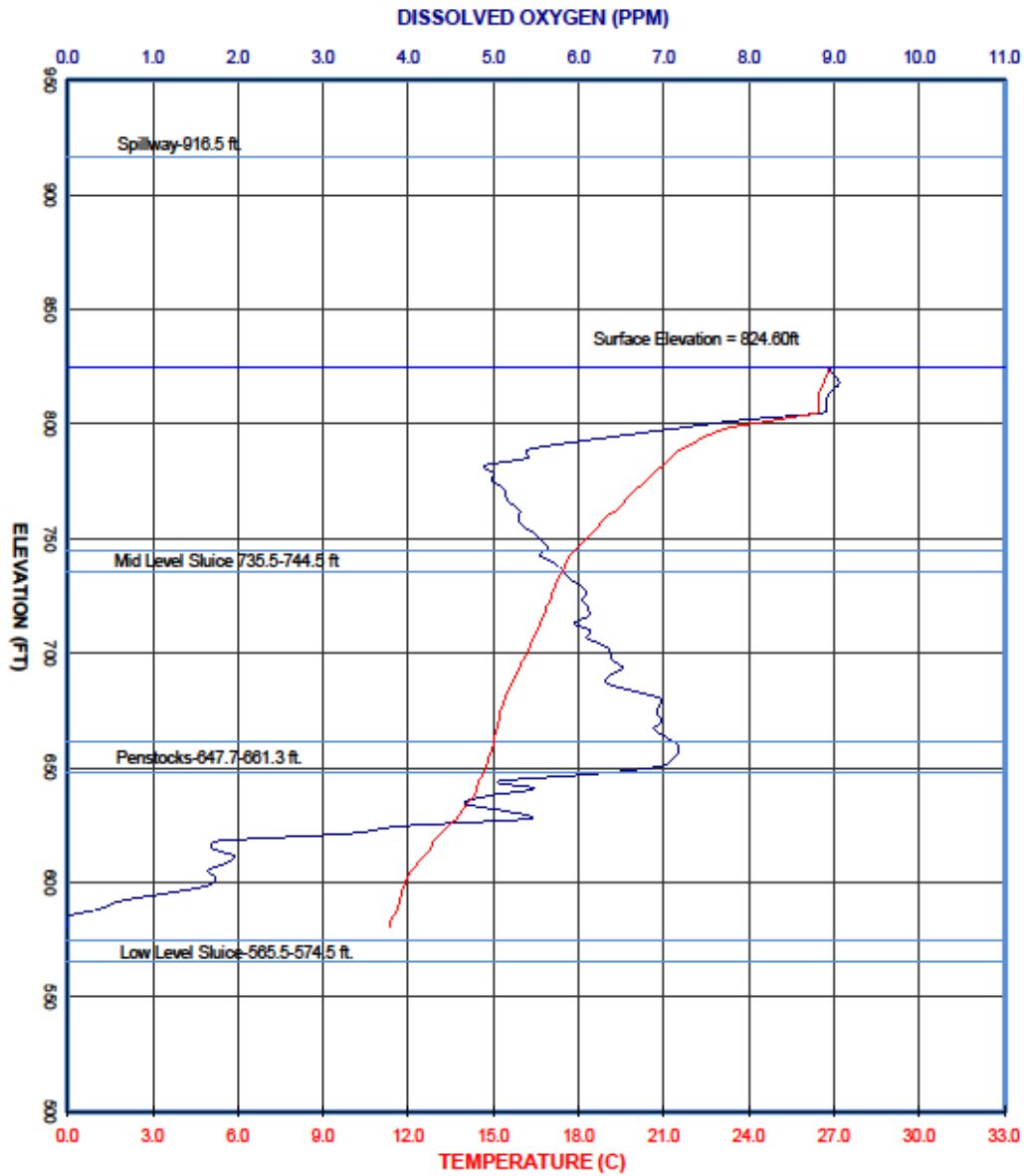
PINE FLAT RESERVOIR 06/05/2018 (Time: 1105-1225) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 928.80



