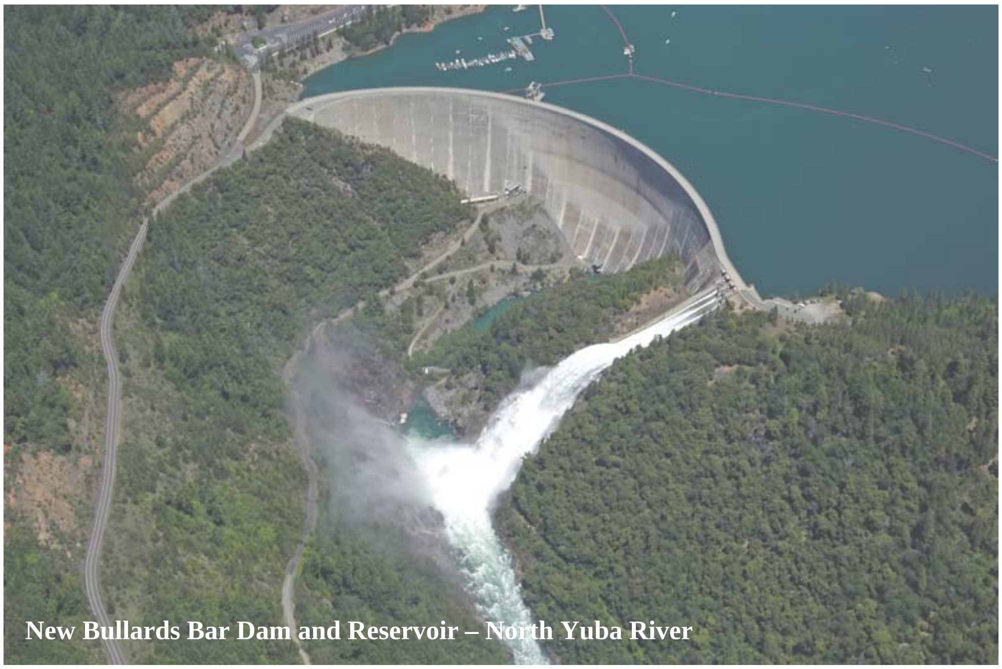
YUBA COUNTY WATER AGENCY

Yuba River Development Project
FERC Project No. 2246


New Bullards Bar Dam and Reservoir – North Yuba River

Pre-Application Document

Public Information

[SECURITY LEVEL: PUBLIC]

November 2010

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EXECUTIVE SUMMARY

Yuba County Water Agency (YCWA) owns and operates the existing Yuba River Development Project, which has facilities located on the western slope of the Sierra Nevada in Yuba, Sierra, and Nevada counties, California, on the main stems of the Yuba River, the North Yuba River, the Middle Yuba River, and Oregon Creek (a tributary to the Middle Yuba River).

The Project consists of one dam and associated storage reservoir (New Bullards Bar), two diversion dams (Our House and Log Cabin), two diversion tunnels (Lohman Ridge and Camptonville), two underground power tunnels (New Colgate and Narrows 2), one aboveground penstock (New Colgate), three powerhouses (New Colgate, New Bullards Minimum Flow and Narrows 2), seven recreation areas (Emerald Cove Marina, Hornswoggle Group Camp, Schoolhouse Family Camp, Dark Day Campground, Dark Day Boat Ramp, Garden Point Campground, and Madrone Cove Campground) on New Bullards Bar Reservoir, and other appurtenant structures. The Project passes water through the United States Army Corps of Engineer's Englebright Reservoir,[1] and portions of the Project are on National Forest System land managed by the United States Department of Agriculture, Forest Service.

The primary benefits of the Project are:

- Flood Management – 170,000 acre-feet of seasonally dedicated flood space
- Fishery Enhancement – up to 574,000 acre-feet of water in instream flows for listed species
- Water Supply - irrigation supply for about 100,000 acres of productive farmland
- Hydroelectric Power Generation, including Ancillary Services - 395 megawatts of renewable energy capable of supplying electricity to up to 200,000 homes
- Recreation - over 60 miles of shoreline and 132 campsites, with over 100,000 recreation visitor days annually

A uniquely important set of agreements regarding the Project is the Lower Yuba River Accord (Yuba Accord), which is a comprehensive, consensus-based program to protect and enhance aquatic habitats in the Yuba River downstream of Englebright Dam. The Yuba Accord is composed of four agreements: 1) the Lower Yuba River Fisheries Agreement, which specifies Lower Yuba River minimum streamflows and creates a detailed fisheries monitoring and evaluation program; 2) the Water Purchase Agreement, under which YCWA provides annual water supplies to the State of California's Natural Resources Agency for fish and wildlife purposes in the Bay-Delta ecosystem, CALFED's Environmental Water Account (the first major long-term acquisition of water that protects Bay/Delta fish and wildlife) and State Water Project and Central Valley Project contractors; 3) the Conjunctive Use Agreements with seven of

[1] Englebright Dam was constructed by the California Debris Commission in 1941, is owned, operated and maintained by the United States Army Corps of Engineers, and is not included as a Project facility in FERC's license for the Yuba River Development Project. None of the Project facilities are physically connected to Englebright dam. Narrows 2 Powerhouse is located a few hundred yards downstream of the dam and the Narrows 2 Power Tunnel is north of the dam and does not pass through the dam.

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YCWA's member units, which specify the terms of the Yuba Accord's groundwater conjunctive-use program; and 4) amendments to the 1966 Power Purchase Contract between YCWA and PG&E. Together, this package of agreements commits more water to minimum instream flows in the Yuba River downstream of Englebright Dam and provides greater reliability for both instream and consumptive uses than any previous state or federal requirement. YCWA has been operating the Project in conformance with the Yuba Accord since 2006.

To preserve and enhance the important Project benefits, on November 5 2010, YCWA filed with FERC a notice of intent (NOI) to file an application for new license for the Project by April 30, 2014, two years prior to the termination of YCWA's existing license.

YCWA's goals in the relicensing are to enhance the Project's ability to meet the flood management, environmental, water supply, power generation and recreation objectives.

New Bullards Bar Reservoir's flood management benefits are critical to maintaining Yuba County as a safe, sustainable and desirable community in which people can live and work by reducing the risk of catastrophic flooding like the flooding that occurred in 1986 and 1997. The Project's flood management capabilities provide local protection and also are integrated into the regional flood protection system through a set of agreements with State and federal flood control agencies.

YCWA's partnering with federal and state resource agencies and the environmental community has made significant and measurable improvements in the lower Yuba River's aquatic biota, especially anadromous fish, through the implementation of the Yuba Accord, which significantly modified Project operations. The Yuba Accord allocates available water to instream flows downstream of Englebright Dam to address anadromous fish stressors on a prioritized basis. The Accord instream flow schedules were developed considering all of the available water supplies that are controlled by the Project, and carefully allocating these supplies to the various demands for this water. For this reason, any substantial adjustment of the Yuba Accord instream flow schedules could result in reductions of the lower Yuba River habitat enhancements that the Yuba Accord currently provides.

The water supply reliability provided by the Project for the county's agricultural base is a vital element of economic stability in the otherwise stressed local economy. The Project is a critical component of ensuring a reliable water supply from the Yuba River for eight irrigation districts that convey water to approximately 100,000 acres of productive farmland in Yuba County. Currently, the Project's water supply capability is carefully matched with groundwater usage through a formal conjunctive use program to maximize both surface and groundwater supplies, and to protect the local aquifers. Surface water for irrigation purposes is a key factor in maintaining the reliable groundwater supplies that all municipal water suppliers in Yuba County rely upon.

New Colgate Powerhouse, the centerpiece of the Project's generation facilities, is a major provider of electric energy and capacity for Northern California. Due to the size and unique nature of this facility, it plays a central role in stabilizing the Northern California power grid by providing a wide range of ancillary services capability. Any restrictions on the flexible operation

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of New Colgate Powerhouse to provide peaking power and ancillary services would impact the Project's value and have direct impacts on energy consumers throughout the region.

Numerous developed and undeveloped recreation opportunities are provided for the public in the vicinity of the Project impoundments. New Bullards Bar Reservoir provides a variety of water-related recreational opportunities including water skiing, wakeboarding, houseboating, power boating, jet skiing, wildlife viewing, non-motorized boating, warm and cold water fishing, hiking, and camping. Our House Diversion Dam and Log Cabin Diversion Dam impoundments provide day use recreation opportunities for visitors, but are relatively small. In all, Project recreation facilities include five campgrounds (132 total sites), two picnic areas, two boat launch ramps, one marina (i.e., Emerald Cove Marina at Cottage Creek), one overlook, one day use area and several developed hiking trails.

Simultaneously with filing of its NOI, YCWA files with FERC this Pre-Application Document (PAD).[2] The PAD is intended to assist FERC, other federal agencies, State of California agencies, Indian tribes, local governments, non-governmental organizations, businesses, members of the public, and others interested in the relicensing[3] to prepare for the relicensing.

YCWA used several methods to obtain existing, relevant and readily available information regarding the Project and potentially-affected resources including: 1) sending a comprehensive questionnaire to over 100 separate individuals identified as being likely to be interested in the relicensing and to have existing and relevant information; 2) holding public outreach meetings to discuss the Project, potential issues that should be addressed in the relicensing, information needs and potential studies; 3) meeting or talking by telephone individually with representatives of resource agencies, tribes, and others; 4) reviewing files in local agency offices; and 5) conducting an extensive search of publicly available databases, university records, and YCWA's own files.

The PAD is composed of one bound volume and contains the following sections and appendices:

1. Introduction
2. Process Plan, Schedule and Communication Guidelines
3. General Description of River Basin
4. Major Applicable Laws
5. Consistency with Comprehensive Plans
6. Project Location, Facilities and Operations

[2] The PAD can be viewed on YCWA's Yuba River Development Project Relicensing Website (www.ycwa-relicensing.com) by clicking on "Relicensing Documents" in the Quick Launch bar on the left side of the webpage, and opening the folder labeled "Pre-Application Document." YCWA's NOI can be found at the same location in the folder labeled "Notice of Intent." The PAD and NOI are also made available for inspection and reproduction at YCWA's place of business and in local libraries.

[3] These parties together with YCWA are collectively referred to as the Relicensing Participants.

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7. Description of Existing Environment
    - 7.1 Geology and Soils
    - 7.2 Water Resources
    - 7.3 Aquatic Resources
    - 7.4 Wildlife Resources
    - 7.5 Botanical Resources
    - 7.6 Wetland, Riparian and Littoral Habitats
    - 7.7 Threatened, Endangered and Fully Protected Species
    - 7.8 Recreational Resources
    - 7.9 Land Use
    - 7.10 Aesthetic Resources
    - 7.11 Socio-Economic Resources
    - 7.12 Cultural Resources
    - 7.13 Tribal Resources
8. Potential or Known Issues and Project Effects
9. Existing and Licensee Proposed Measures
10. Licensee's Preliminary Proposed Studies

Appendices
- A - Summary of Contacts
- B - Information Sources
- C - Agent for Yuba County Water Agency
- D - Project Maps
- E – Project Helicopter Video
- F – Hydrology Data

One of the main purposes of the PAD is to identify information gaps that need to be filled to develop information to assess Project effects and inform requirements that may be included in the new FERC license. YCWA's goal is to reach agreement on as many of the studies needed to fill these information gaps with as many Relicensing Participants as possible. To facilitate this, YCWA:

- In September 2009, distributed a Preliminary Information Package that was formatted similar to and contained much of the information included in this PAD.
- In October and November 2009, provided tours of the Project to interested Relicensing Participants.
- In 2010, scheduled and held meetings to discuss information gaps and needed studies.
- Developed and posted to the Relicensing Website "straw man" study proposals to facilitate discussion.
- Scheduled, in consultation with Relicensing Participants, meetings to continue study proposal development after filing of the NOI and PAD and into 2011.

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Based on the above, YCWA has included in its PAD 41 preliminary proposed studies (listed in Table ES-1). Some of these resource studies, such as the studies for channel morphology and riparian habitat, that would normally be a single study, have been divided into two studies: one upstream of Englebright Dam and one downstream of Englebright Dam. YCWA developed separate preliminary study proposals for these two areas because of the uniquely different conditions above and below Englebright Dam. Prior to 1930, vast amounts of hydraulic mining sediments were deposited in the lower Yuba River. Starting in the late 1800s, large diversions of water from the Yuba River watershed were made to supply mining and agricultural interests outside of the watershed. The construction of Englebright Dam in 1941 as a sediment barrier resulted in sediment starvation of the upper portion of the lower Yuba River, and the dam, which does not contain any fish ladders or other provisions for upstream fish passage, completely blocks upstream fish passage. These major events have had substantial and interrelated effects on the Yuba River watershed that were all in place before construction of the Project. In addition, due to this long history of disturbances, the presence of anadromous fish, and the monitoring program of the Yuba Accord, the lower Yuba River is one of the more intensely studied river systems in California. In comparison, the Yuba River watershed upstream of Englebright Dam is fairly typical of lower elevation Sierra Nevada streams, and has been the subject of relatively few environmental studies. Because the two areas are so different, the methods used to gather information in the two areas and the preliminary study proposals for the two areas also are very different.

Table ES-1. List of YCWA's preliminary proposed studies.[1]

Study Number	Study Name
GEOLOGY AND SOILS	
1.1	Channel Morphology Upstream of Englebright Reservoir
1.2	Channel Morphology Downstream of Englebright Dam
WATER RESOURCES	
2.1	Hydrologic Alteration
2.2	Water Balance/Operations Model
2.3	Water Quality
2.4	Bioaccumulation
2.5	Water Temperature Monitoring
2.6	Water Temperature Model
AQUATIC RESOURCES	
3.1	Aquatic Macroinvertebrates Upstream of Englebright Reservoir
3.2	Aquatic Macroinvertebrates Downstream of Englebright Dam
3.3	Special-Status Aquatic Mollusks
3.4	Special-Status Amphibians – Foothill Yellow-Legged Frog Surveys
3.5	Special-Status Amphibians – Foothill Yellow-Legged Frog Habitat Modeling
3.6	Special-Status Turtles – Western Pond Turtle
3.7	Reservoir Fish Populations
3.8	Stream Fish Populations Upstream of Englebright Reservoir
3.9	Stream Fish Populations Downstream of Englebright Dam
3.10	Fish Instream Flow Upstream of Englebright Reservoir
3.11	Fish Entrainment
WILDLIFE RESOURCES	
4.1	Special-Status Wildlife – California Wildlife Habitat Relationships
4.2	Special-Status Wildlife – Bats
BOTANICAL RESOURCES	
5.1	Special-Status Plants
WETLAND, RIPARIAN AND LITTORAL HABITATS	
6.1	Riparian Habitat Upstream of Englebright Reservoir
6.2	Riparian Habitat Downstream of Englebright Dam
6.3	Wetlands

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Table ES-1. List of YCWA's preliminary proposed studies.[1]

Study Number	Study Name
THREATENED, ENDANGERED AND FULLY PROTECTED SPECIES	
7.1	ESA-Listed Plants
7.2	Narrows 2 Powerhouse Intake
7.3	ESA-Listed Amphibians – California Red-Legged Frog
7.4	ESA-Listed Wildlife – Valley Elderberry Longhorn Beetle
7.5	CESA-Listed Plants
7.6	CESA-Listed and Fully Protected Wildlife – California Wildlife Habitat Relationships
7.7	CESA-Listed and Fully Protected Wildlife – Bald Eagle
7.8	ESA/CESA-Listed Salmonids Downstream of Englebright Dam
7.9	North American Green Sturgeon Downstream of Englebright Dam
7.10	Instream Flow for Steelhead and Chinook Salmon Downstream of Englebright Dam
RECREATIONAL RESOURCES	
8.1	Recreation Use and Visitor Surveys
8.2	Recreational Flow
LAND USE	
9.1	Primary Project Roads and Trails
AESTHETIC RESOURCES	
10.1	Visual Quality
CULTURAL RESOURCES	
12.1	Historic Properties
TRIBAL RESOURCES	
13.1	Native American Traditional Cultural Properties

[1] YCWA may modify these studies, including adding or deleting studies, based on comments filed with FERC on YCWA's PAD, comments made during FERC's implementation of its National Environmental Policy Act process, and continued consultation with Relicensing Participants.

Written comments on YCWA's PAD may be filed with FERC within 60 days of the date that FERC issues a Notice of Commencement of Proceeding. Assuming FERC issues its notice on January 1, 2011 (approximately 60 days after YCWA files its NOI and PAD) written comments on the PAD will be due to FERC by March 1, 2011. However, this is an approximation by YCWA. Interested parties should confirm with FERC the due date for PAD comments, or comply with the due date that will be described in the upcoming FERC notice.

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GLOSSARY - DEFINITION OF COMMONLY USED TERMS, ACRONYMS, AND ABBREVIATIONS

Term	Definition
A	
A	Ampere
AA	Federal Antiquities Act
ac	acre
ac-ft	acre-feet or acre-foot, the amount of water needed to cover one acre to a depth of one foot (43,560 cubic feet or 325,900 gallons)
ac-ft/yr	acre-feet per year
accretion flow	The incremental flow between two points. Also known as local inflow.
ACEC	Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ACSR	aluminum conductors steel reinforced
ADA	Americans with Disabilities Act
adit	An almost vertical pipe or short horizontal passage entering a tunnel, either to add water from a conduit, sluice or other water source, or as a maintenance access tunnel (also referred to as a portal)
aestivation	Similar to hibernation, where an animal is dormant during unfavorable summer-like conditions. For example, to survive long periods of drought, some reptiles and amphibians become inactive or "aestivate."
AFRP	Anadromous Fish Restoration Program
afterbay	A reservoir located immediately downstream from a powerhouse, sometimes used to re-regulate flows to the river or stream
AGC	Automatic Generation Control used to support California electric regulation system
AIR	Additional Information Request issued by the Federal Energy Regulatory Commission
AIRFA	American Indian Religious Freedom Act
AMSET	Adaptive Management Services Enterprise Team
amsl	above mean sea level
anabat	An electronic instrument used to detect and record high frequency vocalization of bats
anadromous	Anadromous fish live most of their lives in saltwater and return to freshwater to spawn.
ancillary	Provides added support
APE	Area of Potential Effect, as pertaining to Section 106 of the National Historic Preservation Act
AR	American Rivers
AUM	animal unit months
AW	American Whitewater
B	
BA	Biological Assessment
BAOT	boats at one time
baseload	Generation around-the-clock
Basin Plan	Basin Plans provide the basis for protecting water quality in California. Basin Plans are mandated by both the Federal Clean Water Act and the State Porter-Cologne Water Quality Act. Sections 13240-13247 of Porter-Cologne specify the required contents of a regional basin plan. For a given region, each plan contains 1) water quality objectives to ensure the reasonable protection of beneficial uses and 2) a program of implementation for achieving those objectives.
BASINS	Better Assessment Science Integrating Point and Nonpoint Sources (software)
Bay-Delta	The San Francisco Bay-San Joaquin Delta Estuary
BBS	Breeding Bird Survey
BC	Before Christ
BDAC	Bay-Delta Advisory Committee
BDCP	Bay-Delta Conservation Plan
BEPA	Bald Eagle Protection Act
BLM	United States Department of the Interior, Bureau of Land Management
BLM-S	Bureau of Land Management, sensitive species
BMI	benthic macroinvertebrates
BMP	Best Management Practice
BO	Biological Opinion
BOD	biological oxygen demand
BOR	United States Department of the Interior, Bureau of Reclamation

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Glossary (continued)

Term	Definition
B (continued)	
BP	before present
BVID	Browns Valley Irrigation District
BWD	Brophy Water District
bypass flow	Bypass flows are those flows that are required to be released into a stream, and do not flow through the powerhouse
C	
C	Centigrade
CAISO	California Independent System Operator
CALFED	Interagency committee with management and regulatory responsibility for Bay-Delta Estuary
CalVeg	Classification and Assessment with Landsat of Visible Ecological Groupings. The Forest Service's classification system of California's existing vegetation communities. Original information was collected using remote sensing techniques along with field verification.
CAS	California Academy of Sciences
CRLF	California red-legged frog
Cal-IPC	California Invasive Plant Council
CalTrans	California Department of Transportation
capital improvement	The construction, installation, or assembly of a new fixed asset, or the significant alteration, expansion, or extension of an existing fixed asset to accommodate a change of purpose.
CCWD	Contra Costa Water District
CD	Compact Disc
CDBAW	California Department of Boating and Waterways
CDEC	California Data Exchange Center
CDF	California Department of Forestry and Fire Protection
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CDPR	California Department of Parks and Recreation
CD-ROM	Compact Disc-Read-Only Memory
CDSOD	California Department of Water Resources, California Division of Safety of Dams
CDWR	California Department of Water Resources
CE	Federal Candidate Endangered Species. A species or subspecies listed as endangered under the California Endangered Species Act
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFBF	California Farm Bureau Federation
CFR	Code of Federal Regulations
cf or ft^3	cubic feet
cfs	cubic feet per second. One cfs equals approximately 1.98 acre-feet per day.
CHRIS	California Historical Resources Information Center
CID	Cordua Irrigation District
CIPS	Commission Issuance Posting System
CL	carapace length
cm	centimeter
CMARP	Comprehensive Monitoring, Assessment, and Research Program
CNDDB	California Natural Diversity Data Base
CNPPA	California Native Plant Protection Act
CNPS	California Native Plant Society
CNPS-1A	Plant presumed by the CNPS to be extinct in California
CNPS-1B	Plant considered by the CNPS as rare or endangered in California and elsewhere
CNPS-2	Plant considered by the CNPS as rare or endangered in California but more common elsewhere
CNPS-3	Plant that requires more information by the CNPS before assigning to other lists – A review list
CNPS-4	Plant considered by the CNPS as plants of limited distribution
Commission	Federal Energy Regulatory Commission; also referred to as FERC
Comprehensive Plans	A comprehensive plan is a plan for the development or generation or other beneficial uses of a river recognized under the Federal Power Act section 10(a)(2)(a).
component	A named data set in an operation model that is a building block for a condition.
Conjunctive use	Conjunctive use of surface and groundwater consists of combining the use of both water sources in order to (1) minimize the undesirable physical, environmental and economical effects of using each and (2) optimize the water demand/supply balance.

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Glossary (continued)

Term	Definition
C (continued)	
Consumptive use of water	Water no longer available for use because it has evaporated, transpired, or has been incorporated into products and crops.
Conceptual design for recreation facilities	A conceptual design is the designer's initial communication to convey proposed design solutions. Conceptual designs for a facility may consist of diagrammatic sketches, bubble diagrams, line diagrams, preliminary floor plans, or renderings. A conceptual design is prepared prior to a site development plan. (Forest Service Handbook 7309.11, Chapter 30.)
condition	The main building block of a scenario, containing the data used by the operation model to simulate the system. At this time, the only condition that is defined by components is 'Turbine Generator'.
Conduit	A pipe, flume or canal used for diverting or moving water from one point to another, usually used when there is no existing streambed or waterway.
Contact List	List of Interested Parties that have provided an e-mail address to the Licensee for distribution of information regarding the Relicensing. Also referred to as Relicensing Contact List.
Control Area	An electric system bounded by interconnection metering and telemetry, capable of controlling generation to maintain its interchange schedule with other control areas and contributing to frequency regulation of the interconnection. A control area operates its AGC on tie-line frequency bias.
CORP	California Outdoor Recreation Plan
CP	California Protected Species. Species designated as protected under the CDFG sport fishing regulations as authorized by the California Code of Regulations, Title 14
CPUC	California Public Utility Commission
CR	California Rare Species. A species or subspecies listed as rare under the California Endangered Species Act
critical habitat	Areas of land or water that the United States Fish and Wildlife Service or National Marine Fisheries Service has designated to have the physical or biological features essential to the conservation of a species listed under the federal Endangered Species Act.
CRMP	Cultural Resource Management Plan
CSBP	California Stream Bioassessment Procedure
CSPA	California Sportfishing Protection Alliance
CSC	California Special Concern Species, an administrative designation by CDFG
CT	Federal Candidate Threatened Species. A species or subspecies listed as threatened under the California Endangered Species Act
cu yd	cubic yard
CVHJV	The California Central Valley Habitat Joint Venture
CVP	Federal Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Federal Clean Water Act
CWHR	California Wildlife Habitat Relationships System
CWSC	California Water Services Company
CWT	coded wire tags
D	
DBW	Dam Base Width. The width of the dam at its widest point along the foundation.
DCE	Dam Crest Elevation. The elevation of the lowest point along the crest.
DCW	Dam Crest Width. The width of the dam at the crest.
Dam fish release requirement	The flow that must be released to the stream downstream of the dam; also known as minimum streamflow release requirement or bypass flow.
DH	Dam Height. The height of the dam from the crest (see below) to the stream channel at the downstream toe.
Dam Low Level Outlet Control	The type of gate and/or valve that controls the release from the low level outlet.
Dam Low Level Outlet Type	A description of the low level outlet facilities.
Dam Max Low Level Outlet Capacity	The flow that can be discharged through the low level outlet at the NMWS.
Dam Max Spillway Discharge	The maximum flow the spillway can pass with the water surface at the crest of the dam.
Dam Slope – Upstream Face	The slope of the upstream face of the dam.
Dam Slope – Downstream Face	The slope of the downstream face of the dam.
Dam Spillway Control	The type of device that controls the spillway.
Dam Spillway Crest Elevation	The elevation of the lowest point of the spillway.
Dam Spillway Type	The type of spillway.
Dam Type	A description of the type of dam.
Dam Year Placed in Service	The first calendar year water was impounded behind the dam.

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Glossary (continued)

Term	Definition
D (continued)	
dbh	diameter at breast height
DCMWC	Dry Creek Mutual Water Company
de novo	From the beginning: start fresh.
Decommission	Demolition, dismantling, removal, obliteration and/or disposal of a deteriorated or otherwise unneeded asset or component, including necessary cleanup work. This action eliminates the deferred maintenance needs for the fixed asset. Portions of an asset or component may remain if they do not cause problems nor require maintenance.
DEIR	Draft Environmental Impact Report
DEIS	Draft Environmental Impact Statement
DEM	Digital Elevation Model – The format of the USGS digital elevation data sets containing elevation values that have been primarily derived from the United States Geological Survey topographic map series.
Dependable capacity	The maximum dependable output (in units of power, e.g., MW) of a generator or a group of generators under a combination of adverse hydrologic conditions and high electrical demand.
Development	The Project facilities situated immediately upstream of a powerhouse, which are not part of another development.
Discharge	water released from a dam
distribution system	The substations, transformers and lines that convey electricity from high-power transmission lines to the consumer. Usually 115 kV and lower voltage.
Diversion dam	Generally a small dam with minimal storage and a primary purpose of routing a portion of upstream flow into a diversion conduit.
DLA	Draft License Application
DO	dissolved oxygen
DOC	dissolved organic carbon
DPS	distinct population segment
Draft EA	Draft Environmental Assessment
DEIR	Draft Environmental Impact Report
DRP	Dispute Review Panel
DSS	The United States Army Corps of Engineers' Hydrologic Engineering Center Data Storage System is a database system designed to store and retrieve scientific data.
DVD	Digital Versatile Disk
E	
EA	Environmental Assessment
EAP	Emergency Action Plan
ECPA	Electric Consumers Protection Act
EDD	California Employment Development Department
EDR	Englebright Dam Reach
EFH	Essential Fish Habitat
EIA	Energy Information Administration
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
elev	Elevation
endemic (adj.) endemism (noun)	Restricted to a certain locality or region. Indigenous. Native.
EPA	United States Environmental Protection Agency
EPT	Orders of benthic insects: Ephemeroptera, Plecoptera, and Tricoptera.
ESA	Federal Endangered Species Act
ESU	evolutionarily significant unit
EVC	existing visual condition
F	
°F	Fahrenheit
FAC	Federal Advisory Committee
FACA	Federal Advisory Committee Act
FARM	Framework for Archaeological Research and Management of Forests of the North Central Sierra Nevada
FC	Federal Candidate Species. A species or subspecies currently proposed as a candidate for listing under the ESA
FE	Federal Endangered Species. A species or subspecies listed as endangered under the Federal Endangered Species Act
FEA	Final Environmental Assessment

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Glossary (continued)

Term	Definition
F (continued)	
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FEPD	A federally-listed endangered species currently proposed for delisting from the ESA
FERC	Federal Energy Regulatory Commission
FERC determination	A binding decision made by FERC during the relicensing process
FERC Project Boundary	The area Licensee uses for normal Project operations and maintenance, and is shown on Exhibits G, J, and K of the current license.
FGDC	Federal Geographic Data Committee: promotes the coordinated development, use, sharing, and dissemination of geographic data.
FHSA	Federal Historic Sites Act
FHWA	Federal Highway Administration
fishway	A structure on or around natural or artificial barriers to facilitate fish migration, such as a fish ladder.
fixed asset	A constructed feature such as a building, road, campground, trail, or other item of infrastructure.
fixed asset component	A subsystem, major item of equipment, or other portion of a fixed asset. Examples of components include: roof for a building, deck for a bridge, pavement for a road, interpretive kiosk at a viewing area, site furnishings (tables, grills, etc.) at a campground.
flashboards	Removable boards installed seasonally in reservoir spillways to temporarily increase storage capacity
flood elevation	The reservoir elevation at which the plant's reservoir spills.
FLPMA	Federal Land Policy and Management Act
flume	A lined structure, commonly made of wood, metal or concrete, used for conveyance of water, usually where no streambed exists or the topography is not suitable for a canal or tunnel.
FMP	Fire Management Plan
FMU	Fire Management Unit
FODC	Friends of Deer Creek
forebay	A reservoir upstream from the powerhouse from which water is drawn into a tunnel or penstock for delivery to the powerhouse
Forest Service	United States Department of Agriculture, Forest Service
FOW	forced oil and water cooled
FP	Fully Protected. A species or subspecies designated as "fully protected" under the California Department of Fish and Game Code
FPA	Federal Power Act
FPD	Federal Proposed Delisting. A species or subspecies proposed for listing as endangered under the federal Endangered Species Act.
FPE	Federal Proposed Endangered. A species proposed for listing as "endangered" under the federal Endangered Species Act.
fps	feet per second
FPT	Federal Proposed Threatened. A species or subspecies proposed for listing as threatened under the federal Endangered Species Act.
Frequency Regulation	The ability of a Control Area to assist the interconnected system in maintaining scheduled frequency.
FRRRPA	The Forest and Rangeland Renewable Resources Planning Act
FSC	Federal Species of Concern. An administrative designation by United States Fish and Wildlife Service (former category 2 species)
FSM	Forest Service Manual
FSS	Forest Service Sensitive. A species or subspecies designated as "sensitive" by the Forest Service
FSV	Species designated by the Sierra Nevada Framework as moderate to high vulnerability and species of concern.
FT	Federal Threatened Species. A species or subspecies listed as threatened under the Federal Endangered Species Act
ft	foot or feet
FWCA	Fish and Wildlife Coordination Act
G	
G	Giga
g	Gram
GAP	Gap Analysis Program. United States Geological Survey and UC Santa Barbara's vegetation, land cover, and potential wildlife habitat map(s) for California.
Generator	A machine, powered by a turbine, that converts the rotating mechanical energy into electrical energy.

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Glossary (continued)

Term	Definition
G (continued)	
GIS	Geographic Information System
GMP	General Management Plan
gpd	gallons per day
gpm	gallons per minute
GPS	Global Positioning System
GRCD	Grasslands Resource Conservation District
grizzly	A wide-opening grating across the entry to a water conduit, for screening of large objects such as logs.
Gross head	The difference between the headwater elevation and the tailwater elevation.
GWh	gigawatt hour (equals one million kilowatt hours)
H	
H	Horizontal
“H”-frame structure	A wood pole transmission structure that consists of two wood poles with a horizontal cross arm above the conductor
HA	Commercially or recreationally harvested species; non-protected species.
HABS	Historic American Building Survey
HABTAT	United States Fish and Wildlife Service Instream Flow Incremental Methodology simulation model
HAER	Historic American Engineering Record
HCP	Habitat Conservation Plan
head	The vertical height of water that represents potential energy.
Headwater	The upper tributaries that form the source of a stream
head loss	The amount of head that is lost (to friction, etc.) between the headwater (reservoir/forebay/intake) and the tailwater.
HEC	Hydrologic Engineering Center of the United States Army Corps of Engineers
HEC-ResSim	United States Army Corps of Engineers – Hydrologic Engineering Center Reservoir Simulation model, Version 3.0. Also referred to as ResSim.
HEP	Habitat Evaluation Procedures
HIC	Hallwood Irrigation Company
HLCTS	Hydropower License Compliance Tracking System
hp	Horsepower
HPMP	Historic Properties Management Plan
hr	Hour
HREZ	Heritage Resource Emphasis Zones
HRMA	Heritage Resource Management Area
HSC	Habitat Suitability Criteria
HSI	Habitat Suitability Indices
HSPH	Hydrologic Simulation Program—Fortran
HU	Hydro unit, numbers assigned by California’s regional water quality control boards.
HUC	Hydrologic unit codes developed by the Water Resources Council corresponding to hierarchal classification of hydrologic drainage basins in the United States. Each hydrologic unit is identified by a unique HUC.
HVAC	Heating Ventilation and Air Conditioning System
Hz	Hertz (cycles per second)
I	
ICD	Initial Consultation Document, also known as Pre-Application Document
IFIM	United States Fish and Wildlife Service, Instream Flow Incremental Methodology
IHA	Indicators of Hydrologic Alteration
ILP	Integrated Licensing Process
Immediate Vicinity	The area extending to about one mile out from a Project feature
in	Inch
inflow	The water entering a reservoir.
Initial License	The first license for a Project issued by Federal Energy Regulatory Commission.
Installed capacity	Installed capacity refers to the maximum amount of electric energy, in megawatts, that can be produced by all of a dam’s turbines operating to their maximum capacity for a given time. No power station ever produces at maximum capacity over a sustained period of time due to maintenance needs, lack of demand or, in the case of hydro dams, lack of water. Also called nameplate capacity or maximum capacity.
Interchange	Electric power that flows from one entity to another.

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Glossary (continued)

Term	Definition
I (continued)	
Interested Parties	All governmental agencies, non-governmental organizations, Native American tribes, and unaffiliated members of the public who either (1) routinely participate in Federal Energy Regulatory Commission relicensings in California or (2) have advised the Licensee that they wish to become involved in one or more of the relicensing proceedings. The Licensee is considered to be an Interested Party.
introgression	The introduction of genes from one species into the gene pool of another species.
Inverted siphon	A pressurized pipe section of conduit that crosses a stream channel or ravine.
ISO	Independent System Operator
ITA	Indian Trust Asset
J	
JPS	Jimmerson-Gasper-Surface association, a soils classification
K	
kcfs	a thousand cubic feet per second
kg	kilogram: 1,000 grams
kg/day	kilograms per day
kg/ha	kilograms per hectare
kg/yr	kilograms per year
km	kilometer: 1,000 meters
kV	kilovolt: 1,000 volts
kVA	kilovolt amperes
KVP	Key View Point
kW	kilowatt: 1,000 watts
kWh	kilowatt-hour: 1,000 watt hours
L	
L	Liter
lb	Pound
LCMMP	Land Coordinated Mapping and Monitoring Program
lead agency	A lead agency is the agency responsible for ensuring that a course-of-action, i.e., project, complies with the California Environmental Quality Act and/or the National Environmental Policy Act.
Lentic	Related to or living in standing water.
LEO	Law Enforcement Officer
level	reservoir surface elevation
level fluctuation	The change in reservoir surface elevation.
License Application	Application for a new license; submitted to the Federal Energy Regulatory Commission no less than two years in advance of expiration of an existing license.
Licensee	Yuba County Water Agency
license term	The period for which a license is issued by the Federal Energy Regulatory Commission. Usually between 30 and 50 years.
LIDAR	Light Detection and Ranging. An optical remote sensing technology that measures properties of scattered light to find range and/or other information of a distant target.
load shapes	The daily schedule of power pricing and the hour duration of each price.
local inflow	The incremental inflow between two plants (also known as accretion flows).
LOP	limited operating periods
lotic	Related to or living in flowing water.
LRMP	Land and Resource Management Plan
LWD	large woody debris
M	
µ	micro
µg	microgram
µg/L	micrograms per liter (equals parts per billion, or ppb)
µmho/cm	micromhos per centimeter, a measurement of electrical conductivity
µS	microsiemens, a measurement of electrical conductivity
M	mega
m	meter (if the letter is used as a unit on its own)
m	milli (if the letter is placed in front of another unit)
mainstem powerhouse	A plant located on the main stream that runs through the system. Not a plant on a side or tributary stream.
maximum penstock velocity	The maximum velocity in the penstock at the "installed capacity" as defined above. This will occur at the smallest penstock diameter.

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Glossary (continued)

Term	Definition
M (continued)	
mbf	million board feet
MBTA	Migratory Bird Treaty Act
MCA/T	mandatory conditioning agencies/tribes
MCE	maximum credible earthquake
MCL	maximum contaminant level
Meeting Participant	A Relicensing Participant who attends a specific meeting. Meeting Participants are different for each meeting.
Member Unit	One of eight water users who participated in the Yuba Accord with YCWA.
metadata	“Data about data” - Describe the content, quality, condition, purpose and other characteristics of data.
mg	milligram
mg/L	milligrams per liter (equals parts per million, or ppm)
mgC/m^2	milligrams of carbon per square meter
mi	mile
mills/kWh	0.1 cent per kilowatt hour
minimum daily average flow	A requirement indicating the minimum flow of water that must be maintained at a measurement location when instantaneous flow measurements are averaged on a daily basis.
minimum instantaneous flow	A requirement indicating the minimum flow of water that must be maintained at a measurement location at any point in time.
minimum instream flow	A requirement indicating the minimum flow within a Project-affected reach, at a fixed measurement location. A minimum instream flow can be defined as an instantaneous flow or a time period-averaged flow.
MIR	minimal implementation requirement, a Forest Service system
MIS	A Forest Service Management Indicator Species
mm	millimeters
MNBMC	Migratory Bird of Management Concern, a Forest Service classification
MOA	memorandum of agreement
morphometric	measurement of the external form (size and shape) of an object
MOU	memorandum of understanding
MPN	most probable number
mps	meters per second
MSCS	Multi-Species Conservation Strategy
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
msl	mean sea level
must-run	Energy or ancillary services necessary to maintain system reliability
MVA	megavolt-ampere
MVZ	Museum of Vertebrate Zoology
MW	megawatt: 1,000 killowatts
MWh	megawatt-hours: 1,000 kilowatt-hours
mya	million years ago
MYR	Middle Yuba River
N	
n	nano
NAD 83	North American Datum 1983 – Based on a definition of the size and shape of the earth. It is the datum for map projections and coordinates within the United States and throughout North America.
NAGPRA	Native American Graves Protection and Reparation Act
NADV	North American Vertical Datum
NAHC	California Native American Heritage Commission
NAIP	National Agriculture Imagery Program
Narrows 1; Narrows 2	
natal	Of, relating to, or present at birth.
natural inflow	The flow that a point in the system would have received if there were no upstream flow regulation in the system. This flow is equal to the sum of all upstream accretion inflows. Also known as unimpaired or unregulated flows.
NCCP	Natural Conservation Plan
NCIC	North Central Information Center
NDA	no data available
NEPA	National Environmental Policy Act
NEPAct	National Energy Policy Act

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Glossary (continued)

Term	Definition
N (continued)	
new construction	The erection, construction, installation, or assembly of a new fixed asset.
New License	A license issued for a Project for which the Federal Energy Regulatory Commission has issued an initial license
NFMA	National Forest Management Act
NFS	National Forest Service
ng	nanogram
NGO	Non-Governmental Organizations
NGVD	National Geodetic Vertical Datum
NHA	National Hydropower Association
NHI	Natural Heritage Institute
NHPA	National Historic Preservation Act
NID	Nevada Irrigation District
NJE	Nanny-Jacksback-Esro association, a soil classification
NLT	No later than
NMFS	Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NMWS	Normal Maximum Water Surface elevation, applies to reservoirs
NOAA	Department of Commerce, National Oceanic and Atmospheric Administration
normal operating capacity	The maximum MW output of a generator or group of generators under normal maximum head and flow conditions
NOI	Notice of Intent
NPDES	National Pollution Discharge Elimination System
NPN	Neuns-Ponto-Neer association, a soils classification
NPS	National Park Service
NRCS	Natural Resource Conservation Act
NRHP	National Register of Historical Places
NRI	Nationwide Rivers Inventory
NTU	nephelometric turbidity unit
NWI	National Wetlands Inventory
NWIS	United States Geological Survey's National Water Information System
NWS	National Weather Service
NYI	North Yuba Index
NYR	North Yuba River
O	
O&M	Operation and maintenance
OEHHA	California's Office of Environmental Health Hazard Assessment
OEP	Federal Energy Regulatory Commission Office of Energy Projects (Formerly Office of Hydropower Licensing)
OGM	Obie-Goulder-Mounthat association, a soils classification
OHP	State Office of Historic Preservation
OHV	Off Highway Vehicle
Operation and maintenance	The utilization of fixed Project assets for their intended use, as well as any ongoing, repetitive tasks associated with keeping fixed Project assets in acceptable condition, including safety inspections.
ORV	Off-road vehicle ***or*** Outstanding Remarkable Views
OS	Office of the Solicitor
Oz	ounce
P	
P	phosphorus
PA	Programmatic Agreement
PAC	Protected activity center
PAD	Pre-Application Document
PAD Questionnaire	Questionnaire developed and circulated by Yuba County Water Agency to gather existing, relevant and reasonably available information for inclusion in the Yuba River Development Project Pre-Application Document.
PAOT	people at one time
PCT	Pacific Crest Trail
PDF	Portable document format
peaking	Operation of generating facilities to meet maximum instantaneous electrical demands
penstock	An inclined pipe through which water flows from a forebay or tunnel to the powerhouse turbine

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Glossary (continued)

Term	Definition
P (continued)	
penstock capacity	The maximum design flow in the penstock.
penstock connections	The type of connections in the penstock both within the cans themselves and between cans.
penstock diameter	The nominal diameter of the penstock.
penstock length	The length of the penstock (see definition for penstock, above) from the tunnel or upstream inlet to the turbine shut off valve
penstock supports	The type of supports for the penstock.
penstock type	A description of the type of pipe and whether the pipe is surface or buried.
pf	power factor
PFMC	Pacific Fishery Management Council
PG&E	Pacific Gas and Electric Company
PH	Powerhouse
pH	The measure of the acidity or alkalinity of a substance or liquid
Powerhouse operation type	A reference to the manner in which water is scheduled though a powerhouse. At this time there are six operating types: Diversion Powerhouse – A powerhouse that utilizes upstream diversions with minimal storage. Fill and Spill – A powerhouse that peaks with the loadshape but gives priority to the upstream powerhouse and will spill in order for the upstream powerhouse to follow the loadshape as closely as possible. Strictly Peaking - A powerhouse that peaks its discharge. Attempts to schedule water in highest value periods of day. Can instantaneously (in a 15-minute increment) change load. Peaking with Ramp Rates – A powerhouse where the water discharge still closely follows the load shape (powerhouse will Peak); however, the powerhouse is constrained by ramping rates. Pure Run of River – A powerhouse where inflows are equal to outflows on an instantaneous basis. Re-regulating – A powerhouse designed to regulate peaked discharge from upstream powerhouses into smoother discharges. This powerhouse releases constant outflows for the whole day. Re-regulating powerhouses may or may not be constrained by ramping rates.
powerhouse maximum capability	Maximum megawatt output generated by the specific powerhouse. For powerhouses with two or more units, this value is the maximum simultaneous total output generated.
PHABSIM	Physical Habitat Simulation Models
Plan	A common term for a County's general plan.
PLP	Preliminary Licensing Proposal
PM&E	Protection, Mitigation & Enhancement
PM&E measure	A Project facility, operation or management activity undertaken for the purpose of protecting or mitigating impacts that would result from continued Project operation and maintenance, or for the purpose of enhancing resources that would be affected by continued Project operation and maintenance.
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PNF	Plumas National Forest
POAOR	California Public Opinion and Attitudes in Outdoor Recreation Survey
Posted File	A file placed on the Licensee's Relicensing Website.
power development	See "development"
Power Factor	The ratio of actual power to apparent power. Power factor is the cosine of the phase angle difference between the current and voltage of a given phase. Unity power factor exists when the voltage and current are in phase
ppb	parts per billion
PPL	Pit-Pastolla-Lasvar association, a soils classification
ppm	parts per million
Program	CALFED Bay-Delta Program
Project	YCWA's Yuba River Development Project, FERC Project No. 2246. Specifically, the Project facilities and features identified in the existing FERC license.
Project Area	The area within the FERC Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within about 0.25 mile of the FERC Project Boundary) and including Project-affected reaches between facilities and downstream to the next major water controlling feature or structure.
Project Drainage Basins	Combination of the Middle Yuba River, North Yuba River and Yuba River drainage basins.
Project Region	The area surrounding the Project in the order of a county or national forest.
Project Roads	Roads within Project boundary and constructed for Project purposes and necessary for Project operation and maintenance

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Glossary (continued)

Term	Definition
P (continued)	
Project Vicinity	The area surrounding the Project on the order of a United States Geological Survey 1:24,000 topographic quadrangle.
Project Viewshed	The area from which Project features are visible. The land base from which the Project may be seen.
Project Works	All of the infrastructure associated with the operations of the Project
PSEA	Pacific Service Employees Association
psi	pounds per square inch
PSR	Pacific Southwest Region of the Forest Service
PURPA	Public Utilities Regulatory Policies Act
PWC	Personal water craft
PWD	Persons with Disabilities
PX	California Power Exchange
Q	
QA/QC	Quality Assurance/Quality Control
QF	A qualifying facility, a cogenerator or small power producer that sells its excess power to a utility
quad	Quadrangle
Qualifying Plans	A specific list of comprehensive plans submitted to FERC by California agencies.
R	
ramping	The act of increasing or decreasing stream flows from a powerhouse, dam or diversion structure
ramping rates	The rate of water discharge from a powerhouse, dam or diversion structure, prescribed by the License or other regulatory-driven rule.
ramping rate curve	The river flow vs. stage curve relationship at the point where ramping rate compliance is measured.
RCA	Riparian Conservation Areas as defined by Tahoe National Forest
RCO	Riparian Conservation Objectives as defined by Tahoe National Forest
RD	Recreation Day, which equals a visit by a person to a site for recreation purposes during any portion of a 24-hour period
Reach	A stretch of stream defined for the purposes of communication, usually defined between readily identifiable endpoints (such as structures or stream confluence).
REC	Sierra Foothill Research and Extension Center
Regulated hydrology	The hydrology of Project-affected streams subsequent to construction of the Project. The hydrology of any stream that is augmented, constrained, or otherwise manipulated by upstream man-made structures.
Relicensing	The process of acquiring a new license for a Project that has an existing license from the Federal Energy Regulatory Commission.
Relicensing Contact List	List of Interested Parties that have provided to YCWA an e-mail address to which YCWA may forward information regarding the Relicensing. Also referred to as Contact List.
Relicensing Participants	Interested Parties, which includes YCWA, that routinely actively take part (i.e., attend meetings/workshops and make filings) in the Relicensing proceedings
relicensing proceeding	Relicensing of YCWA's Yuba River Development. Sometimes referred to as the Relicensing.
reservoir	The water retained by a dam. Also referred to as headwater, storage, forebay, or headpond.
reservoir drainage area	The area that drains into the reservoir.
reservoir elevation	The water surface elevation of a reservoir at a given point in time
reservoir gross storage	Reservoir storage at maximum normal water surface elevation.
reservoir length	The distance between the two most distant points on the reservoir shore at normal maximum water surface elevation.
reservoir maximum storage capacity	The gross volume of water that can be stored in the reservoir.
reservoir NMWS elevation	Normal Maximum Water Surface - The elevation of the lowest spill crest if uncontrolled, the top of the gates for gates at the top of the dam.
reservoir surface area	The surface area of the reservoir at the normal maximum water surface elevation.
reservoir storage curve	A curve that defines a reservoir's volume in acre-ft at various surface elevations.
reservoir usable capacity	A volume measurement of the amount of water that can be stored for generation, down to a minimum level
reservoir width	The maximum distance between the two most distant points on the reservoir shore at normal maximum water surface elevation taken at a right angle to the line at reservoir length.
residence time	The period of time water remains in a reservoir.
ResSim	United States Army Corps of Engineers - Hydrologic Engineering Center (USACE-HEC) Reservoir Simulation model, Version 3.0. Also known as HEC-ResSim.
Responsible agency	A responsible agency is a public agency with discretionary approval authority over a portion of a project that is subject to the California Environmental Quality Act.

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Glossary (continued)

Term	Definition
R (continued)	
RIMS	Records & Information Management System
riparian	Riparian applies to the vegetation zone and other biological resources adjacent to and hydrologically affected by neighboring riverine (lotic) and reservoir (lentic) water bodies.
RM	River mile as measured along the river course, from downstream to upstream, often beginning at a downstream confluence with another river reach.
RMA	Resource Management Area, a Bureau of Land Management term
RMP	Resource Management Plan, a Bureau of Land Management term
RMT	Yuba Accord's River Management Team
RNA/ACEC	Research Natural Area/Area of Critical Environmental Concern
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
Rosgen classification	The Rosgen classification system is a widely-used method for classifying streams and rivers based on common patterns of channel formation (morphology). The patterns are preferably observed from physical measurements.
ROW	Right-of-way
rpm	revolutions per minute
RST	Rotary Screw Traps
RTD	resistance temperature detector
run-of-the-river	A hydro project that uses the flow of a stream with little or no reservoir capacity for storing water
RV	recreational vehicle
RVD	Recreation Visitor Days
RWD	Ramirez Water District
RWQCB	Regional Water Quality Control Board
S	
salmonids	Any member of the taxonomic family Salmonidae, which includes all species of salmon, trout, char, whitefish, and grayling.
SCE	State candidate endangered. Species is a candidate for listing under the California Endangered Species Act, as endangered.
SCT	State candidate threatened. Species is a candidate for listing under the California Endangered Species Act, as threatened.
SCD	State candidate for delisting. Species is a candidate for delisting under the California Endangered Species Act.
SCADA	Supervisory Control And Data Acquisition system
scenario	A collection of settings that constitutes a HEC Res-Sim operation model run. Output data for a run are referenced by the scenario name.
SCORP	State Comprehensive Outdoor Recreation Plan
SD1	Scoping Document 1: A document issued by the Federal Energy Regulatory Commission summarizing the relicensing process for a Project; generally issued following the first public meeting after the NOI.
SD2	Scoping Document 2: Within 45 days following the deadline for filing of comments on Scoping Document 1, the Federal Energy Regulatory Commission staff shall, if necessary, issue Scoping Document 2 to address comments received regarding Scoping Document 1.
SE	State Endangered. A species or subspecies listed as endangered under the California Endangered Species Act.
Secchi Disc	A method of measuring surface water transparency in a reservoir
Section 106	Refers to section 106 of the National Historic Preservation Act
Section 401 Certification	Water quality certification issued by the State Water Resource Control Board, the California agency responsible for administering Section 401 of the Clean Water Act
Section 7 Consultation	The required formal consultation required under the Endangered Species Act between the Licensee and the United States Fish and Wildlife Service and/or the National Marine Fisheries Service.
SFP	State fully protected
SFPP	South Feather Power Project
SFREC	Sierra Foothill Research and Extension Center
SFWPA	South Feather Water and Power Agency
SHPO	California Department of Parks and Recreation, Office of Historic Preservation, State Historic Preservation Officer
SL	standard length
Smartville	In 2008, the people of this community petitioned to have the name changed to Smartsville, with an ‘s” in the middle of the name. However, the USGS gage refers to the former spelling of the community name. Therefore in this document, the community is referred to as such.