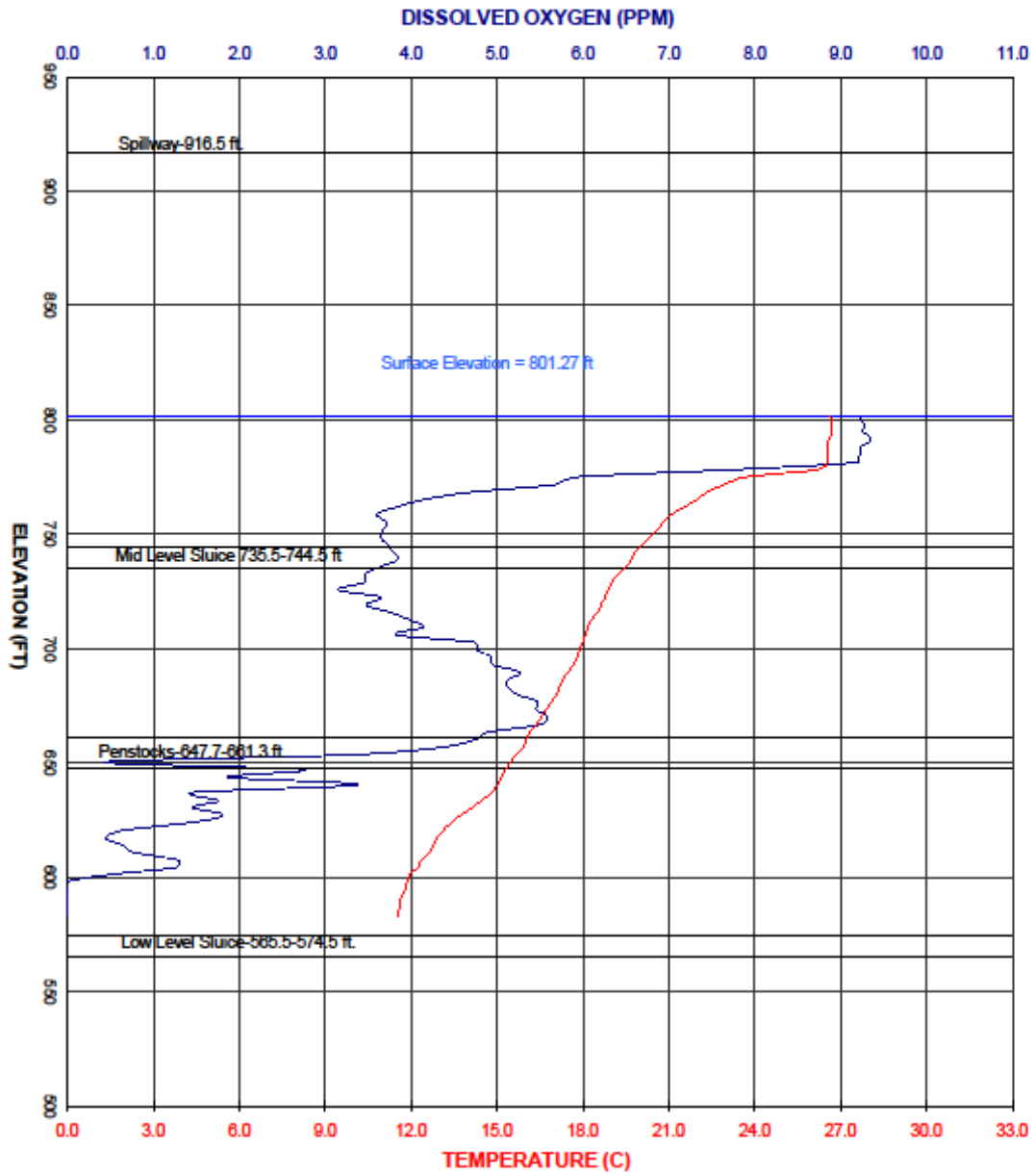
PINE FLAT RESERVOIR 07/03/2018 (Time: 1109-1243) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 890.37



PINE FLAT RESERVOIR 08/07/18 (Time: 1021-1136) New Buoy Line
Placement (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 824.60



PINE FLAT RESERVOIR 8/21/2018 (Time: 1026-1136) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 801.27



PINE FLAT RESERVOIR 9/5/2018 (Time: 1025-1135) New Buoy Line Placement
 (0.57 miles upstream of Dam) Reservoir Elevation in Feet = 783.12