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Glossary (continued)

Term	Definition
S (continued)	
SMS	United States Fish and Wildlife Service, Scenery Management System
SMZ	Streamside Management Zone as defined by Tahoe National Forest
SNEP	Sierra Nevada Ecosystem Project
SNFMISA	Sierra Nevada Forest Management Indicator Species Amendment
SNFPA	Sierra Nevada Forest Plan Amendment
SNTEMP	The United States Fish and Wildlife Service's Stream Network Temperature Model
SNYLF	Sierra Nevada yellow-legged frog
SOHA	spotted owl habitat areas
Special-Status Species	Special status species or subspecies are listed under the California Endangered Species Act, federal Endangered Species Act, resource agency, or resource trustee, as candidates for endangered or threatened status, species of special concern, sensitive species, watch list species, management indicator species, or rare species.
Spill	Water that passes over a spillway or dam without being utilized for power generation.
Spillway	A constructed passage for releasing surplus water from a reservoir or release water, not used for power generation, as otherwise necessary for safe project operation
spillway capacity curve	A curve that defines the magnitude of spill, in cubic feet per second, for the spillway at given reservoir elevations.
SPT	sediment pass-through
sq ft or ft^2	square foot
sq mi or mi^2	square mile
SR	State Rare. A species or subspecies listed as rare under the California Environmental Quality Act.
SRMA	Sierra Resource Management Area
SRMP	Sierra Resource Management Plan
SRWP	Sacramento River Watershed Program
ST	State Threatened. A species or subspecies listed as threatened under the California Environmental Quality Act.
Stage	A water surface elevation based on a local datum
State	State of California
station use	Energy used to operate the generating facility's auxiliary equipment
STATSGO	State Soil Geographic Database
stoplogs	Removable logs installed seasonally in reservoir spillways to temporarily increase storage capacity. Also known as “flashboards”.
Storage-area-elevation curve	A rating curve that defines reservoir storage and water surface area as a function of the water surface elevation
STORET	The United States Environmental Protection Agency's computerized water quality data storage and retrieval system.
Study Area	The geographic area covered by a specific study
Study Plan	The aggregate of all study descriptions
Study Proposal	A single study, as well as the aggregate of all studies performed in support of the relicensing.
Su	Standard units; units of measuring PH
sub-basin	An area drained by a stream and all its tributaries that is contained within a larger basin or watershed
SUP	Special Use Permit issued by the Forest Service
SWDU	Statement of Water Diversion and Use
switching center	The main control center for the development. The switching center is responsible for operation of the development's automatic, semiautomatic and manual powerhouses.
switchyard	A facility where electricity from the electrical generator is transferred to the electric grid
SWP	State Water Project
SWRCB	State Water Resources Control Board
synthesized hydrology	The calculated estimate of flow (not measured).
SYR	South Yuba River
SYRCL	South Yuba River Citizens League
system operational losses	The water power lost during regular operation of the reservoir and hydropower system.
SYWD	South Yuba Water District
T	
tailrace	Channel through which water is discharged from the powerhouse turbines
tailwater curve	A curve that defines the tailwater elevation at the range of powerhouse flows.
tailwater elevation	The elevation where all energy from the water passing the turbine had been extracted. (Can be the turbine centerline or the river surface elevation at the point of powerhouse discharge)

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Glossary (continued)

Term	Definition
T (continued)	
taxa	Plural form of taxon.
taxon	A term used in animal and plant classification. One or more organisms that are classified as being members of the same group, related to each other.
TCP	Traditional Cultural Property
TDS	total dissolved solids
T&E	Threatened and Endangered species as listed by either the Federal Endangered Species Act or the California Endangered Species Act.
thalweg	The lowest elevation within the cross-section of a natural or artificial water conveyance channel
THP	Timber Harvest Plan
TLP	Traditional Licensing Procedure as defined by Federal Energy Regulatory Commission regulations
TMDL	total maximum daily load
TN	total nitrogen
TNC	The Nature Conservancy
TNF	Tahoe National Forest
TOC	total organic carbon
transformer	An electrical device which modifies the voltage and current relationship of a power source.
trash rack	A mechanism, found on a dam or intake structure, which clears the water of debris before the water passes through the structure
TRP	Traditional Relicensing Procedure as defined by Federal Energy Regulatory Commission regulations
TSS	total suspended solids
tunnel	An underground or underwater passageway
tunnel capacity	The maximum design flow in the tunnel.
tunnel diameter	The nominal design size of the tunnel.
tunnel length	The length of the tunnel from the upstream portal to the downstream portal.
tunnel lining	The type of lining in the tunnel, if any.
tunnel type	Either pressure or free flow.
turbine	A machine that converts the energy of moving water into the mechanical energy of rotation. This energy is then used to turn an electrical generator or other device.
TWD	tailwater depression unit
U	
UC Davis	University of California, Davis
unimpaired hydrology	Synthesized hydrology of Project-affected streams with no developments. An estimate.
Unit	A term referring to the combined turbine-generator machine.
US	United States
USACE	United States Department of Defense, Army Corps of Engineers
USBIA	United States Department of Interior, Bureau of Indian Affairs
USBLM	United States Department of Interior, Bureau of Land Management
USBR	United States Department of Interior, Bureau of Reclamation
USC	United States Code
USDA	United States Department of Agriculture
USDOC	United States Department of Commerce
USDOD	United States Department of Defense
USDOI	United States Department of Interior
USFWS	United States Department of Interior, Fish and Wildlife Service
USGS	United States Department of Interior, Geological Survey
UTM	Universal Transverse Mercator – The map projection upon which the UTM Coordinate System is based.
UYRSP	The Upper Yuba River Studies Program
V	
V	volts
VELB	valley elderberry longhorn beetle
VFW	Veterans of Foreign Wars
VMS	A Forest Service Visual Management System
VQO	Visual Quality Objectives, a Forest Service visual classification system
VRM	Visual Resource Management
W	
W	watt

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Glossary (continued)

Term	Definition
W (continued)	
Watch List	A list prepared by an individual National Forest Land Resource Management Plan of plants and animal species that are locally rare (as opposed to declining throughout their range) and are of public concern, occur as disjunct populations, are newly described taxa, or lacking sufficient information on population size, treats, trends or distribution. These species are not on the federal special status species list.
Water quality certification	Issued by the State Water Resources Control Board in California, but required by the federal Clean Water Act, Section 401 water quality certification is required for any permit or license issued by a federal agency for any activity that may result in a discharge into waters of the state to ensure that the proposed project will not violate state water quality standards.
water withdrawals	Water that is withdrawn from the reservoir, not available for energy generation, which is lost from the system. Withdrawals can be either positive or negative.
WBWG	Bat species designated by the Western Bat Working Group as High Priority because they are imperiled or at high risk of imperilment
Whitewater Classification System	**Class I:** (Easy) Moving water with small disturbances on the surface and a few small waves. There is little to no danger to swimmers. **Class II:** (Novice/Beginner) Faster moving water with easily avoided rocks, holes, and waves. Danger to swimmers is still slight but care must be taken. **Class III:** (Intermediate) Fast moving water containing various rocks, holes, currents, and waves that require skillful maneuvering to avoid. Swimmers could be at risk and may require help. **Class IV:** (Advanced) Strong rapids, large waves, big holes, unpredictable currents, and dangerous obstructions requiring multiple maneuvers to get through or around. Swimmers are at risk and will require help to be rescued. **Class V:** (Expert) All of the characteristics of Class IV with the added danger of being longer and containing more continuous features that may not be avoided. There is serious risk to swimmers and others may be of no help. **Class VI:** (Unrunnable) Only a team of experts who carefully plan every aspect of this expedition would have hope of surviving these rivers and rapids.
WPT	western pond turtle
WSEL	water surface elevation
WSRA	Wild and Scenic Rivers Act
WUA	Weighted Usable Area
WWD	Wheatland Water District
WY	water year
X	
Y	
y^3	Cubic yard
ya	years ago
YCWA	Yuba County Water Agency
yd	yard
YOY	young-of-the-year
Yuba Accord	Adopted in 2008, the Yuba Accord consists of three agreements between Yuba County Water Agency and others to 1) increase Yuba County Water Agency's contribution to flows in the Lower Yuba River for fishery enhancement; 2) formalize conjunctive use practices in the Yuba County Water Agency's service area to help increase the volume of water available to increase the flows; 3) authorizes Yuba County Water Agency to sell the water, once it's downstream, to the CALFED Environmental Water Account and others; and 4) amends the YCWA and PG&E's power purchase contract.
Z	

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SECTION 1

INTRODUCTION

1.1 Yuba County Water Agency

Under separate cover, Yuba County Water Agency (YCWA or Licensee) this day filed with the Federal Energy Regulatory Commission (FERC) a Notice of Intent (NOI) to seek a new license for the existing Yuba River Development Project, FERC Project No. 2246 (Project).[1] YCWA, located in Marysville, California, is a public agency formed in 1959 pursuant to the Yuba County Water Agency Act (West's California Water Code App. §§ 84-1 – 84-28). Section 4.1 of the Yuba County Water Agency Act (West's California Water Code App. § 84-4.1) authorizes YCWA to develop hydroelectric power in connection with YCWA's projects.[2]

Under the provisions of the Federal Power Act (FPA),[3] on May 16, 1963, the Federal Power Commission (FPC), FERC's predecessor agency, issued to YCWA an initial license for the Project. The FPC issued an order on May 6, 1966, amending the initial license and making the license effective from May 1, 1966, through April 30, 2016.

YCWA has prepared this Pre-Application Document (PAD) to assist federal and State of California agencies, Indian tribes, local governments, non-governmental organizations, businesses, members of the public, and others interested in the Relicensing, which are collectively referred to as "Relicensing Participants," to prepare for the relicensing.

1.2 Yuba River Development Project

The Project, which was constructed in the mid 1960s and put into service in 1970, replaced three older facilities: 1) the Colgate Diversion Dam, Flume and Powerhouse, which originally were constructed in 1899 by the Yuba Electric Power Company, 2) the Bullards Bar Dam and Reservoir, which were constructed in 1923-1924 by a group of private investors led by Harry Payne Whitney and purchased by Pacific Gas and Electric Company (PG&E) a few years later; and 3) the Bullards Bar Powerhouse, which was constructed by PG&E in 1949.

The existing Project is located in Yuba, Sierra, and Nevada counties, California, on the main stems of the Yuba River, the North Yuba River, and the Middle Yuba River, and on Oregon Creek, a tributary to the Middle Yuba River. A portion of the existing FERC Project Boundary[4] is located on public land managed by the United States Department of Agriculture (USDA)

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[1] Activities related to the preparation of an application for a new license are referred to collectively as the "Relicensing."

[2] For additional information regarding YCWA, refer to Section 2.1 of this Pre-Application Document and to YCWA's website at www.ycwa.com.

[3] The Federal Power Act (FPA) of 1920 provided the Federal Power Commission (FPC), FERC's predecessor agency, and now provides FERC with exclusive authority to license all non-federal hydroelectric projects that are located on navigable waterways or federal lands. The Yuba River Development Project (Project) is located in part on federal lands and a navigable waterway, and is therefore subject to FERC licensing.

[4] The existing FERC Project Boundary is the area that Licensee uses for normal Project operations and maintenance, and is shown in Exhibits G, J, and K of the existing license.

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Forest Service (Forest Service) as part of the Plumas and Tahoe national forests (PNF and TNF, respectively).

The Project consists of three developments, New Colgate, New Bullards Minimum Flow, and Narrows 2, which range in elevation from 280 feet to 2,049 feet.[5] In total, the Project includes:

- 1 dam and associated storage reservoir - New Bullards Bar
- 2 diversion dams - Our House and Log Cabin
- 2 diversion tunnels - Lohman Ridge and Camptonville
- 2 underground power tunnels - New Colgate and Narrows 2
- 1 above ground penstock - New Colgate
- 3 powerhouses - New Colgate, New Bullards Minimum Flow, and Narrows 2
- 7 recreation areas - Emerald Cove Marina, Hornswoggle Group Camp, Schoolhouse Family Camp, Dark Day Campground, Dark Day Boat Ramp, Garden Point Campground, and Madrone Cove Campground

The Project does not include any aboveground water conduits (e.g., canals or flumes) or any transmission lines.

Licensee typically operates New Bullards Bar Reservoir by capturing winter and spring runoff from rain and snowmelt. Consequently, New Bullards Bar Reservoir normally reaches its peak storage at the end of the spring runoff season, and then is gradually drawn down until its lowest elevation is reached in mid-winter. The reservoir does not undergo substantial daily changes in elevation. New Bullards Bar Reservoir has mandatory flood pool criteria from October through April that can affect storage.[6] Our House and Log Cabin diversion dam impoundments do not store water and Licensee operates them to divert water to New Bullards Bar Reservoir in spring during high flow periods. Licensee operates New Colgate Powerhouse for peaking/ancillary services and the New Bullards Minimum Flow and Narrows 2 powerhouses as base load facilities.

Project benefits include water supply, flood control, recreation, fish and wildlife habitat, and power generation.

Detailed information regarding Project facilities, features, and operation is included in Section 6.0 of this PAD. Refer to Section 3.0 for a description of the river basins in which the Project is located.

1.2.1 Lower Yuba River Accord

A uniquely important set of agreements regarding the Project is the Lower Yuba River Accord (Yuba Accord). In 2005, YCWA and 16 other interested parties signed memoranda of

5 All elevation data are in United States Department of Commerce (USDOC), National Oceanic and Atmospheric Association (NOAA), National Geodetic Survey (NGS) Vertical Datum of 1983 (NAVD 83).

6 The USACE contributed $12 million to the construction of New Bullards Bar Dam in exchange for flood control space the reservoir would provide.

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understanding that specified the terms of the Yuba Accord. The Yuba Accord is a comprehensive, consensus-based program to protect and enhance aquatic habitat in the Yuba River downstream of the United States Army Corps of Engineers' (USACE) Englebright Dam. Following environmental review, YCWA executed four agreements in 2007, which together comprise the Yuba Accord. The four agreements are: 1) the Lower Yuba River Fisheries Agreement, which specifies the Yuba Accord's Lower Yuba River minimum streamflows and creates a detailed fisheries monitoring and evaluation program; 2) the Water Purchase Agreement, under which the California Department of Water Resources (CDWR) purchases water, some of which is provided by the Yuba Accord's minimum streamflows, from YCWA for CALFED's Environmental Water Account (the first long-term acquisition of water that protects Bay/Delta fish and wildlife), and for State Water Project and Central Valley Project contractors; 3) the Conjunctive Use Agreements with seven of YCWA's member units, which specify the terms of the Yuba Accord's groundwater conjunctive-use program; and 4) amendments to the 1966 Power Purchase Contract between YCWA and PG&E.

The Yuba Accord was developed by a multi-agency resource team, including representatives from the National Marine Fisheries Service, the US Fish and Wildlife Service, the California Department of Fish and Game, and a group of non-governmental organizations. The Yuba Accord flow schedules were developed to essentially optimize habitat conditions during high flow years for this highly regulated river system. Subsequently additional flow schedules were developed by the resources team for drier conditions which included a "balancing of resources" approach. The Accord flow schedules were ultimately approved by the State Water Resources Control Board.

Together, this package of agreements commits more water to minimum instream flows and provides greater reliability for both instream and consumptive uses than would be possible without the agreements. Licensee has been operating the Project in conformance with the Yuba Accord since 2006.[7] On May 20, 2008, the State Water Resources Control Board (SWRCB) adopted its Corrected Order WR 2008-0014, which approved the long-term amendments to YCWA's water-right permits that were necessary so that YCWA may continue to implement the Yuba Accord. For additional information regarding the Yuba Accord, refer to http://www.ycwa.com.

1.3 Relicensing Process

To prepare an application for a new license, Licensee intends to follow FERC's Integrated Licensing Process (ILP) as established in regulations in Title 18 of the United States Code of Federal Regulations (18 CFR), Part 5. These regulations require Licensee to file with FERC an NOI and a PAD sometime between November 2010 and April 2011, and an application for a new license by April 2014.

This PAD is a requirement of FERC's ILP regulation and constitutes one of the initial activities in the Relicensing. Licensee is filing this PAD with FERC simultaneously with the NOI and will

[7] The 2006, 2007, and early 2008 operations were under one-year pilot programs that were approved by the State Water Resources Control Board.

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make the PAD available to Relicensing Participants. The PAD provides FERC and Relicensing Participants with summaries of existing, relevant, and reasonably available information related to the Project that is in Licensee's possession at the time the PAD is filed. The information required in the PAD is specified in 18 CFR § 5.6(c) and (d).

Licensee exercised due diligence in acquiring information included in the PAD. Licensee contacted appropriate governmental agencies, Native American tribes, and others potentially having relevant information; conducted extensive searches of publicly available databases and its own records; and broadly distributed a comprehensive questionnaire designed specifically to identify existing, relevant, and reasonably available information related to the Project.

Licensee has established a publicly accessible website (www.ycwa-relicensing.com) to make Relicensing information readily available to Relicensing Participants.

1.4 Licensee's Early Consultation and Preliminary Information Package

Since July 2009, Licensee has conducted over 30 meetings with Relicensing Participants to familiarize them with Project facilities, features, and operations; to review Licensee's relicensing plans and the ILP; to seek out sources of existing, relevant, and reasonably available information; to identify potential relicensing issues; and to begin early development of study plans. The meetings included a tour of the Project on October 1, 2009. Participants in these meetings have included representatives of:

- Federal Energy Regulatory Commission
- USDA, Forest Service
- United States Department of Interior, Bureau of Land Management
- United States Department of Interior, Fish and Wildlife Service
- United States Department of Commerce, National Marine Fisheries Service
- State Water Resources Control Board
- California Department of Fish and Game
- Yuba County Fish and Game
- Yuba County Resource Center
- Camptonville Community Services District
- American Whitewater
- Sierra Club
- Friends of the River
- California Sportfishing Protection Alliance
- Foothills Water Network
- South Yuba River Citizens League
- Sierra Salmon Alliance
- Gold Country Fly Fishers
- Federation of Fly Fishers

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- Social Alliance Network
- Save Sierra Salmon

To facilitate these meetings, Licensee issued a Preliminary Information Package in May 2009. The package included much of the information included in the PAD.

A major focus of Licensee's early consultation meetings was the identification of data gaps and the collaborative development of study proposals, which are discussed in more detail in Section 10.0 of the PAD.

1.5 Contents of Pre-Application Document

This PAD includes the following sections:

- Table of Contents – A listing of each section, subsection, table, figure, map, photo, and appendix included in the PAD.
- Glossary – A list of terms, acronyms, and abbreviations commonly used in the PAD and a definition of each.
- Section 1 – This introduction to the PAD.
- Section 2 – A process plan and schedule for all relicensing activities through filing of the License Application, per 18 CFR § 5.6(d)(1). This section also includes a description of YCWA and its relicensing goals and interests, Licensee's Relicensing Communication Guidelines, and an ILP Flow Chart.
- Section 3 – General description of the river basins and sub-basins potentially affected by continued operation of the Project, per 18 CFR § 5.6(d)(3)(xiii).
- Section 4 – A discussion of major laws that apply to the Project and this relicensing process.
- Section 5 – A list of comprehensive plans filed with FERC (Qualifying Plans) and other plans that apply to the Project and this relicensing process, per 18 CFR § 5.18(d)(4)(iii).
- Section 6 – A description of the existing Project facilities and operations, and Licensee's proposed new facilities and changes in Project operations, per 18 CFR § 5.6(d)(2).
- Section 7 – A description of the existing environment by resource area, per 18 CFR § 5.6(d)(3)(i)(A), (B), and (d)(3)(ii)-(xiii), based on information acquired and reviewed by Licensee to date.
- Section 8 – A description of preliminary issues associated with the Project, including continuing impacts. This section includes a discussion of Project activities and known or potential environmental and recreation effects associated with each issue, per 18 CFR § 5.6(d)(3)(i)(C) and (4)(i).
- Section 9 – A description of Project facilities and operations and management activities Licensee currently undertakes or proposes to undertake as a condition of the new license for the purpose of protecting or mitigating impacts that would result from continued operation

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and maintenance (O&M) of the Project, or for the purpose of enhancing resources that would be affected by continued Project O&M. These facilities, operations, and management activities are referred to as resource management measures. [18 CFR § 5.6(d)(3)(i)(D)].

- <u>Section 10</u> – A preliminary description of studies by resource area, which Licensee proposes to undertake as part of the Relicensing process, per 18 CFR § 5.6(d)(4)(ii). Relicensing Participants should consider these study proposals as "straw man" proposals by Licensee to facilitate development of detailed study proposals that Licensee will include in its Proposed and Revised Study Plans.
- <u>Section 11</u> – A list of sources of information cited in the PAD.
- <u>Appendix A</u> – A summary of contacts made by Licensee in preparing the PAD.
- <u>Appendix B</u> – A listing and brief description of existing, relevant, and reasonably available information by resource area found by Licensee during preparation of the PAD.
- <u>Appendix C</u> – The name of each person authorized to act as agent for Licensee in the relicensing process.
- <u>Appendix D</u> – A series of hardcopy maps at a scale of 1:24,000 that show the Project Area and surrounding non-Project facilities and features. For the purposes of the PAD, the Project Area is defined as the area within the existing FERC Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within about 0.25-mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature or structure.
- <u>Appendix E</u> – Licensee's low-altitude helicopter videos of Project-affected river reaches and Project facilities and features on digital video disk (DVD).
- <u>Appendix F</u> – Regulated and unimpaired hydrology, including reservoir elevations.

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SECTION 2

PROCESS PLAN, SCHEDULE, AND COMMUNICATION GUIDELINES

2.1 Yuba County Water Agency and Its Relicensing Goal and Principal Interests

2.1.1 Description of Yuba County Water Agency

Established in 1959 by the Yuba County Water Agency Act (West's California Water Code App., §§ 84-1 – 84-28) and headquartered in Marysville, California, the Yuba County Water Agency (YCWA or Licensee) is a public agency governed by a seven-member Board of Directors consisting of the five members of the Yuba County Board of Supervisors and two members elected from districts that together encompass Yuba County. YCWA was created "*for the purpose of accomplishing a function of statewide importance.*" (YCWA Act, § 1, West's California Water Code App., § 84-1). YCWA has the power to: 1) "*control the flood and storm waters of the agency and the flood and storm waters of streams that have their sources outside of the agency, which streams and flood waters flow into the agency, and to conserve such waters for the beneficial and useful purposes of said agency*;" 2) "*do any and every lawful act necessary in order that sufficient water may be available for any present and future beneficial use*;" and 3) "*develop hydroelectric power to the extent that such power can be developed in connection with the construction and operation of its projects*." (YCWA Act, §§ 4, 4.1 & 4.2; West's California Water Code App., §§ 84-4, 84-4.1 & 84-4.2.)

Today, YCWA owns and operates New Bullards Bar Dam and Reservoir, which provide critical flood control to Marysville and other downstream communities and, through their associated powerhouses, provide clean, renewable energy to the California energy grid. YCWA delivers approximately 300,000 acre-feet (ac-ft) of water to local irrigation districts in Yuba County annually, is a leader in statewide water transfers and lower Yuba River fisheries restoration, and is involved in many constructive efforts with local, State, and federal agencies, and conservation groups.

YCWA firmly believes that continued ownership and operation of the Yuba River Development Project (Project) is integral to YCWA's, Yuba County's, and the region's future.

2.1.2 Licensee's Relicensing Goal

Licensee enters the Relicensing with the following expressed goal: *Obtain a new license for the Project with minimal adverse impact to Project economics while helping to foster YCWA's relationship with the community, resource agencies, and other interested parties. YCWA desires to obtain a new license of maximum term for the Project at minimum cost, both initially and ongoing, that protects and enhances the Project's water supply and flood control benefits, while*

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maximizing economic benefits from the production of electrical power and meeting environmental, recreational, and other non-power requirements and needs.

2.1.3 Licensee's Principal Relicensing Interests

To meet its relicensing goal, Licensee will seek to obtain a new Project license that embodies the following:

- Maximizes public and employee safety and minimizes liability risks.
- Complies with all laws, regulations, license and permit conditions, and agreements pertaining to the Project.
- Complies with Licensee's mission and is consistent with Licensee's policies and procedures.
- Maintains reasonable operation and maintenance flexibility and access to Project facilities.
- Uses, to the extent appropriate, the positive relationships and results of the Lower Yuba River Accord (Yuba Accord) and other related proceedings.
- Addresses ongoing environmental effects of facilities, features, and operations within the jurisdiction of the Federal Energy Regulatory Commission (FERC) and those federal and State of California agencies with mandatory conditioning authority under the Federal Power Act (FPA). Licensee's interest is to not confuse the Relicensing by addressing Licensee's facilities, features, and operations that are non-Project related and, therefore, outside FERC's jurisdiction under relicensing.
- Preserves and enhances the value of the Project as both a reliable source of water and power, and maintains a robust, economically competitive Project.
- Includes a new license term length of 40 to 50 years.
- Includes conditions that are based on the best available sound science, that protect the environment, and that achieve a reasonable balance between power and non-power utilization of Project-affected resources.
- Includes a reasonable schedule for implementation of license conditions involving capital improvements.
- Avoids open-ended license conditions. Uses adaptive management only where data are insufficient to support fixed license conditions.
- Provides for appropriate public recreation opportunities within the FERC Project Boundary[1] consistent both with the resource carrying capacity and demand as specified in the FPA and with the primary power generation, flood control, and water supply purposes of the Project.
- Achieves reasonable resource management objectives at the lowest feasible cost.
- Preserves flexibility in meeting minimum stream flow requirements.

[1] The FERC Project Boundary is the area that Licensee uses for normal Project operations and maintenance, and is shown in Exhibits G, J, and K of the current license.

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- Maintains operational flexibility, including options to operate in base load or peaking mode.
- Is consistent with other resource and land-planning efforts, but focuses on Project impacts to Project-affected resources.

2.2 Process Plan and Schedule

2.2.1 Regulatory Relicensing Deadlines

FERC's Integrated License Process (ILP) regulations in 18 CFR Part 5 establish a schedule of activities and milestone dates to which Licensee, FERC, and Relicensing Participants must adhere. Many milestone dates are contingent upon a previous activity (e.g., a party may file comments within 30 days of a FERC ruling). However, some dates are fixed by the current license expiration date and do not depend on when a previous Relicensing activity is completed. These fixed milestones for the relicensing process are:

- November 1, 2010 (Monday) – The earliest date Licensee may file a Notice of Intent (NOI) to file an application for a new license and a Pre-Application Document (PAD) is 5.5 years prior to the date that the initial license expires (18 CFR § 5.6).
- May 2, 2011 (Monday) – The latest date Licensee may file an NOI and PAD is 5 years prior to the date that the initial FERC license expires. Five years prior to the expiration of the license is April 30, 2011, a Saturday. FERC's policies provide that when a filing date falls on a weekend or federal holiday, the filing date automatically becomes the next regular business day. However, if the date by which FERC must take an action falls on a weekend or holiday, the deadline moves to the previous business day. May 2, 2011, is the first regular business day after April 30, 2011, and is, therefore, the latest date that Licensee may file its NOI and PAD.
- December 2, 2013 (Monday) – The latest date Licensee may file with FERC a Preliminary License Proposal (PLP) or a Draft License Application (DLA) is 150 days before Licensee must file an application for a new license, which is April 30, 2014 (18 CFR § 5.16). One hundred and fifty days before April 30, 2014, is Saturday, November 30, 2013. As stated above, FERC's policies provide that when a filing date falls on a weekend or federal holiday, the filing data automatically becomes the next regular business day. December 2, 2013 is the first regular business day after November 30, 2013, and is, therefore, the latest date that Licensee may file a PLP or DLA.
- April 30, 2014 (Wednesday) – The latest date that Licensee may file an application for a new license with FERC is 2 years before the initial FERC license expires (18 CFR § 5.17).
- April 30, 2016 (Saturday) – The date the initial FERC license for the Project expires.

Table 2.2-1 shows major ILP regulatory processes and associated deadlines. YCWA developed this table using the timeframes set forth in 18 CFR, Part 5, and based the table on anticipated NOI and PAD filing dates of November 1, 2010, the earliest possible filing date. The first column in Table 2.2-1 shows the pertinent ILP regulation for the activity in the row. The second

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column shows the party responsible for initiating the activity. The third column describes the activity including, where appropriate, a previous activity linked to this activity. The last column shows the calendar duration of the activity. Where an activity is contingent on a previous activity, the schedule shown assumes the previous activity is completed on the latest date shown for that previous activity.

Table 2.2-1. Project relicensing regulatory deadlines based on filing the NOI and PAD on November 1, 2010.

18 CFR §	Lead	Activity	Timeframe (Start and Finish)[1,2]	
§ 5.5. NOTIFICATION OF INTENT				
(a)-(g)	Licensee	File Notice of Intent (NOI) to file an application for a new license and request for non-federal representative status under § 7 of the Endangered Species Act (ESA) and § 106 of the National Historic Preservation Act (NHPA), if Licensee intends to request such status *(no earlier than 5.5 years and no later than 5 years prior to expiration of the current license)*	11/1/10 (Monday)	
§ 5.6. PRE-APPLICATION DOCUMENT				
(a)-(e)	Licensee	File Pre-Application Document (PAD) *(no earlier than 5.5 years and no later than 5 years prior to expiration of the current license)*	11/1/10 (Monday)	
§ 5.7. TRIBAL CONSULTATION				
-----	FERC	Hold meeting with potentially affected Native American tribes *(no later than (NLT) 30 days of date NOI and PAD filed)*	11/2/10 (Tuesday)	12/1/10 (Wednesday)
§ 5.8. NOTICE OF COMMENCEMENT OF PROCEEDING AND SCOPING DOCUMENT, OR OF APPROVAL TO USE TRADITIONAL LICENSING PROCESS OR ALTERNATIVE PROCEDURES				
(a)	FERC	Issue Notice of Commencement of Proceeding (NCP) *(NLT 60 days of date NOI and PAD filed)*	11/2/10 (Tuesday)	12/31/10 (Friday)
(b)(2)	FERC	Request initiation of informal consultation under § 7 of the ESA and/or § 106 of the NHPA, if appropriate *(NLT 60 days of date NOI and PAD filed)*	11/2/10 (Tuesday)	12/31/10 (Friday)
(c)	FERC	Issue Scoping Document 1 (SD1) *(NLT 60 days of date NOI and PAD filed)*	11/2/10 (Tuesday)	12/31/10 (Friday)
(b)(3)(viii)	FERC	Hold NEPA scoping meeting and conduct site visit *(NLT 30 days of date NCP issued)*	1/1/11 (Saturday)	1/28/11 (Friday)[3]
§ 5.9. COMMENTS AND INFORMATION OR STUDY REQUESTS				
(a)	Licensee & Relicensing Participants	File comments on PAD and SD1, and request studies *(NLT 60 days of date NCP issued)*	12/31/10 (Friday)	3/1/11 (Tuesday)
§ 5.10. SCOPING DOCUMENT 2				
---	FERC	Issue Scoping Document 2 (SD2) *(NLT 45 days of the end of SD1 comment period)*	3/2/11 (Wednesday)	4/15/11 (Friday)
§ 5.11. APPLICANT'S PROPOSED STUDY PLAN AND STUDY PLAN MEETINGS				
(a)	Licensee	File Proposed Study Plan *(NLT 45 days of the end of SD1 comment period)*	3/2/11 (Wednesday)	4/15/11 (Friday)
(e)	Licensee	Hold initial study plan meeting *(NLT 30 days after date Proposed Study Plan filed)*	4/16/11 (Saturday)	5/16/11 (Monday)[4]
§ 5.12. COMMENTS ON PROPOSED STUDY PLAN				
	Relicensing Participants	File comments on Proposed Study Plan *(NLT 90 days after date Proposed Study Plan is filed)*	4/16/11 (Saturday)	7/14/11 (Thursday)
§ 5.13. REVISED STUDY PLAN AND STUDY PLAN DETERMINATION				
(a)	Licensee	File Revised Study Plan *(NLT 30 days of date Proposed Study Plan comment period ends)*	7/15/11 (Friday)	8/15/11 (Monday)[5]
(b)	Relicensing Participants	File comments on Revised Study Plan *(NLT 15 days of the date Revised Study Plan is filed)*	8/16/11 (Tuesday)	8/30/11 (Tuesday)
(c)	FERC	Issue Study Plan Determination *(NLT 30 days of date Revised Study Plan is filed)*	8/16/11 (Tuesday)	9/14/11 (Wednesday)
(d)	FERC	Study plan approved *(20th day after FERC Determination if no study plan disputes filed)*	10/4/11 (Tuesday)	

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Table 2.2-1. (continued)

18 CFR §	Lead	Activity	Timeframe (Start and Finish)[1,2]	
§ 5.14. FORMAL STUDY DISPUTE RESOLUTION PROCESS				
(a)	Mandatory Condition Agencies and Tribes	File Notice of Dispute (NOD) *(NLT 20 days of date FERC Determination issued)*	9/15/11 (Thursday)	10/4/11 (Tuesday)
(d)	FERC	Convene Dispute Resolution Panel (*NLT 20 days of date NOD filed)*	10/5/11 (Wednesday)	10/24/11 (Monday)
(i)	Licensee & Relicensing Participants	File comments on NOD *(NLT 25 days of date NOD filed)*	10/5/11 (Wednesday)	10/31/11 (Monday)[6]
(k)	Dispute Resolution Panel (DRP)	Deliver to FERC finding on NOD *(NLT 50 days of date NOD filed)*	10/5/11 (Wednesday)	11/23/11 (Wednesday)
(l)	FERC	Director of Office of Energy Projects issues written determination regarding NOD *(NLT 70 days of date NOD filed)*	10/5/11 (Wednesday)	12/13/11 (Tuesday)
§ 5.15. CONDUCT STUDIES				
(a)	Licensee	Implement FERC-approved study plan	9/15/11 (Thursday)[7]	9/16/12 (Sunday)
(b)	Licensee	File periodic progress reports	FERC Determine Frequency	
(c)(1)	Licensee	File Initial Study Report *(NLT 1 year after FERC's approval of Revised study plan)*	9/15/11 (Thursday)	9/17/12 (Monday)
(c)(2)	Licensee	Hold Initial Study Report meeting *(NLT 15 days of date Initial Study Report filed)*	9/18/12 (Tuesday)	10/2/12 (Tuesday)
(c)(3)	Licensee	File Initial Study Report meeting summary including proposed plan modifications and new studies *(NLT 15 days after Initial Study Report meeting)*	10/3/12 (Wednesday)	10/17/12 (Wednesday)
(c)(7)	FERC	Approval of meeting summary and study plan modifications if no disagreements filed *(30th day after meeting summary filed)*	11/16/12 (Friday)	
(c)(4)	Relicensing Participants	File disagreements with meeting summary including Licensee's proposed study plan modifications and new studies *(NLT 30 days after Initial Study Report meeting summary filed)*	11/17/12 (Saturday)	12/17/12 (Monday)[8]
(c)(5)	Licensee & Relicensing Participants	File response to disagreements *(NLT 30 days after Dispute period ends)*	12/18/12 (Tuesday)	1/16/13 (Wednesday)
(c)(6)	FERC	Resolve disagreement and amend study plan *(NLT 30 days after responses to disagreements period ends)*	1/17/13 (Thursday)	2/15/13 (Friday)
(f)	Licensee	File Updated Study Report *(NLT 2 years after FERC's approval of Revised Study Plan)*	9/15/11 (Thursday)	9/16/13 (Monday)
(c)(2)	Licensee	Hold study plan meeting *(NLT 15 days of date Updated Study Report filed)*	9/17/13 (Tuesday)	10/1/13 (Tuesday)
(c)(3)	Licensee	File study plan meeting summary including Licensee's proposed study plan modifications and new studies *(NLT 15 days after Updated Study Report meeting)*	10/2/13 (Wednesday)	10/16/13 (Wednesday)
(c)(7)	FERC	Approve meeting summary and study plan modifications if no disagreements filed *(30 days after meeting summary filed)*	11/15/13 (Friday)	
(c)(4)	Relicensing Participants	File disagreements with meeting summary and proposed study modifications and new studies *(NLT 30 days after Updated Study Report meeting summary filed)*	11/16/13 (Saturday)	12/16/13 (Monday)[9]
(c)(5)	Licensee & Relicensing Participants	File response to disagreements *(NLT 30 days after disagreement period ends)*	12/17/13 (Tuesday)	1/16/14 (Thursday)
§ 5.15. CONDUCT STUDIES (continued)				
(c)(6)	FERC	Resolve disagreement and amend study plan *(NLT 30 days after response to disagreements period ends)*	1/17/14 (Friday)	2/14/14 (Friday)
§ 5.16. PRELIMINARY LICENSING PROPOSAL				
(a)–(d)	Licensee	File Preliminary Licensing Proposal (PLP) or Draft License Application (DLA) *(No less than 150 days prior to deadline for filing license application)*[10]	12/2/13 (Monday)[11]	
(e)	Relicensing Participants	File comments on PLP or DLA *(NLT 90 days of date PLP or DLA filed)*	12/3/13 (Tuesday)	3/3/2014 (Monday)

Table 2.2-1. (continued)

18 CFR §	Lead	Activity	Timeframe (Start and Finish)[1,2]
§ 5.17. FILING OF APPLICATION			
(a)	Licensee	File application for new license *(NLT 2 years prior to expiration of the current license)*	4/30/2014 (Wednesday)

1 This schedule is based on Licensee filing its NOI and PAD on November 1, 2010, 5.5 years prior to the date that the initial license expires — the earliest date that Licensee can file its NOI and PAD.
2 When an activity is contingent on completion of a previous activity, the schedule assumes the previous activity is completed the latest date shown for that previous activity.
3 Thirty days from the date that the NCP is issued is January 30, 2011, a Sunday. Therefore, the date by which FERC must hold the scoping meeting and conduct the site visit is January 28, 2011, a Friday.
4 Thirty days from the date that the Proposed Study Plan is filed is May 15, 2011, a Sunday. Therefore, the date by which Licensee must hold its initial study plan meeting is the next business day, May 16, 2011, a Monday.
5 Thirty days from the deadline for filing comments on the Proposed Study Plan is August 13, 2011. Therefore, the date by which Licensee must file its Revised Study Plan is the next business day, August 15, 2011, a Monday.
6 Twenty-six days from the deadline for Notice of Disputes is October 29, 2011, a Saturday. Therefore, the date by which Relicensing Participants must file comments on the disputes is the next business day, October 31, 2011, a Monday.
7 The schedule assumes that no study proposals go to dispute resolution, and therefore that studies begin upon FERC's Determination.
8 Thirty days from the deadline for filing disputes concerning the Initial Study Report meeting summary is December 16, 2012, a Sunday. Therefore, the date by which responses to disagreements must be filed is the next business day, December 17, 2012, a Monday.
9 Thirty days from the deadline for filing disputes concerning the Updated Study Report meeting summary is December 15, 2013, a Sunday. Therefore, the date by which responses to disagreements must be filed is the next business day, December 16, 2013, a Monday.
10 Licensee may choose to file a PLP (or DLA) sooner than 150 days prior to the date the application must be filed depending on the status of the proceeding. To develop the PLP or DLA, Licensee may choose at any time in the relicensing process to hold meetings to reach agreement on as many protection, mitigation and enhancement (PM&E) measures as possible with as many Relicensing Participants as possible.
11 One hundred and fifty days before April 30, 2014, is Saturday, November 30, 2013. Therefore, the latest Licensee may file the PLP or DLA is the next business day, December 3, 2013, a Monday.

Table 2.2-1 shows that FERC's site visit and National Environmental Policy Act (NEPA) scoping would occur in January 2011 and that the primary activity in 2011 would be study proposal development. The studies would continue in 2012 as well as in 2013, if needed. Refer to Figure 2.4.1 for a list of post-filing activities.

Licensee anticipates that FERC will issue its own schedules after Licensee files its NOI and PAD for the periods both before and after Licensee files its application for new license.

Because there is some flexibility (i.e., if Licensee files a document early, it could affect the comment period) in the schedule shown in Table 2.2-1, this schedule is subject to change throughout the Relicensing. Licensee has posted the above table on the Relicensing Website and will update the schedule periodically as appropriate.

2.2.2 Licensee's Proposed Location and Dates of Scoping Meeting and Site Visit

Section 5.6(d)(1) of 18 CFR requires an applicant to include in its PAD a proposal to FERC for dates and locations for FERC's scoping meeting and site visit. Based on the above process schedule, the scoping meeting and site visit should occur in January 2011. Licensee proposes the following:

- Proposed Site Visit - January 26, 2011 (Wednesday).

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Licensee anticipates that most if not all of the Project will be accessible in January. However, weather conditions may affect access to some Project facilities.

Licensee proposes holding two coordinated scoping meetings on the day after the site visit: one meeting in the morning to focus on resource agency concerns and one in the evening to focus on the public's views. Specifically, Licensee proposes:

- Proposed Scoping Meetings - January 27, 2011 (Thursday) at a place to be selected by FERC in Marysville, California at 9:00 in the morning and at 7:00 in the evening.

2.2.3 Discretionary Activities

Table 2.2-1 provides a schedule of regulatory deadlines that must be adhered to by Relicensing Participants, including Licensee and FERC. However, within the confines of those regulations, Licensee may choose to undertake discretionary activities to facilitate the Relicensing, such as holding additional meetings/workshops to collaboratively develop study proposals, review study results, and develop resource management measures.

2.2.3.1 Early Study Proposal Development

One such discretionary activity is the continued development of study proposals. To facilitate development of study proposals, Licensee plans to invite Relicensing Participants to a series of study proposal development meetings immediately following issuance of the PAD. The purpose of the meetings will be to continue discussions of study proposals begun in 2010 with the goal of collaboratively reaching agreement on as many study proposals as possible with as many Relicensing Participants as possible before the time that Licensee must file its Proposed Study Plan. Licensee intends to continue this collaborative effort up to the time that Licensee files its Revised Study Plan.

2.2.3.2 Initiation of Studies Before FERC's Study Determination

Licensee will consider initiating studies before FERC's Study Determination.

2.3 Relicensing Communication Guidelines

2.3.1 Objectives

The Communication Guidelines describe how Licensee plans to communicate and interact with Relicensing Participants during the Relicensing. Licensee does not propose that participation in the Relicensing be contingent upon formal acceptance of these Communication Guidelines, but that Licensee and Relicensing Participants will voluntarily abide by the intent of these Communication Guidelines. It should be noted that:

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- These guidelines do not supersede or in any way modify FERC's ILP regulations, or any other federal or State of California regulations related to the Relicensing, including those related to Section 106 of the NHPA, Section 7 of the ESA, or Section 410 of the CWA.
- These guidelines do not apply to FERC or any documents, meetings, correspondence, or other actions for which FERC is responsible during the relicensing process.
- These are guidelines, not hard rules.
- The Communication Guidelines may be revised as necessary at any time during the relicensing process.

Licensee proposes these Communication Guidelines to facilitate communication and for the purpose of encouraging early and continuing participation in the Relicensing to facilitate making collaborative, consensus-based decisions in a timeframe that is consistent with FERC's ILP. One of the goals of the Communication Guidelines is to provide guidance during the Relicensing leading to collaborative development of study proposals and Protection, Mitigation, and Enhancement (PM&E) measures for the Project. If Licensee and Relicensing Participants determine it is appropriate, these Communication Guidelines may be revised during the Relicensing.

2.3.2 Participation

2.3.2.1 Participants[2]

Participation in the Relicensing under the ILP is open to any federal agency (including FERC); State of California agencies; local agencies; non-governmental organizations (NGOs); Native American tribes, including tribes formally recognized by the federal government, tribes that are not formally recognized by the federal government, and members of tribes; businesses; and unaffiliated members of the public. Licensee assumes that each Relicensing Participant is authorized to speak on behalf of the agency, organization, or affiliation that he or she represents in the relicensing.

To the extent allowed by law, including the NHPA and consultation requirements under Section 106 of the NHPA, Licensee invites participation in the Relicensing by tribes formally recognized by the federal government, as well as by non-federally recognized tribes.

2.3.2.2 Late Participation in the Relicensing

The ILP is a carefully structured process, the success of which depends on timely participation by all interested stakeholders. Licensee anticipates that each Relicensing Participant who begins participating in the Relicensing after the beginning of the Relicensing processes will take actions, including consulting with Licensee and other Relicensing Participants regarding available information, as necessary to become informed and "up-to-speed." Licensee intends that late or delayed participation will not be allowed to routinely disrupt the Relicensing.

[2] Licensee understands that the SWRCB may provide clarification regarding its participation in the relicensing.

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2.3.3 Relicensing Contact List

Licensee will maintain a list of contacts (Contact List) for all Relicensing Participants who express to Licensee an interest in the Relicensing and who have provided to Licensee an email or mailing address for a contact.

Besides an email address, Licensee will request that each agency, tribe, and NGO provide appropriate information (i.e., name, title, affiliation, mailing address, and telephone and fax numbers) for its designated contact. Licensee assumes that those designated contacts will keep the appropriate members of their agency, tribe, or NGO advised of Relicensing activities. Also, Licensee anticipates that each agency, tribe, and NGO will notify Licensee if contact information for its designated contact changes.

Relicensing is a long process that will extend for at least 5 years. To keep the Contact List current, Licensee intends to periodically issue an email to all those on the Contact List asking for each contact to confirm that he or she wishes to remain on the Contact List. Licensee will assume that those who do not respond in a timely fashion are no longer interested in the Relicensing and delete those individuals from the Contact List.

Because Licensee understands that many people would be uncomfortable if their contact information were made readily available on the internet, Licensee does not intend to post the Contact List on the Relicensing Website.

2.3.4 Relicensing Website

Licensee has established, and plans to maintain, a publicly accessible internet website as a means of making information regarding the Relicensing readily available to Relicensing Participants. Examples of information that will be provided on the website include the initial FERC license for the Project including an annotated current license, FERC filings, FERC orders regarding the relicensing, and Relicensing documents (e.g., the NOI and PAD, as well as other documents such as the Proposed Study Plan, Revised Study Plan, and license application as they are developed). Many of the folders on the website will be empty until the documents for each folder are developed.

Licensee's Project Relicensing Website can be accessed at www.ycwa-relicensing.com.

2.3.5 Relicensing Action Item Log

Licensee intends to maintain an Action Item Log that will include the status of all action items agreed to by Licensee and Relicensing Participants for the Relicensing. The log will include an action item number, when the action item was originated and by whom or at which meeting or workshop, a clear description of the action item, when the action was intended to be completed, who the action item was assigned to, the status of the item, and the date it was completed. Closed items will be shaded in grey to indicate they have been completed. Licensee will keep

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the most current version of the Action Item Log posted on the Relicensing Website. Open action items will be reviewed as appropriate at each Licensee-sponsored meeting.

2.3.6 Meetings

As noted above, these Communication Guidelines apply only to Licensee-sponsored meetings. Licensee anticipates that meetings sponsored by another party (e.g., FERC or a Relicensing Participant) will be organized, announced, hosted, and followed up on by that other party. The guidelines Licensee intends to follow for Licensee-sponsored meetings are provided below.

2.3.6.1 Meeting Locations and Start Time

Licensee intends that meeting locations, including those for regularly scheduled meetings, and start times will be selected by Licensee in consultation with interested Relicensing Participants to ensure the greatest participation by those who wish to attend the meeting and the least amount of inconvenient travel for meeting participants overall. Licensee assumes that each Relicensing Participant will be aware of any meeting start time and location posted on the Relicensing Website Event Calendar. The Relicensing Website Event Calendar is described below.

2.3.6.2 Event Calendar

An Event Calendar that includes scheduled meetings will be maintained on the Relicensing Website. Relicensing Participants and others may view the Event Calendar to see when a meeting is planned. The calendar will provide details, such as location and a notice/agenda for the meeting. After a meeting has occurred, the calendar will provide the notice/agenda, the completed sign-in sheet, and any presentations made by Licensee at the meeting. It is Licensee's intent that the Action Item Log will suffice as a meeting summary.

2.3.6.3 Meeting Notice/Agenda

Soon after Licensee becomes aware of a meeting, Licensee will make a good faith effort to issue an e-mail to the Contact List giving those on the list early notice that the meeting has been scheduled and of the potential agenda.

Licensee will make all reasonable efforts to issue to Relicensing Participants on the Contact List a notice and accompanying agenda and meeting material at least 5 working days in advance of the meeting. Changes to the agenda that are made less than 5 working days in advance of the meeting shall be agreed to by Relicensing Participants at the meeting or postponed to a later meeting.

If a party on the Contact List wishes another form of notice, the party should contact Licensee and, within reason, Licensee will comply with the request for an alternative form of meeting notification.

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Licensee will develop an agenda for an upcoming meeting based on input from the Relicensing Participants at previous Relicensing meetings or as otherwise reasonable. Licensee and Relicensing Participants will schedule meetings with the goal of including all appropriate Relicensing Participants. The last agenda topic prior to adjourning a Licensee-sponsored Relicensing meeting will always be to identify the date and agenda topics for the next meeting(s).

If Licensee is aware that an important item is scheduled for decision (see below) at a meeting, Licensee will highlight this item on the notice/agenda. Licensee expects that lack of participation in a meeting in which a decision item is placed on the agenda will not be used to routinely delay decisions.

It is the mutual responsibility of meeting participants to identify key Relicensing Participants who are not in attendance at the meeting and assign someone to contact the identified key Relicensing Participants on particular issues prior to finalizing decisions on that issue.

Unless agreed to by participants at a meeting and to the extent appropriate, standard items on each meeting agenda will include:

- Introductions
- Purpose of Meeting
- Review and Approval of Agenda
- Review Relicensing Schedule, if appropriate for planning meetings and timelines for decisions
- Administrative Items, if any
- Status Reports If Appropriate or Requested, if any
- Review of Proposed Major Decisions and New Action Items
- Set Date and Agenda for Next Meeting(s)

Licensee and Relicensing Participants may make reasonable adjustments or otherwise develop the agenda for any given meeting as necessary.

Those who plan to attend a Licensee-sponsored meeting should understand that those at the meeting may re-organize the agenda or proceed through an agenda at a faster or slower pace than that anticipated when the agenda was developed.

2.3.6.4 Telephone Calling into Planned In-Person Meetings

Licensee believes that in-person participation in a meeting rather than by telephone is a more effective and desirable form of communication. However, to accommodate constrained schedules, encourage participation, and make meetings as accessible as possible to meeting participants, Licensee will attempt to arrange a telephone call-in line for a Relicensing Participant, if the meeting room has such capabilities, and if requested by that Relicensing Participant at least two days in advance of the meeting. If there is a call-in number available,

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Licensee will forward the call-in number to the Relicensing Participant who requested it. However, Licensee does not guarantee the quality of the phone connection or that the Relicensing Participant will be forwarded all material that may be reviewed at the meeting. Licensee hopes that no Relicensing Participant will routinely participate in meetings by telephone.

2.3.6.5 Meeting Moderation/Facilitation

Licensee is committed to an open and transparent process with a free exchange of information and interests among Licensee and all Relicensing Participants. If Licensee and Relicensing Participants agree that a facilitator is pivotal to the success of any particular Relicensing meeting or group of meetings (e.g., study development and PM&E development meetings), Licensee will provide a neutral third-party facilitator for that Relicensing meeting or group of meetings. Licensee intends that there will be a single facilitator for all such meetings. For meetings in which the facilitator is not present or requested, Licensee anticipates that Licensee will lead the meetings and Licensee will make a good-faith effort to ensure that all meeting participants are heard.

2.3.6.6 Meeting Action Items and Decisions

Licensee intends that Relicensing meetings will result in action items and decisions. To capture these meeting results, Licensee intends to place all such action items and decisions on the Action Item Log (see Section 2.3.5). While serving as a meeting summary, the Action Item Log is not intended to be a transcript of the meeting or meeting notes, or to state the position of any Relicensing Participant on any issue, including sentiment concerning the process. The Action Item Log is intended only to reflect action items and major decisions from the meeting.

Licensee will endeavor to update and post the Action Item Log on the Relicensing Website within 2 business days after each meeting.

If a Relicensing Participant suggests a substantive change to an Action Item Log entry, Licensee, with the concurrence of Relicensing Participants who were at the meeting in which the action item was identified, will review the suggestion and revise the Action Item Log appropriately.

Licensee does not intend to prepare any other summary of a meeting unless Licensee and Relicensing Participants agree that a summary would be important in tracking a particular issue and agree on specific wording that will be included in the summary. If a summary is prepared, then the summary will be posted on the Event Calendar for that meeting.

2.3.6.7 Confidential Meetings

Some meetings and information prepared for or shared during a meeting under the ILP may be confidential. For example, information on Native American resources and locations of sensitive environmental and cultural resources are considered confidential material with restrictions on their distribution. Licensee expects that any Relicensing Participant providing confidential

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information under applicable law or regulations will identify the information as confidential in advance of disclosure and will manage the information appropriately.

2.3.6.8 Decision Making

Licensee intends to make a good faith effort to make decisions and reach agreement by consensus with Relicensing Participants present at any scheduled Licensee-sponsored Relicensing meeting. For the purpose of the Relicensing, Licensee intends that "consensus" means that Licensee and Relicensing Participants "can live with" the decision. Licensee expects that each Relicensing Participant will be responsible for completing the necessary internal coordination to ensure that his or her organization can approve a decision. For each major decision at the meeting, Licensee will ask each Relicensing Participant if the agency, organization, or tribe he/she represents "can live with" the decision. Licensee will assume that Relicensing Participants will be truthful and responsive to all decisions that are put to question.

Licensee intends that lack of participation in a meeting in which a decision item is placed on the agenda will not be used to delay decisions. Licensee encourages each Relicensing Participant to participate in meetings at which a decision of interest to them will be considered.

Unless otherwise indicated, Licensee will consider all "can you live with it" decisions as interim decisions subject to further discussion and modification based on additional information or reconsideration.

Licensee intends to include all consensus decisions in the Action Item Log.

2.3.6.8.1 Use of "Collaboration" and "Consultation"

Some study proposals or plans, or other documents, may require Licensee and Relicensing Participants (or a designated subset of Relicensing Participants, such as a group of agencies or an agency) to "collaborate" or to "consult" on a decision. In those cases where "collaboration" is required, this shall mean Licensee and the Relicensing Participants (or a designated subset of Relicensing Participants) will make a reasonable effort to reach a consensus decision using the "can you live with it" threshold described in Section 2.3.6.8 above, and such decisions will be final to the extent required in the study proposal or plan or other document. Failure to reach consensus after Licensee makes a reasonable effort to collaborate will complete Licensee's and the Relicensing Participants' (or the designated subset of Relicensing Participants') requirement for "collaboration" (i.e., collaboration can result in an agreement to disagree).

Where a study proposal or plan requires "consultation," this shall mean that License will make a reasonable effort to seek out the opinions and input of Relicensing Participants (or a designated subset of Relicensing Participants) prior to Licensee making a decision. Consultation does not require Licensee reach consensus, though Licensee's goal in all cases is to do so.

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2.3.6.9 Attendance at Meetings

Licensee encourages each Relicensing Participant to make a good faith effort to be represented at every Licensee-sponsored relicensing meeting that is of interest to the Relicensing Participant.

2.3.6.10 Preparation for Meetings

Licensee encourages Relicensing Participants to make good faith efforts to arrive at meetings on time, read background information provided before each meeting, and be prepared to effectively discuss topics on the meeting agenda. Licensee encourages Relicensing Participants to discuss material on the agenda with other Relicensing Participants whom they think might be interested in the material.

2.3.6.11 Caucus

Licensee encourages Relicensing Participants to call for a caucus, if needed, at any time during a Licensee-sponsored meeting.

2.3.6.12 Relicensing Participants Unable to Attend a Meeting

If a Relicensing Participant finds that he or she is unable to attend, or to have a representative attend, a meeting at which the Relicensing Participant wishes to be represented, the Relicensing Participant may provide to Licensee any input the Relicensing Participant wishes to be considered at the meeting. If this occurs, Licensee will make a good faith effort to convey the information accurately, and its source, to Relicensing Participants at the meeting.

2.3.6.13 Planned Telephone Conference Calls (In Lieu of In-Person Meetings)

Where Relicensing Participants agree, Licensee plans to arrange a meeting by telephone conference only (i.e., as compared to a planned in-person meeting to which some meeting participants may call in by telephone, as described in Section 2.3.6.4) for a meeting where a small number of individuals are expected to participate and the agenda is very limited. To the extent reasonable, Licensee intends to treat such telephone conferences as regular Licensee-sponsored meetings. In those instances, Licensee will issue a teleconference meeting notice and agenda, including a call-in number, to those Relicensing Participants who have advised Licensee that they plan to participate in the teleconference (i.e., not to all Relicensing Participants).

Licensee does not intend to conduct any Licensee-sponsored meetings by videoconference.

2.3.6.14 Types of Meetings

Licensee plans to hold various types of meetings. A brief description of each type of meeting is provided below. This list is not comprehensive; other types of meetings may be scheduled and held by Licensee as appropriate.

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- Quarterly Relicensing Participants Meetings. Licensee intends to schedule a meeting at least once every 3 months for all Relicensing Participants. In addition to other agenda items, the overall relicensing schedules and process-type issues will be discussed at each of these meetings.
- Study Proposal Development Workgroups. Licensee may form study proposal development workgroups for each general resource area study. Licensee anticipates that the workgroups will meet as needed to try to resolve any differences regarding study proposals, and that the workgroups will continue to meet as long as reasonable progress is being made up to the time Licensee files its Revised Study Plan.
- Resource Management Measure Workgroups. Licensee's goal is to include in its license application resource management measures that each Relicensing Participant "can live with," and that each Relicensing Participant will support in comments and recommendations to FERC and in other Relicensing-related proceedings. To do so, Licensee plans to consult in a timely fashion with Relicensing Participants to schedule and hold workshops for the development of resource management measures with the goal of reaching agreement on as many measures as possible with as many Relicensing Participants as possible. The number of workshops will depend on progress made at the previous workshops.
- ILP Required Meetings. ILP regulations require Licensee to hold meetings at specific times in the relicensing process and for specific purposes.
- Workgroup Meetings. Licensee and Relicensing Participants may agree to form specific workgroups from time to time during the Relicensing. Licensee plans that such workgroups would be specifically charged by Licensee and Relicensing Participants with the accomplishment of a specific task, such as drafting a joint document or focusing on a specific highly technical issue. Licensee intends that these Communications Guidelines will apply to such workgroups unless otherwise agreed to by Licensee and Relicensing Participants. Upon completion of its assigned task, Licensee expects that the workgroup will disband.

2.3.7 Documents

FERC's regulations identify a number of documents that are required for inclusion in the ILP. The ILP regulations stipulate that either FERC, the applicant, or in some instances another party, is responsible for producing these necessary documents. Licensee anticipates that there will also be other informal documents generated during the course of the relicensing.

2.3.7.1 FERC's Documents

For documents issued by FERC, Licensee anticipates that FERC will distribute the documents in accordance with FERC's protocols. Licensee anticipates that all documents issued or received by FERC will be posted and publicly available in the e-Library on FERC's website at www.ferc.gov. To view these, a Relicensing Participant should click on "Documents and Filing," "eLibrary," then "General Search." FERC's website provides further instructions for obtaining documents. Each Relicensing Participant can register to receive a notice each time FERC posts a document to its website regarding the relicensing of the Project. To register, a

Relicensing Participant should go to FERC's website, click on "Documents and Filing," and then "eSubscription." FERC's website provides further instructions.

2.3.7.2 Non-Licensee or FERC Generated Documents

Licensee expects that any Relicensing Participant who creates, files with FERC, or distributes a document including correspondence will be responsible for the distribution of the document. A Relicensing Participant should not assume that by using the "Reply All' function in a Licensee-generated e-mail that all Relicensing Participants on the Contact List received his or her e-mail.

2.3.7.3 Licensees' Documents

Licensee anticipates using FERC's e-Filing whenever possible for documents Licensee files with FERC, and anticipates distributing such documents by e-mail, compact disc (CD), or paper copy to Relicensing Participants, as appropriate. The distribution will also go to FERC's Service List after Licensee's license application is accepted by FERC and FERC establishes a formal Service List. Licensee plans to use e-mail for distribution of informal documents it initiates. Licensee anticipates that it will post on the Relicensing Website all public documents (e.g., letters addressed to Licensee, but not e-mails) Licensee sends or receives regarding the relicensing. Licensee will have the date, the name of the document, and the page number on each page of each document when it is initially distributed by Licensee. Other miscellaneous information, such as "draft," will be shown in the footer of each page of the document, if appropriate.

2.3.7.4 Collaboratively Developed Documents

Licensee anticipates that at times Licensee and Relicensing Participants may desire to develop a document collaboratively. In those cases and unless otherwise agreed to by Licensee and Relicensing Participants interested in the document, Licensee plans to use a single-text approach. Specifically, once an initial draft of the document is developed, Licensee plans to post the document on its Relicensing Website in Microsoft Word or some other appropriate format (i.e., not pdf or a password-protected document) that can be downloaded from the Relicensing Website and used by Relicensing Participants. This is referred to as a Posted File.

As a Posted File is revised, Licensee anticipates that Licensee or the Relicensing Participant who revises the Posted File will include in the file name the date of the version of the file and the author/reviser. For instance, a file may be named "Water Quality Study Proposal CDFG110109.doc" to indicate the Posted File a is version of a water quality study proposal, the revisions were made by the California Department of Fish and Game (CDFG), and the date of the file is November 1, 2009. The author or reviser will be responsible for ensuring that the appropriate headers and footers are on the file and that the date of the file in the footer matches the date in the file name. Licensee plans to post the revised file on the Relicensing Website if Licensee made the revision, or post the file once provided to Licensee if a Relicensing Participant made the revision.

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Periodically, Licensee, with the approval of Relicensing Participants may remove from the website Posted Files that have been revised. Licensee will maintain the Posted Files on its or its consultant's server.

Licensee intends that all changes to a Posted File will be made in Microsoft Word Track Changes or other appropriate manner so that changes and/or comments can easily be understood, shared, and integrated into a revised text.

Licensee plans that Track Changes on a Posted File may be accepted if Licensee and Relicensing Participants developing the document agree.

2.3.7.5 Availability of Information in PAD

In accordance with 18 CFR 5.6(c)(2) and Section 5.2, Licensee plans to provide sources of information on the existing environment and known or potential resource impacts included in the PAD to anyone who requests the information. Licensee will make a good faith effort to provide the document within 20 days of receipt of request. The document may be provided electronically (e.g., by email or on CD) unless the requester asks for the information in hard copy. Except for agencies, Licensee may charge a reasonable cost for copying and postage for the material.

2.3.8 Monthly Anticipated Fieldwork Schedules

Near the end of each month, Licensee will post to the Relicensing Website an anticipated fieldwork schedule for the upcoming month. If no fieldwork is anticipated for the upcoming month, a schedule will not be posted. The anticipated fieldwork schedule will be organized by FERC-approved study and will be Licensee's best estimate at the time the schedule is posted. It will be subject to modification by Licensee without prior notice. The anticipated fieldwork schedule will not be a formal part of the FERC-approved study or in any way supersede the FERC-approved study.

The anticipated fieldwork schedule will include a running list of variances, if any, to the FERC-approved study.

Any Relicensing Participant interested in observing fieldwork listed in the anticipated fieldwork schedule may contact Licensee's designee at least one week in advance of the scheduled fieldwork, and the designee will coordinate with the participant to the extent possible. It is understood that Licensee is not responsible in any way (e.g., transportation, equipment and gear, food and beverages, access to private property or safety) for any participant who wishes to observe fieldwork.

2.3.9 Field Data Availability

As field data are collected for each study, Licensee plans to efficiently compile data, assure itself of data quality (i.e., quality assurance/quality control (QA/QC) review), and organize data in the format Licensee plans to use to review the data, which may be described in the appropriate study

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proposal. Once that is done, which may not be until technical reports are issued, Licensee plans to make data available to Relicensing Participants by posting the compiled data on the Relicensing Website or otherwise make the data available (e.g., on CD) to Relicensing Participants.

2.3.10 Periodic Reports to Meet FERC Requirements

2.3.10.1 Periodic Progress Reports

Licensee plans to provide FERC with brief written progress reports on a periodic basis as determined by FERC in its Study Plan Determination. The periodic progress reports will briefly describe the progress on each study since the last progress report, key findings, and any modification to the FERC-approved study proposal.

2.3.10.2 Initial and Updated Study Reports

As required by 18 CFR § 5.15(c) and (f), Licensee will file with FERC an Initial Study Report within one year of FERC's Study Plan Determination, and an Updated Study Report within two years of FERC's Study Plan Determination. The reports will describe Licensee's overall progress in implementing the FERC-approved studies, status of schedule, and a summary of data collected to date. These are progress reports and are intended to be filed during performance of the studies and not after the studies are complete. The reports will also include a discussion of any variance from the FERC-approved study proposal and schedule and modifications to ongoing studies. The reports will also include any new studies proposed by Licensee. Licensee will follow the guidelines provided in 18 CFR § 5.15(c) and (f) regarding holding a meeting within 15 days of filing each study report and filing a meeting summary within 15 days of the meeting.

2.3.11 Personal Conduct

2.3.11.1 Respect for Participants

Licensee expects that the personal integrity, values, and legitimacy of the interests of each Relicensing Participant will be respected at all times by all other Relicensing Participants. Licensee intends that the facilitator will provide guidelines for respectful conduct.

2.3.11.2 Commitments

Licensee encourages Relicensing Participants to not make commitments lightly. Licensee intends to make a good faith effort to ensure that adequate time is provided for the interests of all Relicensing Participants to be discussed and acted upon. However, Licensee does not intend to routinely defer decisions or allow the relicensing process to be disrupted by delays.

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2.3.11.3 Communicating Interests

Licensee expects that each Relicensing Participant will communicate his or her interests in topics under consideration. Licensee firmly believes that it is incumbent upon each Relicensing Participant to state his or her interests, and that timely voicing of these interests is essential to enable meaningful dialogue and full consideration of different points of view. Licensee encourages resource information germane to assessment of potential impacts and development of potential resource management measures to be shared with Licensee and Relicensing Participants.

2.3.11.4 Good Faith

Licensee encourages each Relicensing Participant to make a good faith effort to achieve his or her Relicensing objectives through use of the ILP.

2.3.12 Communications

Licensee understands that all Relicensing Participants, including Licensee, are free to communicate informally with each other; however, all parties are encouraged to share relevant communications with Licensee and among all Relicensing Participants as appropriate.

Other than verbal communications at meetings, Licensee intends that e-mail will be the primary means of Licensee's formal communication among Relicensing Participants. The initiator of any such e-mail is responsible for ensuring it is sent to all Relicensing Participants, as applicable.

Licensee anticipates telephone calls among Relicensing Participants will be treated informally, with no specific documentation.

2.4 Integrated Licensing Process Flow Chart

The diagram attached, Figure 2.4-1, was prepared by FERC and illustrates the ILP pursuant to 18 CFR Part 5.

2.5 List of Attachments

None

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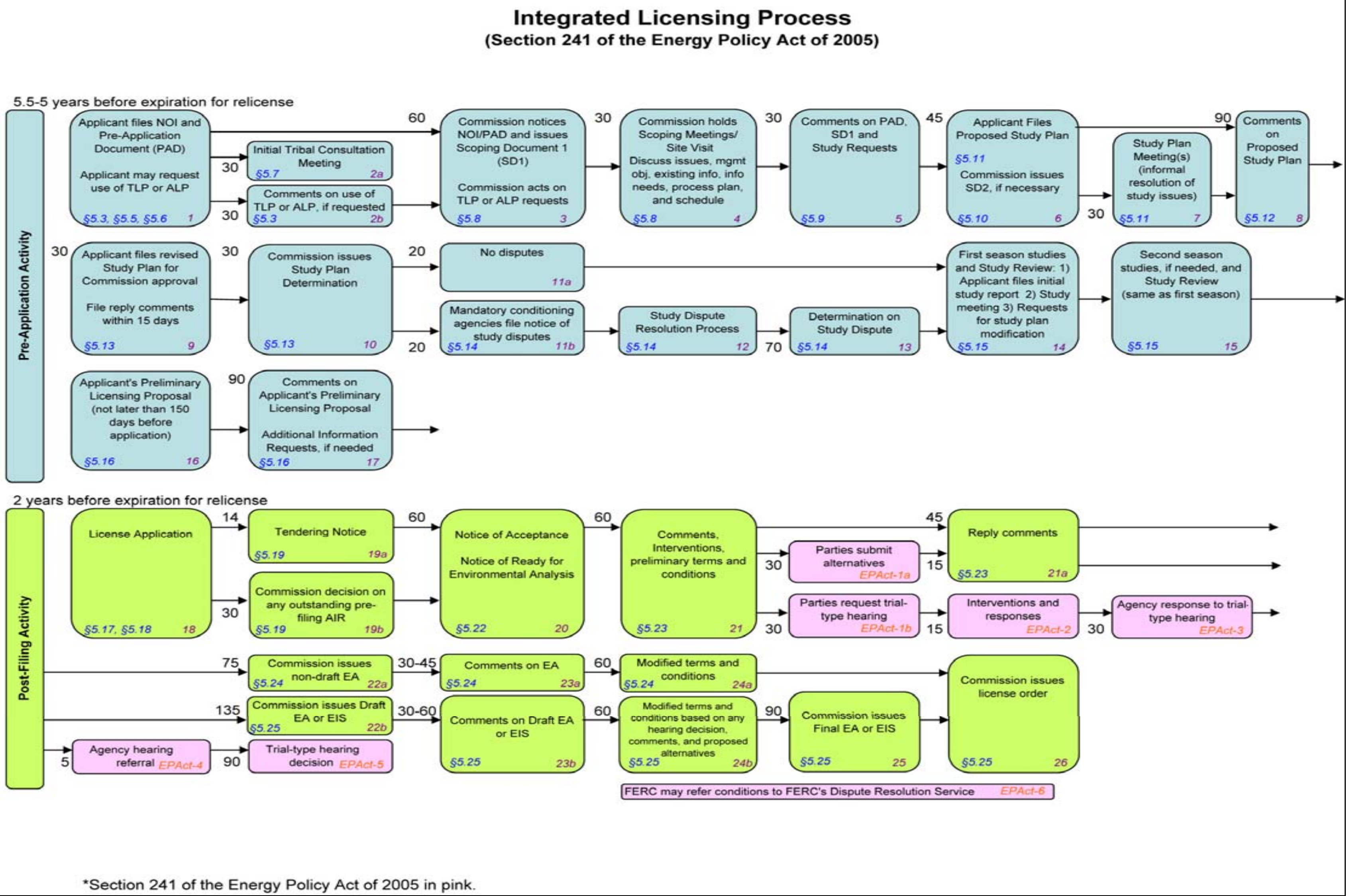

Source: FERC

Figure 2.4-1. FERC's Integrated Licensing Flowchart.

SECTION 3

GENERAL DESCRIPTION OF THE RIVER BASIN

This section provides a general overview of the river basin that may be affected by continued operation and maintenance (O&M) of Yuba County Water Agency's (YCWA or Licensee) Yuba River Development Project (Project). For the purpose of this Pre-Application Document (PAD), a river basin refers to the total land area contributing runoff to a particular point in a given river.

This section is divided into 6 subsections. Section 3.1 provides a description of the river basin, Section 3.2 describes river reaches potentially affected by the Project, Section 3.3 describes the climate in the basin, Sections 3.4 and 3.5 provide information regarding major land and water uses within the basin, Section 3.6 provides a table of streams and tributaries in the Project Vicinity,[1] and Section 3.7 lists the major dams and diversion structures in the basin. Figure 3.1-1 shows the Yuba River Basin. The amount of water diverted out of the basin upstream and downstream of the Project is discussed in Section 7.2.8 of the PAD.

3.1 Affected River Basin

The Project is located in Yuba, Sierra, and Nevada counties, California, on the mainstem Yuba River, the North Yuba River, and the Middle Yuba River, including Oregon Creek, a tributary to the Middle Yuba River. A portion of the land within the Federal Energy Regulatory Commission (FERC) Project Boundary[2] is located on public land managed as the Plumas National Forest (PNF) and the Tahoe National Forest (TNF) by the United States Department of Agriculture, (USDA) Forest Service (Forest Service).

The Project consists of 3 developments: New Colgate, New Bullards Bar Minimum Flow, and Narrows 2, which range in elevation from 2,049 feet to 280 feet.[3] The Project does not include any canals, flumes, or transmission lines. In total, the Project includes:

- 1 dam and associated storage reservoir – New Bullards Bar
- 2 diversion dams – Our House and Log Cabin
- 2 diversion tunnels – Lohman Ridge and Camptonville
- 2 underground power tunnels – New Colgate and Narrows 2
- 1 above ground penstock – New Colgate
- 3 powerhouses – New Colgate, New Bullards Bar Minimum Flow, and Narrows 2
- 7 recreation areas, all on New Bullards Bar Reservoir – Emerald Cove Marina, Hornswoggle Group Camp, Schoolhouse Family Camp, Dark Day Campground, Dark Day Boat Ramp, Garden Point Campground and Madrone Cove Campground.

[1] For the purposes of this document, the Project Vicinity is defined as the area surrounding the Project on the order of a United States Geological Survey (USGS) 1:24,000 topographic quadrangle.
[2] The existing Federal Energy Regulatory Commission (FERC) Project Boundary is the area that Licensee uses for normal Project operations and maintenance, and is shown on Exhibits G, J, and K of the current license.
[3] All elevation data are in United States Department of Commerce (USDOC), National Oceanic and Atmospheric Association (NOAA), National Geodetic Survey (NGS) Vertical Datum of 1988 (NAVD 88).

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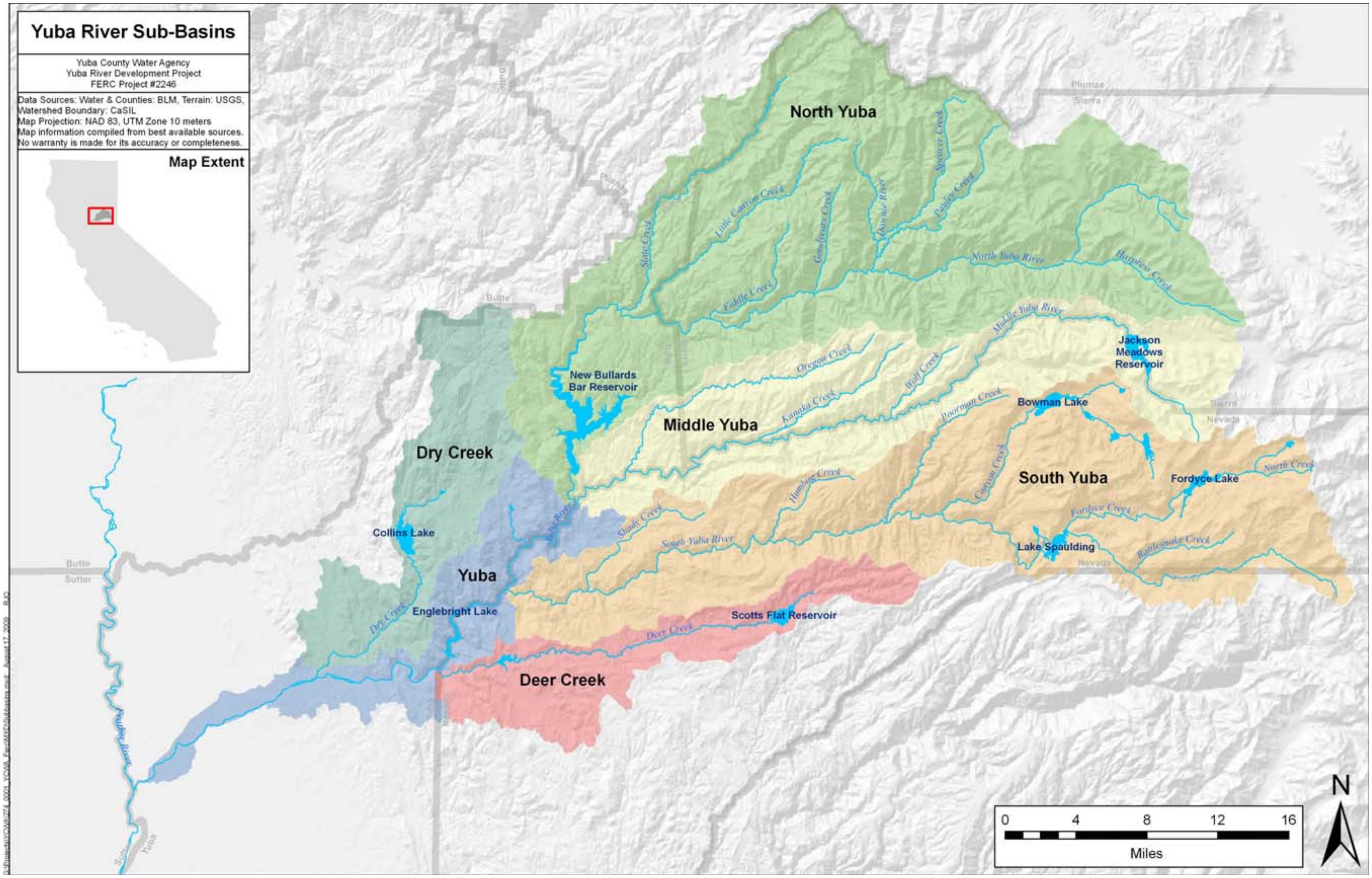

Figure 3.1-1. Sub-basins of the Yuba River.

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3.1.1 Overview of the Yuba River Basin

The Yuba River drains approximately 1,339 square miles of the western Sierra Nevada, including portions of Sierra, Placer, Yuba, and Nevada counties, and is formed by the forks of the North Yuba, the Middle Yuba, and the South Yuba rivers.

The average annual unimpaired flow of the Yuba River from 1975 to 2004 at the United States Geological Survey's (USGS) Smartville[4] Gage at river mile (RM) 23.6 (which is below the confluence with Deer Creek) is 2,340,000 acre-feet (ac-ft), and ranged from a maximum of approximately 4,700,000 ac-ft in 1995 to a minimum of approximately 360,000 ac-ft in 1977. The gage is located downstream of the United States Army Corps of Engineers' (USACE) Englebright Dam, which is not part of the Project.

3.1.1.1 North Yuba River Sub-basin

The North Yuba River originates at Yuba Pass at an elevation of 6,701 feet near State Highway 49 in Sierra County. The highway follows the river downstream from the community of Downieville for about 14 miles, where the river departs from the road and flows westward to where it enters the Project's New Bullards Bar Reservoir. The reservoir was completed in 1969 and is the sole storage reservoir for the Project, located between RM 2.3 and 18.1.[5] In total, the North Yuba River is about 43.3 miles long.

Flow in the sub-basin upstream of New Bullards Bar Reservoir is unrestricted (i.e., no significant dams or water diversions) except for the Slate Creek Diversion Dam, a part of South Feather Water and Power Agency's (SFWPA) South Feather Power Project (FERC Project No. 2088). SFWPA's Slate Creek Diversion Tunnel has a maximum capacity of 848 cubic feet per second (cfs) of water out of Slate Creek to Sly Creek Reservoir on Lost Creek, a tributary to the South Fork Feather River. SFWPA's water rights limit Slate Creek diversions to 600 cfs and at times diversions are limited to 500 cfs due to high water elevations in Sly Creek Reservoir. Additional information on South Feather Power Project annual diversion amounts can be found in Section 7.2.8 of this PAD.

New Bullards Bar Reservoir is deep and thermally stratified, and has a retention time of about six months. The reservoir has a dendritic shape with three arms. The narrow center arm is the longest of the three arms at about 13 miles and extends up the North Yuba River to just upstream of the Slate Creek confluence. The slightly wider northeast arm extends upstream about 4 miles, and is formed primarily by Willow and Badger creeks. The northwest arm, the shortest of the three at about 1 mile long, is formed by Little Oregon and Burnt Bridge creeks. The portion of reservoir north of New Bullards Bar Dam near Garden Point is the widest portion of the reservoir at about 2 miles wide. Most of the land surrounding New Bullards Bar Reservoir is primitive (i.e., no roads or residential communities).

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[4] In 2008, the people of this community petitioned to have the name changed to Smartsville, with an 's' in the middle of the name. However, the USGS gage refers to the former spelling of the community name. Therefore in this document, the community is referred to as such.

[5] River miles on the North Yuba River begin at RM 0.0 at the confluence of the North Yuba River with the Middle Yuba River and extend upstream on the North Yuba River.

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The reservoir has a total storage capacity of 966,103 ac-ft with a minimum operating level of 234,000 ac-ft, leaving 732,103 ac-ft of regulated capacity. Licensee typically operates New Bullards Bar Reservoir by capturing winter and spring runoff from rain and snowmelt. Consequently, New Bullards Bar Reservoir reaches its peak storage at the end of the spring runoff season, and then is gradually drawn down as water is released into the North Yuba River. Water is released through the New Bullards Bar Minimum Flow Powerhouse at the base of the dam, and through the New Colgate Power Tunnel and New Colgate Powerhouse discharge to the main stem Yuba River. The reservoir usually reaches its lowest elevation in mid-winter. The annual drawdown in normal water years is about 90 feet. The reservoir does not undergo significant daily changes in elevation.

New Bullards Bar Reservoir is used to provide irrigation water to about 90,000 acres of farmland in western Yuba County. Releases of water from storage are made through the spring and summer to provide flows that are diverted downstream at USACE's Daguerre Point Dam at RM 12.0 on the main stem of the Yuba River. Water is released from storage in the fall for diversion at USACE's Daguerre Point Dam for rice stubble decomposition and waterfowl habitat.

New Bullards Bar Reservoir is also the main flood control facility for the lower Yuba River area. About 23 percent (170,000 ac-ft) of the usable capacity of the reservoir is held in reserve from October through May for flood control purposes[6].

In addition to providing power and downstream water supply, Licensee pumps water directly from New Bullards Bar Reservoir to supply water to the Cottage Creek Water Treatment Plant for domestic and recreational uses adjacent to the reservoir. This pumping averages approximately 6 ac-ft per year. This relatively minimal level of pumping does not affect Project operations. Licensee anticipates that pumping of similar magnitude will continue during the period of the new license.

New Bullards Bar Dam (RM 2.3) is the fourth dam constructed in the Bullards Bar area. The first dam was a timber crib, rock-filled diversion dam that was constructed in 1899, and washed out a year later. In 1900, a 30-foot-tall masonry rock dam was built to replace the washed out dam. The rock dam is still in place and is located about 1,000 feet downstream of New Bullards Bar Dam. Licensee maintains this dam as a weir to measure instream flow releases from New Bullards Bar Dam. The third dam was Bullards Bar Dam, a 200-foot-tall concrete-arch dam constructed by a group of investors led by Harry Payne Whitney in 1922-1923 and acquired by Pacific Gas and Electric Company (PG&E) a few years later. Bullards Bar Dam was inundated in 1969 when New Bullards Bar Dam and Reservoir began operation. Bullards Bar Dam is located about 1 mile upstream from New Bullards Bar Dam in New Bullards Bar Reservoir, and is not normally exposed.

The drainage area at New Bullards Bar Dam is 488.6 square miles, approximately 49.4 square miles[7] of which lie upstream of SFWPA's Slate Creek Diversion Dam.

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6 The USACE contributed $12 million to the construction of New Bullards Bar Dam in exchange for flood control space the reservoir would provide.

7 Drainage area based on USGS gage information for gage No. 11413300, Slate C bl Div Dam Nr Strawberry CA. http://waterdata.usgs.gov/nwisweb/local/state/ca/text/11413300-manu.html.

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From New Bullards Bar Dam, the North Yuba River flows southwest another 2.3 miles to where it converges with the Middle Yuba River to form the main stem of the Yuba River. This confluence is at an elevation of about 1,350 feet near the unincorporated town of North San Juan. The total drainage area of the North Yuba River is 491 square miles.

3.1.1.2 Middle Yuba River Sub-basin

The Middle Yuba River originates at an elevation of approximately 7,200 feet along the northern side of Meadow Lake Hill, and flows westerly for about 41.4 miles to the Project's Our House Diversion Dam located at RM 12.1,[8] southwest of the community of Camptonville near the Sierra/Nevada county line.

Like the North Yuba River, the Middle Yuba River basin is steep, rugged, sparsely populated, and mostly vegetated with coniferous forests. Middle Yuba River flows upstream of the Project are reduced by upstream projects. Nevada Irrigation District's (NID) Jackson Meadows Reservoir (RM 47.1) and Milton Diversion Dam (RM 44.9), both parts of NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266), affect flows entering the Project. Jackson Meadows Reservoir has a gross storage capacity of 67,435 ac-ft of water and the Milton Diversion Dam can divert up to 450 cfs of water from the Middle Yuba River to Bowman Lake on Canyon Creek, a tributary to the South Yuba River. Additional information on annual amounts of diversions by these facilities can be found in Section 7.2.8 of this document.

Our House Diversion Dam and its associated Lohman Ridge Diversion Tunnel can divert about 810 cfs of water from the Middle Yuba River to Oregon Creek. The dam has no appreciable storage capacity. The diversion pool fluctuates passively (i.e., storage is not actively exercised by the operator, but depends on the balance between diversion and inflow) from a minimum pool when natural inflows are at or below the downstream minimum flow requirement and no diversion is occurring, to a maximum pool size of approximately 280 ac-ft when inflows are greater than diversion capacity and the facility is spilling. The drainage area at Our House Diversion Dam is 144.8 square miles, 39.8 square miles of which lies upstream of NID's Milton Diversion Dam.

From Our House Diversion Dam, the Middle Yuba River flows west about 12 miles to where it converges with the North Yuba River at elevation 1,350 feet. The total drainage area of the Middle Yuba River is 210 square miles.

Oregon Creek, a tributary to the Middle Yuba River, originates at an elevation of approximately 5,600 feet and flows southwesterly for about 21.4 miles to where it converges with the Middle Yuba River.

One Project facility is located on Oregon Creek: Log Cabin Diversion Dam at RM 4.1.[9] The dam and its associated Camptonville Diversion Tunnel can divert about 1,100 cfs of water from

[8] River miles on the Middle Yuba River begin at RM 0.0 at the confluence of the Middle Yuba River with the North Yuba River and extend upstream on the Middle Yuba River.

[9] River miles on Oregon Creek begin at RM 0.0 at the confluence of Oregon Creek with the Middle Yuba River and extend upstream on Oregon Creek.

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Oregon Creek to New Bullards Bar Reservoir. The dam has no appreciable storage capacity. The diversion pool fluctuates passively from a minimum pool when natural inflows are at or below the downstream minimum flow requirement and no diversion is occurring, to a maximum pool size of approximately 90 ac-ft when inflows are greater than diversion capacity and the facility is spilling. The drainage area at the dam is approximately 29.1 square miles.

Like the North and Middle Yuba rivers, Oregon Creek is steep, rugged, sparsely populated, and mostly vegetated with coniferous forests. Flow in Oregon Creek upstream of the Project is entirely unrestricted.

3.1.1.3 South Yuba River Sub-basin

No Project facilities are located on the South Yuba River.

The South Yuba River originates at an elevation of about 7,200 feet near Castle Peak and Donner Lake, and flows southwest to its confluence with the main stem Yuba River (RM 30.7)[10] near the community of Bridgeport at USACE's Englebright Reservoir, a non-Project facility, at an elevation of about 527 feet. The total drainage area of the South Yuba River is 352 square miles. The majority of the basin is steep, rugged, and sparsely populated, with small communities in the lower elevation areas.

There are numerous dams and diversions on the South Yuba River (Table 3.6-1) and its tributaries. PG&E's Drum-Spaulding Project (FERC Project No. 2310) has 19 reservoirs on the South Yuba and its tributaries, with a total of 144,644 ac-ft of storage. The largest Drum-Spaulding Project facility, Spaulding Dam (RM 42.0) creates Lake Spaulding, with a gross storage capacity of 75.912 ac-ft. At Spaulding Dam, PG&E can divert a combined total of 947 cfs out of the South Yuba River sub-basin into the Drum and South Yuba canals. Water from the Drum Canal continues to the Drum Forebay and then to the Drum Afterbay on the Bear River. Water from the South Yuba Canal continues on to the South Fork of Deer Creek via the Deer Creek Powerhouse, part of the Drum-Spaulding Project. Additional information on annual amounts of diversions by these facilities can be found in Section 7.2.8 of this document.

NID's Yuba-Bear Hydroelectric Project (FERC Project No. 2266) has five reservoirs on Canyon and Jackson creeks, tributaries to the South Yuba River, with a total of 90,647 ac-ft of storage. The largest of these facilities is Bowman Lake, with a gross storage capacity of 68,363 ac-ft. Water is diverted from Bowman Lake, from smaller tributaries to the South Yuba River, and to Lake Spaulding, but is not diverted out of the South Yuba River basin through NID facilities. Diversions out of the South Yuba River sub-basin are made exclusively through PG&E's Drum and South Yuba canals. Additional information on annual amounts of diversions by these facilities can be found in Section 7.2.8 of this document.

[10] River miles on the Yuba River begin at RM 0.0 at the confluence of the Yuba River with the Feather River and extend upstream on the Yuba River.

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3.1.1.4 Yuba River Sub-basin

Two Project facilities are located on the mainstem Yuba River: 1) New Colgate Powerhouse (RM 33.9) located at the north side of the river about 1.7 miles upstream of USACE's Englebright Reservoir; and 2) Narrows 2 Powerhouse (RM 23.9), located at the north side of the river about 0.1 mile downstream of USACE's Englebright Dam. PG&E's Narrows 1 Powerhouse, part of PG&E's Narrows Project (FERC Project No. 1403) is located on the opposite side of the Yuba River, just downstream of the Narrows 2 Powerhouse.

From the confluence of the North Yuba River and the Middle Yuba River, the Yuba River flows southwest about 40 miles to its confluence with the Feather River in Marysville, California, at an elevation of approximately 60 feet. The total drainage area of the Yuba River downstream of the confluence of the North Yuba River and Middle Yuba River is 95 square miles. Rural agricultural areas and semi-rural agricultural communities flank the mainstem Yuba River as it leaves the Sierra foothills and enters the Central Valley (YCIT 2004). The area is primarily used for annual field and vegetable crops, tree crops, and livestock grazing (YCDA 2005). To the south of the Yuba River downstream of USACE's Englebright Dam is a feature known as the Yuba Goldfields – an area of over 8,000 acres heaped with hydraulic mine tailings created during the California Gold Rush (CDWR 1999). At one time, as many as 12 large bucket-type dredges crawled across the goldfields unearthing riches for some and leaving behind mountains of aggregate. Now, just one dredge is active. At times, flows in this area become sub-surface, flowing through and within the aggregate field of hydraulic mining deposits.

The main stem of the Yuba River includes two USACE debris dams. USACE's Englebright Dam (RM 24.0) was constructed in 1941 by the California Debris Commission, a unit of USACE, which now owns and operates the dam and related facilities. The primary purpose of the dam when constructed was to trap sediment derived from anticipated hydraulic mining operations in the Yuba River watershed. Large-scale hydraulic mining in the Sierra Nevada was halted in 1884, but resumed on a limited basis until the 1930s. Although no hydraulic mining in the upper Yuba River watershed resumed after construction of the dam, the historical mining sites continued to contribute sediment to the river. The dam forms USACE's Englebright Reservoir, which is about 9 miles long and has a gross storage capacity of about 70,000 ac-ft.

Similar to USACE's Englebright Dam, USACE's Daguerre Point Dam was constructed by the California Debris Commission to prevent hydraulic mining debris from the Yuba River watershed from flowing into the Feather and Sacramento rivers. The dam, which was constructed in 1906 and rebuilt in 1964 following damage from floods, has no appreciable storage capacity.

The lower Yuba River refers to the 24-mile section of the river between USACE's Englebright Dam and the confluence with the Feather River southwest of Marysville. Instream flow requirements are specified for the lower Yuba River at the Smartville Gage, located approximately 2,000 feet downstream from USACE's Englebright Dam, and at USGS' Marysville Gage (RM 6.2). Below the Smartville Gage, accretions, local inflow, and runoff contribute, on average, approximately 200,000 ac-ft per year to the lower Yuba River. Much of the accretion flows are contributed by Deer and Dry creeks. The total drainage area of Deer

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Creek is 89 square miles and the total drainage area of Dry Creek is 108 square miles. Deer Creek flows into the Yuba River at approximately RM 22.7. Dry Creek flows into the Yuba River at RM 13.6, approximately 2 miles upstream of USACE's Daguerre Point Dam. The flow in Dry Creek is regulated by Browns Valley Irrigation District's (BVID) operation of Merle Collins Reservoir, located on Dry Creek about 8 miles upstream from its confluence with the Yuba River. In recent years, irrigation diversions from the lower Yuba River at USACE's Daguerre Point Dam and upstream at BVID's Pumpline Diversion Facility have totaled approximately 300,000 ac-ft per year. Irrigation diversions are expected to increase to about 350,000 ac-ft annually when the new Wheatland Canal service area is fully developed.

3.1.2 Overview of Feather River Basin, Sacramento River, and Delta

The Yuba River discharges into the Feather River, whose basin encompasses a broad variety of terrain, climate, historic use, and flora and fauna. Over 80 percent of the upper Feather River watershed is federally owned land managed by the Forest Service as part of the PNF. Approximately 11 percent of the upper Feather River watershed is alluvial valleys that are predominantly privately owned and used for livestock grazing. The rest of the land is used for other agricultural purposes, urban development, and wildlife habitat.

Water originating from the Feather River drainages provides significant amounts of water to California's State Water Project (SWP), which provides water to meet urban and agricultural demands. The Feather River Basin also produces significant forest and agricultural outputs.

Flow in the lower Feather River is controlled mainly by releases from the Oroville Reservoir, the second largest reservoir in the Sacramento River basin and part of the California Department of Water Resources (CDWR) Oroville Project (FERC Project No. 2100), and by flows from the Yuba and Bear rivers. As with many Sierra Nevada foothill streams and rivers, the Feather River Basin has historically been influenced by large-scale gold mining operations. To a lesser degree, gold mining operations still continue within the western slope watersheds.

The Feather River drains into the Sacramento River, the largest river in California, which provides water for municipal, agricultural, recreational, and environmental purposes throughout northern and southern California.

3.2 Stream Reaches

Provided here (Table 3.2-1) are descriptions of stream reaches potentially affected by continued Project operations.

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Table 3.2-1. Stream Reaches Potentially Affected by Continued Project Operations

River	Reach	Description
DIRECT/INDIRECT EFFECTS		
North Yuba River (18.1 River Miles)	New Bullards Bar Reservoir	Approximately 15.8 miles of the North Yuba River canyon from the normal maximum water surface elevation of the reservoir at RM 18.1 to New Bullards Bar Dam at RM 2.3.
	New Bullards Bar Dam Reach	Approximately 2.3 miles of the North Yuba River from the New Bullards Bar Minimum Flow Release Powerhouse at RM 2.3 to the confluence of the North Yuba River with the Middle Yuba River at RM 0.0.
Oregon Creek (4.2 River Miles)	Log Cabin Diversion Dam Impoundment	Approximately 0.1 mile of Oregon Creek canyon from the normal maximum water surface elevation of the impoundment at RM 4.2 to the dam at RM 4.1.
	Log Cabin Diversion Dam Reach	Approximately 4.1 miles of Oregon Creek from RM 4.1 to the confluence of Oregon Creek with the Middle Yuba River.
Middle Yuba River (12.1 River Miles)	Our House Diversion Dam Impoundment	Approximately 0.1 mile of the Middle Yuba River canyon from the normal maximum water surface elevation of the impoundment at RM 12.1 to the dam at RM 12.0.
	Our House Diversion Dam Reach	Approximately 7.5 miles of the Middle Yuba River from Our House Diversion Dam at RM 12.0 to the confluence of the Middle Yuba River and Oregon Creek at RM 4.5.
	Oregon Creek Reach	Approximately 4.5 miles of the Middle Yuba River from the confluence of the Middle Yuba River and Oregon Creek at RM 4.5 to the confluence of the Middle Yuba River with the North Yuba River at RM 0.0.
Yuba River (28.3 River Miles)	Middle/North Yuba River Reach	Approximately 5.8 miles of the Yuba River from the confluence of the North Yuba River with the Middle Yuba River at RM 39.7 to the New Colgate Powerhouse at RM 33.9.
	New Colgate Powerhouse Reach	Approximately 1.7 miles of the Yuba River from New Colgate Powerhouse at RM 33.9 to the normal maximum water surface elevation of USACE’s Englebright Reservoir at RM 32.2.
	USACE’s Englebright Reservoir	Approximately 8.2 miles of the Yuba River canyon from the normal maximum water surface elevation of USACE’s Englebright Reservoir at RM 32.2 to USACE’s Englebright Dam at RM 24.0.
	Narrows 2 Powerhouse Reach	Approximately 12.5 miles of the Yuba River from the Narrows 2 Powerhouse at the base of USACE’s Englebright Dam at RM 24.0 to the normal maximum water surface elevation of the impoundment formed by USACE’s Daguerre Point Dam at RM 11.5.
	USACE’s Daguerre Point Dam Impoundment	Approximately 0.1 mile of the Yuba River from the normal maximum water surface elevation of the impoundment at RM 11.5 to the dam at RM 11.4.
CUMULATIVE EFFECTS		
Yuba River (11.4 miles)	USACE’s Daguerre Point Dam Reach.[1]	Approximately 11.4 miles of the Yuba River from the USACE’s Daguerre Point Dam to the confluence of the Yuba River and the Feather River at RM 0.0.

[1] In the Lower Yuba River Accord proceeding, this reach and the “Narrows 2 Powerhouse Reach” have been referred to as the “above USACE’s Daguerre Point Dam” and “below USACE’s Daguerre Point Dam” reaches.

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Appendix D to this PAD includes a set of 1:24,000 scale maps that show the Project facilities and stream reaches described above. The maps also include river miles and local features such as tributaries, roads, facilities (e.g., dams, gages, and powerhouses), topography, and the FERC Project Boundary.

3.3 Climate

The Project Region,[11] which includes the sub-basins shown in Figure 3.1-1, encompasses two different climate terrains. One typifies the high Sierra climes of the eastern Project Region, and the other typifies the Central Valley lowlands in the western Project Region. The transition zone in between these two climate terrains shares characteristics of each of these terrains. The lower elevation areas, west and south of New Bullards Bar Reservoir, experience hot, dry summers and cool winters with substantial rainfall, but never appreciable snowfall. The higher elevation areas constitute much of the North, Middle, and South Yuba river watersheds, and are characterized by significant winter snowfall accumulation at elevations over 4,000 to 5,000 feet. The snowpack then melts during the spring and early summer months, eventually giving way to warm, dry summers. Areas of moderate elevation in the Project Region (between 500 and 4,000 feet) experience a mélange of the high-elevation and low-elevation climate: predominantly rainy winters with heavier precipitation than low-elevation areas, occasional snowfall with short-lived accumulation, and the ubiquitous warm, dry summers. Overall, the climate within the Project Region has the typical characteristics of a mixed-elevation Mediterranean climate.

The National Weather Service (NWS) maintains a monitoring station (Number 048207) located at Sierra City, California, at an elevation of approximately 4,700 feet, located near the confluence of the North Yuba River and Haypress Creek, which is representative of the Project Region's higher-elevation climate. July air temperatures at Sierra City range from an average high of 86.6 degrees Fahrenheit (°F) to an average low of 52.6°F. The average high temperature for January is 47.2°F, while the average low temperature is 28°F. Average annual snowfall at Sierra City totals 100.4 inches in depth, 84 percent of which occurs from December through March. Annual mean total precipitation at Sierra City is 63.83 inches, most of which (65%) occurs from December through March. The summer months (June through August) produce just 3 percent of the total annual average precipitation. The remaining 32 percent of precipitation in the area occurs during spring and fall.

The NWS monitoring station at Marysville (Number 045385) provides a climate history representative of the lower-elevation areas in the Project Region. These areas occupy the eastern Central Valley and rolling, western Sierra foothills, and can experience high summer temperatures, mostly unmitigated by the "Delta breezes" that are present further south and west in California's Central Valley. July air temperatures at Marysville average a high of 96.4°F, and a low of 62.0°F. Average January high and low temperatures are 54.1°F and 38.0°F, respectively. Annual average precipitation totals 21.59 inches, and falls exclusively as rain, with 67 percent falling during the winter months from December through March. June through

[11] For the purpose of this document, Project Region is defined as the area surrounding the Project on the order of a county or national forest.

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August precipitation averages only one-quarter of an inch, generally resulting from rare summer thunderstorms (WRCC 2009).

3.4 Major Land Uses

Lands within the Project-affected sub-basins have a patchwork of ownership. At the upper elevations above the USACE's Englebright Dam, the Forest Service manages a majority of the public land as parts of the PNF and TNF. Other land managers and owners above elevation 3,000 feet include private corporations such as timber companies. Below elevation 3,000 feet, land is predominantly privately owned, with small portions owned and managed by the Forest Service as part of the TNF, or administered by United States Department of Interior (USDOI) Bureau of Land Management (BLM) as part of the Sierra Resource Management Area (SRMA).

The portions of land within the Project Area[12] managed by federal agencies are administered according to their respective resource management plans: TNF Land and Resource Management Plan (LRMP) for the Forest Service and the Sierra Resource Management Plan (SRMP) for BLM. The Forest Service LRMP divides the TNF into 109 Management Areas. The Project occupies lands within six of the Management Areas (Forty-Niner, Pendola, Oregon, Bullards, Moonshine, and South Yuba). The Project Area within the TNF boundary is predominantly managed for timber, grazing, and recreation.

BLM's SRMP was developed to address necessary administrative changes in consumptive uses, and the need for BLM to coordinate resource protection protocols between Nevada and California agencies.

The counties are the primary agencies for establishing land use policies for private land within the river basins and sub-basins. The county general plans provide the land use policies for each county. The Yuba County General Plan was adopted in 1996, and is currently being revised. Nevada County and Sierra County also adopted their general plans in 1996. The Yuba County General Plan features two community-specific plans near the Project Area: Camptonville (population 242), and Log Cabin (population 282). In general, the majority of Yuba, Sierra and Nevada county lands in the Project Region upstream of USACE's Englebright Reservoir are designated for agricultural, timber, grazing, and open space uses. At the lower elevations of the Project-affected sub-basins, downstream of USACE's Englebright Reservoir, the lands are more often designated as residential and agricultural.

Refer to Section 7.9 of this PAD for a detailed description of land use in the Project Vicinity.

3.5 Major Water Uses

The Central Valley Regional Water Quality Control Board (CVRWQCB), in its Water Quality Control Plan Report (Basin Plan) (CVRWQCB 1998), identifies streams and watersheds with

[12] For the purposes of this document, the Project Area is defined as the area within the FERC Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within about 0.25 mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature or structure.

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unique Hydro Unit (HU) numbers.[13] The Project and the area downstream of the Project falls within two Basin Plan HUs: 1) HU 517, which includes all waters of the North, Middle and South Yuba rivers upstream of USACE's Englebright Dam including New Bullards Bar Reservoir; and 2) HU 515.3, which includes the Yuba River from USACE's Englebright Dam to the Feather River. Designated beneficial uses of surface water in these units are shown by HU in Table 3.5-1.

Table 3.5-1. Beneficial uses of surface water within the Project Area and the area downstream as designated by HU in the Basin Plan.

Designated Beneficial Use Description from Basin Plan, Section II		Designated Beneficial Use by HU from Basin Plan, Table II-1		
		Use	Sources to USACE's Englebright Reservoir	USACE's Englebright Dam to the Feather River
			HU 517	HU 515.3
Municipal and Domestic Supply (MUN)	Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.	MUNICIPAL AND DOMESTIC SUPPLY	Existing	--
Agricultural Supply (AGR)	Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation (including leaching of salts), stock watering, or support of vegetation for range grazing.	IRRIGATION	Existing	Existing
		STOCK WATERING	Existing	Existing
Industry	Uses of water for industrial activities that depend primarily on water quality.	INDUSTRIAL PROCESS SUPPLY (PROC)	--	--
	Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.	INDUSTRIAL SURVICE SUPPLY (IND)	--	--
	Hydropower generation	POWER (POW)	Existing	Existing
Water Contact Recreation (REC-1)	Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.	CONTACT	Existing	Existing
		CANOEING AND RAFTING	Existing	Existing
Non-Contact Water Recreation (REC-2)	Uses of water for recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach-combing, camping, boating, tide-pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.	OTHER NON-CONTACT	Existing	Existing
Freshwater Habitat[1]	Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	WARM[1]	--	Existing
	Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	COLD[1]	Existing	Existing

[13] Basin Plan Hydro Unit (HU) codes do not correspond to Hydrologic Unit Code (HUC) numbers as defined by the Water Resources Council; the Regional Water Quality Control Boards (RWQCB) use the HU codes primarily for state-level water quality purposes.

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Table 3.5-1. (continued)

Designated Beneficial Use Description from Basin Plan, Section II		Designated Beneficial Use by HU from Basin Plan, Table II-1		
		Use	Sources to USACE's Englebright Reservoir	USACE's Englebright Dam to the Feather River
			HU 517	HU 515.3
Migration of Aquatic Organisms (MGR)	Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.	WARM[2]	--	Existing
		COLD[3]	--	Existing
Spawning (SPWN)	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.	WARM[2]	--	Existing
		COLD[3]	Existing	Existing
Wildlife Habitat (WILD)	Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation or enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.	WILDLIFE HABITAT	Existing	Existing

Source: CVRWQCB 1998
[1] Resident does not include anadromous. Any hydrologic unit with both WARM and COLD beneficial use designations is considered COLD water bodies for the application of water quality objectives.
[2] Striped bass, sturgeon and shad.
[3] Salmon and steelhead.

Refer to Section 7.2 of this PAD for a detailed description of water use in the Project Vicinity.

3.6 Project-Affected Basin Streams and Tributaries

Table 3.6-1 provides a list of named tributaries and named secondary tributaries to the Yuba River. Some of the tributaries presented here are intermittent or ephemeral in nature and contribute water to the Yuba River only part of the year.

Table 3.6-1. Streams and tributaries to the North, Middle, South, and main stem Yuba River.

Tributary	Secondary Tributaries
UPSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT	
North Yuba River	
	Salmon Creek
	Haypress Creek
	Jim Crow Creek
	Downie River
	Woodruff Creek
	Goodyears Creek
	Fiddle Creek
	Cherokee Creek
	Canyon Creek
Middle Yuba River	
	Pass Creek
	East Fork Creek
	Wolf Creek
	Bloody Run
	Kanaka Creek
	Indian Creek
South Yuba River	
	Rattlesnake Creek
	Fordyce Creek

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Table 3.6-1. (continued)

Tributary	Secondary Tributaries
UPSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT	
	Rucker Creek
	Fall Creek
	Canyon Creek
	Scotchman Creek
	Poorman Creek
	Humbug Creek
	Spring Creek
	Rock Creek
	Rush Creek
	Shady Creek
	French Corral Creek
WITHIN THE YUBA RIVER DEVELOPMENT PROJECT AREA	
North Yuba River	
	Slate Creek
	Deadwood Creek
	Hampshire Creek
	Lost Creek
	Empire Creek
	Indian Creek
	Mill Creek
	Willow Creek
	Little Oregon Creek
	Cottage Creek
Middle Yuba River	
	Grizzly Creek
	Oregon Creek
	Moonshine Creek
	Clear Creek
	Yellowjacket Creek
Yuba River	
	Sweetland Creek
	Dobbins Creek
DOWNSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT	
	Woods Creek
	Deer Creek
	Sanford Creek
	Dry Creek

Source: USDOI, United States Geological Survey (USGS), National Hydrology Dataset (NHD).

Additional information about the morphology and hydrology of the Project Area is included in Sections 7.1 and 7.2 of this PAD.

3.7 Basin Dams

There are approximately 46 major dams and diversions in the Yuba River Basin, with a combined storage capacity of 1,358,113 ac-ft of water (Table 3.7-1). Thirty-eight of these dams are upstream of the Project and account for about 17 percent of the total storage capacity. Within the Project Area, there are two major dams with a combined storage capacity of 1,011,103 ac-ft (75% of the combined storage capacity of the basin). Seven dams are downstream of the Project; these can store about 8 percent of the combined storage capacity of the basin.

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Table 3.7-1. Owners and capacities of dams and diversions in the Yuba River Basin.

Owner	FERC Project No.	River/Tributary	Dam / Diversion	Reservoir Gross Storage Capacity (ac-ft)
UPSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT				
North Yuba River				
SFWPA	2088	Slate Creek	Slate Creek Diversion Dam	none
Middle Yuba River				
NID	2266	Middle Yuba River	Jackson Meadows Dam	67,435
NID	2266	Middle Yuba River	Milton Main and South Dam	295
NID	2266	Wilson Creek	Wilson Creek Diversion Dam	none
South Yuba River				
NID	2266	Jackson Creek	Jackson Lake Dam	1,330
NID	2266	Canyon Creek	French Lake Dam	13,940
NID	2266	Canyon Creek	Faucherie Lake Dam	3,980
NID	2266	Canyon Creek	Sawmill Lake Dam	3,034
NID	2266	Canyon Creek	Bowman-Spaulding Conduit Diversion Dam	none
NID	2266	Canyon Creek	Bowman Lake Dam	68,383
NID	2266	Texas Creek	Texas Creek Diversion Dam	none
PG&E	2310	Texas Creek	Upper Rock Lake Dam	207
PG&E	2310	Texas Creek	Lower Rock Lake Dam	48
PG&E	2310	Texas Creek	Culbertson Lake Dam	3,150
PG&E	2310	Texas Creek	Upper Lindsey Lake Dam	180
PG&E	2310	Texas Creek	Middle Lindsey Lake Dam	1,100
PG&E	2310	Texas Creek	Lower Lindsey Lake Dam	293
PG&E	2310	Fall Creek	Feeley Lake Dam	739
PG&E	2310	Fall Creek	Carr Lake Dam	150
NID	2266	Clear Creek	Clear Creek Diversion	none
NID	2266	Fall Creek	Fall Creek Diversion Dam	none
NID	2266	Trap Creek	Trap Creek Diversion	none
PG&E	2310	Rucker Creek	Blue Lake Dam	1,163
PG&E	2310	Rucker Creek	Rucker Lake Dam	648
NID	2266	Rucker Creek	Rucker Creek Diversion	none
PG&E	2310	Unnamed Creek	Fuller Lake Dam	1,127
PG&E	2310	Fordyce Creek	Meadow Lake Dam	4,935
PG&E	2310	Fordyce Creek	White Rock Lake Dam	570
PG&E	2310	Fordyce Creek	Lake Sterling Dam	1,764
PG&E	2310	Fordyce Creek	Fordyce Lake Dam	49,903
PG&E	2310	South Yuba River	Kidd Lake Dam	1,505
PG&E	2310	South Yuba River	Upper Peak Lake Dam	1,736
PG&E	2310	South Yuba River	Lower Peak Lake Dam	484
PG&E	2310	South Yuba River	Lake Spaulding Dam	75,912
YCWA	--	Dobbins Creek	Lake Francis Dam	1,905
WITHIN YUBA RIVER DEVELOPMENT PROJECT AREA				
North Yuba River				
YCWA	2246	Middle Yuba River	Our House Diversion Dam	none
YCWA	2246	Oregon Creek	Log Cabin Diversion Dam	none
YCWA	2246	North Yuba River	New Bullards Bar Dam	966,103
USACE	--	Yuba River	Englebright Dam	70,000
DOWNSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT				
Yuba River				
NID	--	South Fork Deer Creek	Cascade Canal Diversion Dam	none
NID	--	Deer Creek	Scotts Flat Dam	49,000
NID	--	Deer Creek	Deer Creek Diversion Dam	none
Lake Wildwood Assoc.	--	Deer Creek	Anthony House Dam	3,840
BVID	3075	Dry Creek	Virginia Ranch Dam	57,000
USACE	--	Yuba River	Daguerre Point Dam	none

BVID= Browns Valley Irrigation District, NID=Nevada Irrigation District, SFWPA=South Feather Water and Power Association

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3.8 List of Attachments

None.

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SECTION 4

MAJOR APPLICABLE LAWS

This section provides a discussion of major federal (Section 4.1) and State of California (Section 4.2) laws that apply to the relicensing of Yuba County Water Agency's (YCWA or Licensee) Yuba River Development Project (Project), and Licensee's plan to comply with each of these laws during the Relicensing proceeding.[1]

4.1 Federal Laws

4.1.1 Federal Power Act of 1920, as Amended (16 USC §§ 791-828c)

The Federal Power Act (FPA) is the most important legislation regarding hydropower relicensing. The FPA provides the Federal Energy Regulatory Commission (FERC) with the exclusive authority to license all non-federal hydroelectric projects that are located on navigable waterways or on federal lands.

Several sections of the FPA are particularly relevant to relicensing. Section 4(e) contains two key standards. The first is equal consideration, which requires that FERC give equal consideration, but not necessarily equal weight, to developmental and environmental values when considering issuing a license. The second is mandatory conditioning authority, which applies to projects located on "federal reservations," and provides an opportunity for the federal agency with the responsibility for managing the reservation to file with FERC terms and conditions to protect the reservation that FERC must include verbatim in any license issued for the project.

At this time, Licensee believes that one land management agency may have section 4(e) mandatory conditioning authority over the Project: the United States Department of Agriculture (USDA) Forest Service (Forest Service) for affected United States-owned land managed by the Forest Service as part of the Plumas National Forest (PNF) and the Tahoe National Forest (TNF). Licensee anticipates the Forest Service will exercise its authority during the relicensing proceeding, as appropriate.

Section 10(j) of the FPA states that FERC must include conditions to adequately protect, mitigate damage to, and enhance fish and wildlife and their habitats, based on recommendations by state and federal fish and wildlife agencies. In general, FERC must incorporate these agencies' recommendations in the license conditions unless FERC determines that a recommendation is inconsistent with the purposes or requirements of the FPA or other applicable law. In this regard, section 10(j) recommendations are distinguished from mandatory conditions filed pursuant to section 4(e) of the FPA. Licensee expects that the appropriate federal and state

[1] While not specifically required to be included in the Pre-Application Document (PAD), Licensee has included this description of major applicable laws in this PAD to better inform Relicensing Participants as the relicensing proceeding begins.

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fish and wildlife agencies will make section 10(j) recommendations during the relicensing proceeding, as appropriate.

Section 10(a) of the FPA requires FERC to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project. To this end, FERC accords section 10(a) comprehensive plan status to any federal or state plan that meets all of the following three criteria: 1) is a comprehensive study of one or more of the beneficial uses of a waterway or waterways; 2) specifies the standards, the data, and the methodology used; and 3) is filed with FERC. Section 5.0 of this Pre-application Document lists comprehensive plans that qualify for section 10(a) status. Licensee will evaluate Project consistency with these plans during the relicensing proceeding.

Section 18 of the FPA gives the Secretaries of the United States Department of Commerce (USDOC) and the United States Department of the Interior (USDOI) the authority to prescribe such fishways as deemed necessary. Section 1701(b) of the Energy Policy Act of 1992 provides guidance on the elements that are appropriate for inclusion in a fishway definition. The Secretaries may exercise their authorities under these statutes during the relicensing proceeding.

4.1.2 Endangered Species Act of 1973, as Amended (16 USC §§ 1531 et seq.)

The main purpose of the federal Endangered Species Act (ESA) of 1973, as amended, is to protect and conserve endangered and threatened species and their habitats. An “endangered” species under the ESA (referred to in this Pre-application Document as FE) is one in danger of extinction throughout all or a significant portion of its range. A “threatened” species under the ESA (referred to in this Pre-application Document as FT) is one that is likely to become endangered within the foreseeable future. In addition, a species may be officially proposed in the Federal Register for listing under the ESA as endangered or threatened (FPE or FPT, respectively), or be a candidate for listing (CE or CT, respectively).[2]

The ESA is administered by the Secretary of the Interior through the USDOI Fish and Wildlife Service (USFWS) for most species, and by the Secretary of Commerce through the National Oceanic and Atmospheric Association (NOAA), National Marine Fisheries Service (NMFS) for marine and anadromous species.

Three sections of the ESA are most applicable to the Project. Section 4 establishes a complex process for listing FE and FT species, identifying their critical habitats (as well as evolutionary significant units, or ESUs, and Distinct Population Segments, or DPSs), and developing and implementing recovery plans. Section 7 of the ESA requires federal agencies to consult with the

[2] The Sacramento USFWS office no longer maintains a list of “species of concern.” However, other agencies and organizations may maintain a list of what they consider to be at-risk species. These may include species on the American Fisheries Society's list of Protected Fishes of the United States and Canada, state lists of protected species, and species identified as imperiled or vulnerable by state Natural Heritage Programs and various conservation organizations, such as The Nature Conservancy. These species, unless otherwise indicated, have no legal status.

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USFWS or NMFS to ensure that any action that they authorize, fund, or carry out is not likely to jeopardize the continued existence of any FE or FT species, or result in the destruction or adverse modification of critical habitat for these listed species. Finally, Section 9 of the ESA prohibits any person from "taking" a FE or FT species.

FERC is the lead federal agency (or "action agency" under the ESA) for relicensing of the Project and, therefore, must consult with USFWS and NMFS to ensure that FERC's actions and authorizations do not jeopardize the continued existence of any FE or FT species or adversely affect any designated critical habitat. Jeopardy exists when an action would "appreciably reduce the likelihood of both the survival and recovery of a listed species" (50 CFR § 402.02). Consultation typically is initiated by a request to USFWS and NMFS for an inventory of FE and FT species as well as species officially proposed by USFWS or NMFS for listing as endangered or threatened that may be present in the Project Region.[3] FERC then prepares a biological assessment (BA), to determine whether these listed species or their critical habitats are likely to be adversely affected by the federal action. Under current regulations, if FERC's BA indicates that the relicensing may have an adverse effect on a listed species or its critical habitat, formal consultation with USFWS or NMFS is required. At the end of the consultation process, USFWS or NMFS issues a biological opinion (BO), which specifies whether or not the action will place a FE or FT species or critical habitat in jeopardy. If a jeopardy opinion is issued, USFWS or NMFS must include reasonable and prudent alternatives to the action. A non-jeopardy opinion may be accompanied by an "incidental take statement" that specifies impacts of the taking, mitigation measures, and terms and conditions for implementation of the mitigation measures.

Section 7.7 of this Pre-application Document discusses species listed under the ESA and designated critical habitats that Licensee will address in the relicensing proceeding.

As provided for in 18 CFR § 5.5(e), Licensee in its Notice of Intent (NOI) to file an application for a new license intends to request that FERC designate Licensee as FERC's non-federal representative for purposes of consultation under Section 7 of the ESA and the joint agency regulations thereunder at 50 CFR Part 402, and Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act and the implementing regulations at 50 CFR § 600.920.

4.1.3 National Historic Preservation Act (16 USC §§ 470 et seq.)

The National Historic Preservation Act (NHPA) of 1966 established the Advisory Council on Historic Preservation (ACHP); authorized the Secretary of the Interior to maintain the National Register of Historic Places (NRHP); directed the Secretary to approve state historic preservation programs that provided for a State Historic Preservation Officer (SHPO); established a National Historic Preservation Fund program; and codified the National Historic Landmarks program.

Section 106 of the NHPA requires that federal agencies take into account the effects of their actions on properties that may be listed on the NRHP or eligible for such listing, and afford the ACHP a reasonable opportunity to comment. To determine if an undertaking could affect

[3] For the purposes of this document, Project Region is defined as the area surrounding the Project on the order of a county or national forest.

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NRHP-eligible properties, all cultural sites (i.e., archeological, historical, traditional cultural, and architectural properties) that could be affected by the undertaking must be inventoried and evaluated for inclusion in the NRHP.

If there would be an adverse impact on historic properties, a Historic Properties Management Plan (HPMP) may be prepared to avoid or mitigate effects. FERC must consult with the ACHP, SHPO, Tribal Historic Preservation Officers, the National Park Service (NPS), members of the public, federal land management agencies, and affected Native American tribes, where applicable.

As provided in 18 CFR § 5.5(e), Licensee in its NOI intends to request that FERC designate Licensee as FERC's non-federal representative for purposes of initiating consultation under Section 106 of the NHPA and the implementing regulations at 36 CFR § 800.2(c)(4).

4.1.4 Wild and Scenic Rivers Act, as Amended (16 USC §§ 1271-1287)

Rivers protected under the Wild and Scenic Rivers Act are designated as such for their outstanding remarkable scenic, recreational, geologic, biological, historic, cultural, or other similar values. According to the National Wild and Scenic Rivers system, these rivers shall be preserved in free-flowing condition, and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The goal of the wild and scenic designation is not to prevent use of the river, but rather to manage the river and its existing resources so they are compatible with use.

The Project Region does not include any areas that have been included in the federal Wild and Scenic Rivers program. In 1999, the Forest Service recommended for Wild and Scenic River designation: 1) the 45 miles of North Yuba River upstream of New Bullards Bar Reservoir (elevation unspecified); 2) Canyon Creek, a tributary to the North Yuba River; and 3) the South Yuba River between Lake Spaulding and Point Defiance. All of these river segments are upstream of the Project Area.[4] Though legislation to confirm this recommendation has not yet been proposed by Congress, the Forest Service currently manages these rivers to protect their wild and scenic values.

4.1.5 Wilderness Act of 1964, as Amended (16 USC §§ 1131-1136.)

The Project Region does not include any areas that have been included in or are proposed for inclusion in the federal Wilderness Act.

[4] For the purposes of this document, Project Area is defined as the area within the FERC Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within about 0.25 mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature or structure.

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4.1.6 Coastal Zone Management Act, as Amended (16 USC §§ 1451-1456)

Section 307(C)(3) of the Coastal Zone Management Act requires that all federally licensed and permitted activities be consistent with approved state Coastal Zone Management Programs. If a project is located within a coastal zone boundary or if a project affects a resource located in the boundaries of a designated coastal zone, the applicant must certify that the project is consistent with the state Coastal Zone Management Program.

The Project is not located within the boundary of a designated Coastal Zone Management Program, nor would continued Project operation and maintenance (O&M) affect resources within the boundary of a designated coastal zone.

4.1.7 National Environmental Policy Act of 1969 (42 USC §§ 4321 et seq.)

The National Environmental Policy Act (NEPA) of 1969 identifies environmental protection as a major national policy objective. NEPA requires all federal agencies involved in the permitting of activities affecting the environment, such as the issuance of a license for the Project, to evaluate environmental effects and the significance of these effects. The NEPA process is to be used to identify and assess the reasonable alternatives to proposed actions, and federal agencies are to use all practical means to restore and enhance the quality of the human environment and to avoid or minimize any possible adverse effects of their actions upon the quality of the human environment. FERC is the lead federal agency in the licensing process; other federal agencies may voluntarily act as cooperating agencies in the FERC's analysis of environmental effects. FERC is bound by the statutory requirements of NEPA and maintains a policy of adhering to the objectives of the NEPA.

An Environmental Assessment (EA) or Environmental Impact Statement (EIS) is typically the NEPA document prepared for an application for a new license. In rare circumstances, FERC prepares an EIS after preparation of an EA.

4.1.8 Americans with Disabilities Act of 1990 (Public Law 101-336)

Public recreation facilities must comply with the Americans with Disabilities Act (ADA) of 1990, as amended. FERC, however, has no statutory role in implementing or enforcing the ADA as it applies to its licenses. A licensee's obligation to comply with the ADA exists independent of its FERC project license. Nevertheless, during the relicensing proceeding Licensee intends to consult with the Forest Service and others with jurisdiction over recreation facilities regarding compliance with the ADA.

4.1.9 Clean Water Act of 1970, as Amended (33 USC §§ 1251 et seq.)

Congress delegated the primary responsibility for implementing the Clean Water Act (CWA) of 1970, as amended, to the United States Environmental Protection Agency (EPA), and the EPA

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has designated the State Water Resources Control Board (SWRCB) as the water pollution control agency with authority to implement the CWA in California (see Water Code § 13160). The SWRCB and the State's nine Regional Water Quality Control Boards (RWQCBs) work in a coordinated manner to implement and enforce the CWA, as provided for in the State's Porter-Cologne Water Quality Act. The Project is within the jurisdiction of the Central Valley Regional Water Quality Control Board (CVRWQCB).

The CWA requires that the EPA adopt water quality standards for surface waters within the United States, and that these standards be reviewed and revised, if necessary, at least every 3 years. The SWRCB carries out its water quality protection authority through the application of specific Regional Water Quality Control Plans, formulated and adopted by the RWQCBs, which submit these plans to the SWRCB for review. The SWRCB reviews the plans, revises them as necessary, and approves the plans (Water Code § 13245).

State water quality standards "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses" [33 USC § 1313(C)(2)(A)]. RWQCB basin plans provide standards through: 1) a designation of existing and potential beneficial uses; 2) water quality objectives to protect those beneficial uses; and 3) programs of implementation needed to achieve those objectives. The RWQCBs are required to consider a number of items when establishing water quality standards, including: 1) past, present, and probable future beneficial uses; 2) environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto; 3) water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality in the area; and 4) economic considerations.

SWRCB's management goals are specified in CVRWQCB's *Water Quality Control Plan (Basin Plan) for the Sacramento and San Joaquin Rivers*, the fourth edition of which was initially adopted in 1998 and which was most recently revised in 2009 (CVRWQCB 1998). The Basin Plan formally sets forth designated existing and potential beneficial uses and water quality objectives for areas including the Yuba River.

The Basin Plan divides the area in the Project Vicinity[5] into two Hydro Units (HU): 1) HU 517, which includes the Yuba River and its tributaries upstream of the United States Army Corps of Engineers' (USACE) Englebright Reservoir; and 2) HU 515.3, which includes the Yuba River from USACE's Englebright Dam to the Feather River. Table 4.1.9-1 lists designated beneficial uses in the river.

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[5] For the purposes of this document, Project Vicinity is defined as the area surrounding the Project on the order of a United States Geological Survey (USGS) 1:24,000 topographic quadrangle.

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Table 4.1.9-1. Beneficial uses of surface water within the Project and the area downstream as designated by HU in the Basin Plan.

Designated Beneficial Use Description from Basin Plan, Section II		Designated Beneficial Use by HU from Basin Plan, Table II-1		
		Use	**Yuba River from Headwaters to USACE's Englebright Dam**	**Yuba River from USACE's Englebright Dam to Feather River**
			HU 517	**HU 513.3**
Municipal and Domestic Supply (MUN)	Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.	MUNICIPAL AND DOMESTIC SUPPLY	Existing	--
Agricultural Supply (AGR)	Uses of water for farming, horticulture, or ranching including, but not limited to, irrigation (including leaching of salts), stock watering, or support of vegetation for range grazing.	IRRIGATION	Existing	Existing
		STOCK WATERING	Existing	Existing
Industrial Process Supply (PRO)	Uses of water for industrial activities that depend primarily on water quality.	PROCESS	--	--
Industrial Service Supply (IND)	Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well repressurization.	SERVICE SUPPLY	--	--
		POWER	Existing	Existing
Water Contact Recreation (REC-1)	Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.	CONTACT	Existing	Existing
		CANOEING AND RAFTING	Existing	Existing
Non-Contact Water Recreation (REC-2)	Uses of water for recreational activities involving proximity to water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach-combing, camping, boating, tide-pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.	OTHER NON-CONTACT	Existing	Existing
Warm Freshwater Habitat (WARM)	Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	WARM[1]	--	Existing
Cold Freshwater Habitat (COLD)	Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.	COLD[1]	Existing	Existing
Migration of Aquatic Organisms (MGR)	Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.	WARM[2]	--	Existing
		COLD[3]	--	Existing
Spawning (SPWN)	Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.	WARM[2]	--	Existing
		COLD[3]	Existing	Existing

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Table 4.1.9-1. (continued)

Designated Beneficial Use Description from Basin Plan, Section II		Designated Beneficial Use by HU from Basin Plan, Table II-1		
		Use	Yuba River from Headwaters to USACE's Englebright Dam	Yuba River from USACE's Englebright Dam to Feather River
			HU 517	HU 513.3
Wildlife Habitat (WILD)	Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation or enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, or invertebrates), or wildlife water and food sources.	WILDLIFE HABITAT	Existing	Existing

Source: CVRWQCB 1998
[1] Resident does not include anadromous. Any hydrologic unit with both WARM and COLD beneficial use designations is considered COLD water body by the SWRCB for the application of water quality objectives.
[2] Striped bass, sturgeon, and shad.
[3] Salmon and steelhead.

In addition, Section 303(d) of the CWA requires that every 2 years each State submit to the EPA a list of rivers, lakes, and reservoirs in the State for which pollution control or requirements have failed to provide for water quality. The SWRCB and CVRWQCB work together to research and update the list for the State of California. Based on a review of this list and its associated Total Maximum Daily Load (TMDL) Priority Schedule, in the Project Vicinity the following surface water bodies' water have been identified by the SWRCB as CWA § 303(d) State Impaired (SWRCB 2006):

- USACE's Englebright Reservoir for mercury
- Deer Creek, a tributary to the Yuba River, for pH
- Kanaka Creek, a tributary to the Middle Yuba River, for arsenic

There are currently no approved TMDL plans for the Yuba River.

Additional surface waters of the Yuba River watershed are being considered for addition to the CWA § 303(d) list. In 2009, the CVRWQCB recommended including New Bullards Bar Reservoir, the North Fork Yuba River between New Bullards Bar and USACE's Englebright Reservoir, the Middle Yuba River, the South Yuba River from Lake Spaulding to USACE's Englebright Reservoir, and the Lower Yuba River from USACE's Englebright Reservoir to the Feather River in the list as impaired for mercury (CVRWQCB 2009). The CVRWQCB also recommended that the South Yuba River from Lake Spaulding to USACE's Englebright Reservoir be listed as impaired for temperature and the lower Yuba River downstream of USACE's Englebright Dam be listed as impaired for iron (CVRWQCB 2009). These recommendations considered and adopted by the SWRCB at the August 3, 2010 Board meeting and were advanced forward for approval by the United States EPA at that time (Azimi-Gaylon, pers. comm., 2010).

For hydropower relicensing, the most important section of the CWA is § 401, which requires that all applicants for federal licenses or permits must seek certification that the proposed project is in compliance with SWRCB-established water quality standards. Certification may be conditioned

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with other limitations to assure compliance with various CWA provisions. The SWRCB is the administrator of the CWA in the State of California, and FERC may not change or dismiss conditions included in a water quality certificate. No water quality certificate was issued for the current FERC license for the Project because the license was issued prior to the enactment of the CWA.

Licensee intends to file with the SWRCB a request for a Section 401 Water Quality Certificate within 60 days of the date that FERC issues its notice accepting Licensee's application for a new license and stating that the application is ready for environmental review.

4.1.10 Federal Land Policy and Management Act (16 USC § 1701)

Section 1701 of Title 16 of the United States Code is known as the Federal Land Policy and Management Act (FLPMA). The FLPMA, among other measures, allows for the management of federally owned lands by federal agencies. As discussed above, the FPA provides for mandatory conditioning by the federal agency that manages the reservation on which a project occurs.

As described in Section 3.1, some portions of the Project are located on federally owned lands managed by the Forest Service as part of PNF and TNF. Licensee anticipates that the Forest Service will exercise its authority, as appropriate.

4.1.11 Magnuson-Stevens Fishery Conservation and Management Act, as Amended (16 USC §§ 1801 et seq.)

The purpose of this Act is to conserve and manage, among other resources, anadromous fishery resources of the United States. The Act establishes eight Regional Fisheries Management Councils that prepare, monitor, and revise fishery management plans with the goal of achieving and maintaining the optimum yield from each fishery.

In California the Pacific Fisheries Management Council is responsible for achieving the objectives of the statute. The Secretary of Commerce has oversight authority. The Act was amended in 1996 to establish a new requirement to describe and identify "essential fish habitat" (EFH) in each fishery management plan. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH has been established by NMFS for waters in California supporting anadromous fish. The Act requires that all federal agencies, including FERC, consult with NMFS on all actions or proposed actions permitted, funded or undertaken by the agency that may adversely affect EFH. Adversely affect means any impact that reduces the quality and/or quantity of EFH. Comments from NMFS following consultation are advisory only; however, a written explanation must be submitted to NMFS if the implementing federal agency does not agree with NMFS' recommendations.

The Project includes two sections of river designated as EFH for Chinook salmon (*Oncorhynchus tshawytscha*). These are: 1) about 21 miles of the main stem of the Yuba River and Middle Yuba River from the Feather River to Our House Diversion Dam; and 2) about 41 miles of the North Yuba River from its confluence with the Middle Yuba River upstream to

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about Salmon Creek near Sierra City. (http://swr.nmfs.noaa.gov/hcd/cvschshd.htm accessed on January 25, 2009.)

4.2 California Laws

4.2.1 California Endangered Species Act (Fish and Game Code §§ 2050 – 2116) and Fully Protected Species Statutes (Fish and Game Code §§ 3505, 3511, 4700, 5050, 5515, and 5517)

The California Endangered Species Act (CESA), enacted in 1970, is codified in the Fish and Game Code (Division 3, Chapter 1.5). The CESA is patterned after the ESA and is administered by the California Department of Fish and Game (CDFG). Species may be listed under the CESA as endangered (referred to in this Pre-application Document as SE) or threatened (referred to in this Pre-application Document as ST).[6] If a project may affect species listed jointly under the ESA and CESA, CDFG must participate in ESA Section 7 consultation to the maximum extent possible. The federal BO will generally reflect both CDFG's and USFWS's or NMFS's findings, and the CDFG is encouraged by CESA to adopt, when possible, USFWS's or NMFS's BO as CDFG's own formal written determination on whether jeopardy exists. However, if CDFG ultimately does not agree with USFWS or NMFS, CDFG may issue an independent CESA determination.

In addition, the Fish and Game Code affords protection to some species not otherwise listed, referring to them as fully protected, or SFP. (See Fish & Game Code §§ 3505, 3511, 4700, 5050, 5515, 5517.)

Section 7.7 of this Pre-application Document discusses species listed under the CESA and the SFP statutes that Licensee will address in the relicensing proceeding.

4.2.2 California General Plan Law (Government Code §§ 65300 et seq.)

The General Plan Law of the State of California requires that each local government in California prepare a "general plan" that establishes the land use policies and details the likely future development patterns within the local government's boundaries. Zoning ordinances and subdivision procedures must be consistent with the general plan. There are seven required elements of the general plan: land use, circulation, housing, conservation, open space, noise, and safety. In general, governments can and often do add other elements to their general plans; consequently, general plans typically change over time. County land use plans do not apply to federally owned lands.

Section 7.9 of this Pre-application Document discusses general plans that Licensee will address in the relicensing proceeding.

[6] CDFG, pursuant to its goal of maintaining viable populations of all native species, also designates "species of special concern" (referred to in this Preliminary Information Package as CSC) when, in CDFG's opinion, declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The CSC designation is an administrative term and has no legal status.

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4.2.3 California Environmental Quality Act (Pub. Resources Code, §§ 21000 et seq.)

In 1970, the State of California enacted California Environmental Quality Act (CEQA). Like NEPA, CEQA was created to require public agencies to identify the potential environmental impacts of proposed projects. CEQA requires public agencies to describe both the significant impacts of proposed projects and the feasible alternatives or feasible mitigation measures that will avoid or substantially lessen those significant impacts. The public agency that has the greatest responsibility for supervising or approving the project is the "lead agency" for the CEQA analysis. The lead agency determines if the project is subject to CEQA or exempt from the CEQA process. If the project is subject to CEQA, the lead agency prepares an Initial Study to identify the project's potential environmental impacts and to determine if any of those impacts may be significant.

After a determination regarding the potential significance of potential impacts, the lead agency will create one of three types of environmental review documents. If the project is found to have no significant impacts, a Negative Declaration will be prepared. If the project has been modified to mitigate or avoid significant impacts, a Mitigated Negative Declaration will be prepared. If the project is found to have potentially significant impacts, or if a detailed analysis of the project's potential impacts is determined to be appropriate, an Environmental Impact Report (EIR) will be prepared. The EIR provides the state and local agencies and the general public with detailed information on the potentially significant environmental impacts that a proposed project is likely to have, lists ways which that the impact or impacts may be minimized, and describes alternatives to the project.

For this Project, Licensee plans to be the Lead Agency for CEQA compliance and anticipates that the SWRCB will be a Responsible Agency under CEQA for the purpose of issuing a Section 401 Water Quality Certificate for the Project.

4.2.4 California Wild and Scenic Rivers Act (Public Resources Code §§ 5093.50 et seq.)

The California Wild and Scenic Rivers Act was enacted in 1972 to preserve designated rivers possessing extraordinary scenic, recreation, fishery, or wildlife values. Like the federal Act, the State Act provides protection for a river or river segment to remain free flowing, and allows for the construction of water diversion facilities only if the Resources Secretary determines that the facility is needed to supply domestic water to local residents and that the facility will not adversely affect the river's free-flowing condition and natural character. The Act requires State and local agencies to exercise their existing powers consistent with the Act's policies and provisions. Initially the Act required the implementation of a management plan for each river or river segment designated as Wild and Scenic, but the amendments of 1982 eliminated this requirement, instead requiring the Resource Agency to coordinate activities affecting the system with other federal, State and local agencies. State designated rivers may be added to the federal system upon the request of the Governor of California and the approval of the Secretary of the

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Interior. Future management of state rivers added to the federal system is the responsibility of the State.

The Project Area does not include any sections of river designated or proposed for designation under the State Wild and Scenic Rivers program. The nearest State-designated Wild and Scenic River is the South Yuba River from Lang Crossing to its confluence with Kentucky Creek below Bridgeport. It is managed by the USDOI Bureau of Land Management (BLM) in partnership with the Forest Service and the California Department of Parks and Recreation (CDPR), and is upstream of the Project Area.

4.3 List of Attachments

None.

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SECTION 5
CONSISTENCY WITH COMPREHENSIVE PLANS

This section describes federal and State of California comprehensive plans related to the Relicensing of Yuba County Water Agency's (YCWA or Licensee) Yuba River Development Project (Project). The section is divided into three major sections. Section 5.1 describes plans that Section 10(a) of the Federal Power Act (FPA) requires the Federal Energy Regulatory Commission (FERC) to consider in the Relicensing. These plans are referred to as Qualifying Comprehensive Plans. Section 5.2 describes Non-Qualifying Comprehensive Plans or agreements that may be pertinent in the Relicensing.[1] Section 5.3 describes other ongoing Relicensings in the Yuba River Basin.

5.1 Qualifying Comprehensive Plans

As described above, Section 10(a) of the FPA requires FERC to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the Project. On April 27, 1988, FERC issued Order No. 481-A which revised Order No. 481, issued October 26, 1987, establishing that FERC will accord FPA Section 10(a)(2)(A) comprehensive plan status to any federal or state plan that meets the following three criteria:

- Is a comprehensive study of one or more of the beneficial uses of a waterway or waterways
- Specifies the standards, the data, and the methodology used to develop the plan
- Is filed with FERC

A review of FERC's Revised List of Comprehensive Plans shows that 61 comprehensive plans have been filed with FERC specifically for the State of California and United States government agencies have filed six plans that apply to multiple states (FERC 2010). Licensee believes that 19 of these qualifying comprehensive plans have a potential to be related to the Project relicensing. Each of these plans is discussed below by resource area. It is important to note that all of the qualifying comprehensive plans that may apply to the Project relicensing were developed after the Project was constructed and began operating. Consequently, the Project was an existing condition during each qualifying comprehensive plan's development.

[1] Copies of Qualifying and Non-Qualifying plans as well as other agreements, decisions, contracts and plans that may be of interest to Relicensing Participants can be found on the Relicensing Website (www.ycwa-relicensing.com) under "Comprehensive Plans and Relevant Agreements." While all Qualifying Plans are discussed in Section 5.1, not all contracts, decisions, etc. on the website are discussed in Section 5.2.

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5.1.1 Water Resources

5.1.1.1 California Water Plan (CDWR 1983) and California Water Plan Update (CDWR 1994)

The California Department of Water Resources (CDWR) first published the California Water Plan in 1957. The California Water Plan focused on the quantity and quality of water available to meet California's water needs, and management actions that could be implemented to improve the State's water supply reliability. Since then, CDWR has updated the California Water Plan numerous times including in 1983 and 1994 (the reference used in FERC's August 2007 List of Comprehensive Plans for the California Water Plan Update). The most recent update was in December 2005. The Project is located in what the California Water Plan calls the "Sacramento River Hydrologic Region." The Project reservoirs represent a small portion of the water supply in the Sacramento River Hydrologic Region.

Water supplies will not be affected by the relicensing proceeding or continued operation of the Project unless Project reservoirs are removed, minimum streamflow requirements are significantly increased, or consumptive water deliveries are significantly reduced.

5.1.1.2 Water Quality Control Plan for the Sacramento and San Joaquin River Basins (CVRWQCB 1998)

This reference is to the water quality control plans adopted by the California State Water Resources Control Board (SWRCB) pursuant to the Clean Water Act (CWA) and the Porter-Cologne Water Quality Control Act. The nine plans, which apply to different areas of California, formally designate existing and potential beneficial uses and water quality objectives. The water quality control plan applicable to the Project Area[2] is the Central Valley Regional Water Quality Control Board's (CVRWQCB) Water Quality Control Plan for the Sacramento River and San Joaquin River Basins (Basin Plan). The SWRCB has updated the water quality control plans several times since 1995. The most recent version of the Basin Plan is the fourth edition approved in 1998 with approved amendments through 2009.

For a discussion of the Basin Plan as it applies to the Yuba River in the Project Area and downstream, and Licensee's anticipated activities to comply with that Basin Plan, refer to Section 4.1.9 of this Pre-Application Document. Refer to Section 5.3 of this document for a detailed discussion of SWRCB's Water Quality Control Plan for the Delta.

[2] For the purposes of this document, Project Area is defined as the area within the Federal Energy Regulatory Commission (FERC) Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within about 0.25 mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature or structure, the United States Army Corps of Engineers' (USACE) Daguerre Point Dam.

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5.1.1.3 Water Quality Control Plans and Policies (SWRCB 1999)

This reference refers to an April 1999 submittal by the SWRCB to FERC of a listing of all SWRCB plans and policies. This submittal stated that all of the listed plans and policies are part of the "State Comprehensive Plan," even though it does not exist as a single plan.

The main plan and policies listed in that submittal to FERC included the most recent edition of the Basin Plan, which is addressed in Section 4.1.9 of this Pre-Application Document.

5.1.1.4 Final Programmatic Environmental Impact Statement/Environmental Impact Report for the CALFED Bay-Delta Program (CDWR 2000)

The California Water Policy Council and the Federal Ecosystem Directorate united in June 1994 to form CALFED. In June 1995, CALFED established its Bay-Delta Program (Program) to develop a long-term, comprehensive solution to environmental issues in the Sacramento-San Joaquin Delta and San Francisco Bay. The Program is a cooperative, interagency effort involving 15 state and federal agencies with management and regulatory responsibilities in the San Francisco Bay-San Joaquin Delta Estuary (Bay-Delta).

The Program was divided into three phases. In Phase I, completed in September 1996, the Program identified the problems confronting the Bay-Delta, developed a mission statement, and developed guiding principles. Following scoping, public comment, and agency review, the Program identified three preliminary alternatives to be further analyzed in Phase II. The three Phase II preliminary alternatives each included Program elements for levee system integrity, water quality improvements, ecosystem restoration, water use efficiency, and three differing approaches to conveying water through the Bay-Delta.

In Phase II, completed in July 2000 the Program refined the preliminary alternatives, conducted a comprehensive programmatic environmental review, and developed implementation strategies. The Program added greater detail to each of the Program elements and crafted frameworks for two Program elements: water transfers and watershed management. The Phase II report contains a general summary of the Program plans. More fundamentally, the report also describes the Program process, the fundamental Program concepts that have guided their development, and analyses that have contributed to Program development. Further, this report describes how this large, complex Program may be implemented, funded, and governed in the future. The following plans outline Program actions:

- Ecosystem Restoration Program Plan (Volumes 1, 2, and 3)
- Water Quality Program Plan
- Water Use Efficiency Program Plan
- Water Transfer Program Plan
- Levee System Integrity Program Plan
- Watershed Program Plan

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The goals of the Water Quality and Watershed programs under CALFED include improving overall water quality by reducing the loadings of many constituents of concern that enter Bay-Delta tributaries from point and non-point sources. Principal targeted constituents include heavy metals (such as mercury), pesticide residues, salts, selenium, pathogens, suspended sediments, adverse temperatures, and disinfection byproduct precursors such as bromide and total organic carbon. The remaining Program plans include the:

- Implementation Plan
- Multi-species Conservation Strategy (MSCS)
- Comprehensive Monitoring, Assessment, and Research Program (CMARP)

Phase II was completed, with publication of the final programmatic Environmental Impact Statement (EIS)/Environmental Impact Report (EIR) in July 2000.

Phase III is on-going and consists of implementation of the Preferred Program Alternative over 20-30 years. Information from the final programmatic EIS/EIR will be incorporated by reference into subsequent tiered environmental documents for specific projects in accordance with National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) guidelines. Project reservoirs do not feed directly into the Bay-Delta. Licensee anticipates that resource agencies that participate in the Program will participate in the relicensing to the extent necessary to assure consistency between the Program and the relicensing.

5.1.2 Aquatic Resources

5.1.2.1 Cooperative Agreement to Implement Actions to Benefit Winter-Run Chinook Salmon in the Sacramento River (CDFG et al. 1988)

Licensee was not able to obtain a copy of the Cooperative Agreement to Implement Actions to Benefit Winter-Run Chinook Salmon in the Sacramento River Plan, which is listed on FERC's August 2007 List of Comprehensive Plans, from the internet, FERC, the California Department of Fish and Game (CDFG), the United States Department of Interior (USDOI), Fish and Wildlife Service (USFWS), USDOI Bureau of Land Management (BLM) or the United States Department of Commerce (USDOC) National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS).

5.1.3 Wildlife Resources

5.1.3.1 Central Valley Habitat Joint Venture Implementation Plan (USFWS et al. 1990)

The California Central Valley Habitat Joint Venture (CVHJV) is one of 12 current joint ventures charged with implementation of the North American Waterfowl Management Plan (USFWS 1986). The CVHJV was formally established by a working agreement signed in July 1988 and is guided by an implementation board comprised of representatives from the California Waterfowl Association, Defenders of Wildlife, Ducks Unlimited, National Audubon Society, Waterfowl Habitat Owners Alliance, and The Nature Conservancy. Technical assistance is provided to the

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board by USFWS, CDFG, the California Department of Food and Agriculture (CDFA), and other organizations and agencies.

The Central Valley of California is the most important wintering area for waterfowl in the Pacific Flyway, supporting 60 percent of the total population. Historically, the Central Valley contained more than 4 million acres of wetlands; however, only 291,555 acres remained in 1990 when the CVHJV was first implemented. The primary cause of this wetland loss was conversion to agriculture, flood control, navigation projects, and urban expansion.

The CVHJV will: 1) protect 80,000 acres of existing wetlands through fee acquisitions or conservation easements; 2) restore 120,000 acres of former wetlands; 3) enhance 291,555 acres of existing wetlands; 4) enhance waterfowl habitat on 443,000 acres of private agricultural land; and 5) secure 402,450 acre-feet (ac-ft) of water for existing State Wildlife Areas, National Wildlife Refuges, and the Grasslands Resource Conservation District (GRCD). These habitat conservation efforts are intended to result in a fall flight of 1 million ducks and 4.7 million wintering ducks. The wintering bird totals will include 2.8 million northern pintail, a species whose wintering population is vitally dependent on the Central Valley.

The CVHJV is a regional approach to conservation and management of waterfowl populations in the Central Valley, but has no specific relevance to the operation and management of the Project.

5.1.4 Threatened, Endangered, and Fully Protected Species

5.1.4.1 Restoring the Balance (California Advisory Committee on Salmon and Steelhead Trout 1988)

The California Advisory Committee on Salmon and Steelhead Trout was established by California legislation in 1983 to develop a strategy for the conservation and restoration of salmon and steelhead resources in California. To streamline its process, the committee divided California's steelhead and salmon resources into 11 systems – the Project is located in the Sacramento River System. The report focuses mostly on the Central Valley; the Project Area was not identified specifically. The committee recommended among other things that California should seek to double its steelhead and salmon populations, and recommended strategies to do so. Many of the recommendations were advanced and discussed in subsequent related publications described below.

Licensee intends to consult with NMFS and CDFG regarding application of this document to the relicensing to the extent that a Project nexus occurs.

5.1.4.2 Central Valley Salmon and Steelhead Restoration and Enhancement Plan (CDFG 1990a)

The Central Valley Salmon and Steelhead Restoration and Enhancement Plan was released by CDFG in April 1990. This plan is intended to outline CDFG's restoration and enhancement goals for salmon and steelhead resources of the Sacramento and San Joaquin river systems and to

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provide direction for various CDFG programs and activities. This plan is also intended to provide the understanding and arguments for the restoration and enhancement of the State's salmon and steelhead resources.

Licensee intends to consult with NMFS and CDFG regarding application of this document to the relicensing proceeding to the extent that a Project nexus occurs.

5.1.4.3 Restoring Central Valley Streams Plan (CDFG 1993)

The Restoring Central Valley Streams Plan was released by CDFG in November 1993. The goals of the plan, all targeted toward anadromous fish, are to restore and protect California's aquatic ecosystems that support fish and wildlife, to protect threatened and endangered species, and to incorporate the State legislature mandate and policy to double the population of anadromous fish in California. The plan encompasses only Central Valley waters accessible to anadromous fish, excluding the Sacramento-San Joaquin Delta.

Licensee intends to consult with NMFS and CDFG regarding application of this document to the relicensing proceeding to the extent that a Project nexus occurs.

5.1.4.4 Steelhead Restoration and Management Plan for California (CDFG 1996)

The Steelhead Restoration and Management Plan for California was released by CDFG in February 1996. This plan focuses on restoration of native and naturally produced (i.e., wild) stocks of steelhead because these stocks have the greatest value for maintaining genetic and biological diversity. Goals for steelhead restoration and management are: 1) increase natural production, as mandated by the Salmon, Steelhead Trout, and Anadromous Fisheries Program Act of 1988, so that steelhead populations are self-sustaining and maintained in good condition; and 2) enhance angling opportunities and non-consumptive uses.

Licensee intends to consult with NMFS and CDFG regarding application of this document to the relicensing proceeding to the extent that a Project nexus occurs.

5.1.4.5 Final Restoration Plan for Anadromous Fish Restoration Program (USFWS 2001a)

The Final Restoration Plan for Anadromous Fish Restoration Program was released by USFWS as a revised draft on May 30, 1997 and adopted as final on January 9, 2001. This plan identifies restoration actions that may increase natural production of anadromous fish in the Central Valley of California. This plan is split up into watersheds within the Central Valley with restoration actions identified for each watershed. It also lists the involved parties, tools, priority rating, and evaluation of each restoration action. The plan encompasses only Central Valley waters accessible to anadromous fish, including the Sacramento-San Joaquin Delta.

Licensee intends to consult with NMFS, USFWS, and CDFG regarding application of this document to the relicensing proceeding to the extent that a Project nexus occurs.

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5.1.5 Recreation Resources

5.1.5.1 California Outdoor Recreation Plan (CDPR 1994)

The objectives of California Department of Parks and Recreation (CDPR) California Outdoor Recreation Plan (CORP), the most recent version of which is from 2002, are to determine outdoor recreation problems and opportunities that are currently the most critical, and to explore the most appropriate actions by which state, federal, and local agencies might address these issues. The CORP also provides valuable information on the State's recreation policy, code of ethics, statewide recreation demand, demographic, economic, political, and environmental conditions. The plan lists the following major issues: 1) improving resource stewardship; 2) serving a changing population; 3) responding to limited funding; 4) building strong leadership; 5) improving recreation opportunities through planning and research; 6) responding to the demand for trails; and 7) halting the loss of wetlands. The CORP applies to state and local parks and recreation agencies, and does not apply to federal or private sector recreational providers.

Because none of the recreation facilities in the Project Area are state or local parks, the CORP has little direct application to the Project other than general guidance.

5.1.5.2 Public Opinions and Attitudes in Outdoor Recreation (CDPR 1998)

CDPR's Public Opinions and Attitudes in Outdoor Recreation survey, the most recent version of which is 2002, provides information used in the development of the CDPR's CORP. This survey identifies: 1) California's attitudes, opinions, and values with respect to outdoor recreation; and 2) demand for and participation in 42 selected outdoor recreation activities.

As with the CORP, this document applies to state and local parks and recreation agencies, and has little direct application to the Project other than general guidance.

5.1.5.3 Recreation Needs in California (California - The Resources Agencies 1983)

In response to the Roberti-Z'berg Urban Open Space and Recreation Program Act of 1976, the CDPR conducted a statewide recreational needs assessment. The report consisted of two major elements: 1) the Recreation Patterns Study that surveyed current participation and projected recreation demand; and 2) the Urban Recreation Case Studies that examined the leisure behavior and needs of seven underserved populations. The purpose of the needs analysis was to: 1) develop statewide recreation planning data; 2) analyze the recreation needs of California's urban residents; and 3) modify project selection criteria used in the administration of grants to local agencies under the Roberti-Z'berg Act.

In general, this report is a wide-ranging, programmatic document providing guidance for statewide planning. The urban-specific study has little relevance to the Project Area, which is mostly remote.

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5.1.5.4 The Recreational Fisheries Policy of the U.S. Fish and Wildlife Service (USFWS 1989)

This is a 12-page policy signed by John F. Turner, then director of USFWS, on December 5, 1989. Its purpose is to unite all of USFWS' recreational fisheries capabilities under a single policy to enhance the nation's recreational fisheries. Regional and assistant directors are responsible for implementing the policy by incorporating its goals and strategies into planning and day-to-day management efforts. USFWS carries out this policy relative to FERC-licensed hydroelectric projects through such federal laws as the Fish and Wildlife Coordination Act, the CWA, the Endangered Species Act (ESA), NEPA, and the FPA, among others.

Project compliance with each of these laws is discussed in Section 4.0 of this Pre-Application Document. Licensee anticipates the Project will comply with the policy and associated acts through USFWS's participation in the relicensing proceeding, and USFWS's review and comment on proposed protection, mitigation, and enhancement measures.

5.1.6 Land Use

5.1.6.1 Tahoe National Forest Land and Resource Management Plan (USDA Forest Service 1990)

The Forest and Rangeland Renewable Resources Planning Act (FRRRPA) requires that each national forest prepare an initial forest plan that provides direction for the efficient use and protection of forest resources within their administrative boundaries. The Tahoe National Forest (TNF) Land and Resource Management Plan (LRMP) was adopted in 1990 (USDA-FS, 1990). The LRMP sets two levels of management direction: one is forest-wide and the other is area-specific. With respect to forest-wide management, direction comes from forest-wide goals, objectives, standards, and guidelines. Area-specific direction is set forth in the management direction for 106 areas and includes management area emphasis, standards, guidelines, and practices. The LRMP addresses resources across TNF.

Through the Sierra Nevada Forest Plan Amendment process, the LRMP has been updated twice since 1990 and it is in the process of being updated a third time (USDA-FS, 2001a; 2004; 2010). Licensee intends to consult closely with the United States Department of Agriculture (USDA) Forest Service (Forest Service) during relicensing to assure consistency with the TNF LRMP.

5.1.6.2 Plumas National Forest Land and Resource Management Plan (USDA Forest Service 1988)

As described above, the FRRRPA requires that each national forest prepare an initial forest plan that provides direction for the efficient use and protection of forest resources within its administrative boundaries. The Plumas National Forest (PNF) LRMP was adopted in 1988.

Licensee intends to consult closely with the Forest Service during relicensing to assure consistency with the PNF LRMP.

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5.1.6.3 The Nationwide Rivers Inventory (NPS 1982)

The Nationwide Rivers Inventory (NRI) is a listing by the USDOI, National Park Service (NPS) of more than 2,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values (ORV) judged to be of more than local or regional significance. In addition to these eligibility criteria, river segments are divided into three classifications: Wild, Scenic, and Recreational river areas. Under a 1979 presidential directive and related council on environmental quality procedures, all federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments. Such adverse impacts could alter the river segment's eligibility for listing and/or alter their classification.

Section 7.10 of this Pre-Application Document discusses segments of river in the Project Area listed on the NRI.

5.2 Non-Qualifying Comprehensive Plans and Agreements

5.2.1 SWRCB 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary

The Bay-Delta is important to the natural environment and economy of California. The watershed of the Bay-Delta provides drinking water to two-thirds of the state's population and water for a multitude of other urban uses. The watershed also supplies water to some of the state's most productive agricultural areas, both inside and outside of the Bay-Delta. The Bay-Delta itself is one of the largest ecosystems for fish and wildlife habitat and production in the United States.

SWRCB adopted a new water quality control plan for the Bay-Delta in May 1995. The 1995 Bay-Delta Plan identified 17 beneficial uses, both within the Delta and throughout the state, to be served by the waters of the Delta. These uses fall into three broad categories: 1) municipal and industrial; 2) agricultural; and 3) fish and wildlife. The 1995 Bay-Delta Plan identified water quality objectives for each of these categories of uses to attain the highest water quality that is reasonable, considering the demands made on the waters of the Bay-Delta. SWRCB established various salinity objectives for the reasonable protection of agriculture as a beneficial use from the effects of salinity intrusion and agricultural drainage in the western, interior, and southern Bay-Delta. To protect fish and wildlife uses, SWRCB's plan established objectives for six parameters: 1) dissolved oxygen, 2) salinity, 3) amounts of Delta outflow, 4) river flows, 5) export limits, and 6) Delta cross-channel gate operation. The plan also included a narrative objective for salmon protection.

In addressing implementation of the objectives in the 1995 Bay-Delta Plan, SWRCB divided the program of implementation into four general components: 1) measures within SWRCB's authority over water diversion and use that implement the water quality objectives; 2) measures requiring a combination of SWRCB's water quality and water rights authorities and actions by

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other agencies to implement the objectives; 3) recommendations to other agencies to improve fish and wildlife habitat conditions; and 4) a monitoring and special studies program.

In November 1997, SWRCB issued a draft EIR for implementation of the 1995 Bay-Delta Plan. The following month, SWRCB issued a notice of public hearing, setting hearing dates for the water rights proceeding in which SWRCB would allocate responsibility for implementing the flow-dependent objectives of the 1995 Bay-Delta Plan.

SWRCB commenced a new proceeding to amend the 1995 Bay-Delta plan on September 29, 2006. The draft amended Bay-Delta Plan and accompanying appendices, including environmental documentation, accompanied the Notice of Public Hearing. Before commencing this proceeding, SWRCB conducted a series of workshops in 2004 and 2005 to receive information on specific topics addressed in the Bay-Delta Plan. The SWRCB sent notice of all workshops to all parties that indicated interest in receiving notices.

SWRCB adopted the revised Bay-Delta Plan (2006 Plan) on December 13, 2006. The 2006 plan supersedes the 1995 Bay-Delta Plan as well as the plans that preceded 1995 Bay-Delta Plan. The 2006 plan made only minor changes to the 1995 plan and the program of implementation. No changes were made to the designated beneficial uses.

In August 2008, SWRCB announced plans to review, and possibly amend, the 2006 plan pursuant to Water Code Section 13240. This process will include the preparation of environmental documentation as required by CEQA.

Current operations of the Yuba River Project are consistent with the Lower Yuba River Accord, as described below, which promotes the objectives of CALFED and provided the first major long-term water acquisition by the State of California for the Bay-Delta Environmental Water Account.

5.2.2 Draft Bay-Delta Conservation Plan (BDCP Steering Committee 2010)

The Bay-Delta Conservation Plan (BDCP) is anticipated to provide for water supply reliability and the recovery of listed species through a Habitat Conservation Plan (HCP) under federal law and a Natural Community Conservation Plan (NCCP) under state law. The BDCP process is intended to provide authorizations pursuant to Section 10 of the ESA and California Fish and Game Code Section 2835 or 2081 to allow the incidental take of threatened and endangered species resulting from covered activities and conservation measures identified through the planning process, including those associated with water operations of the State Water Project and the federal Central Valley Project. The BDCP will include a wide range of conservation actions including habitat restoration, protection, and enhancement; conveyance facilities; water operations and management; monitoring, assessment, and adaptive management; cost and funding; and governance structure and decision-making.

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The BDCP is being prepared by a coalition that includes the USDOI Bureau of Reclamation (BOR), CDWR, Mirant Delta LLC, and the water supply contractors of the Central Valley Project and the State Water Project. Also participating in its preparation are USFWS, NMFS, the California Resources Agency, CDFG, SWRCB, and various stakeholders, including the Nature Conservancy, Environmental Defense, Defenders of Wildlife, the California Farm Bureau Federation (CFBF), the Natural Heritage Institute, American Rivers, the Contra Costa Water District (CCWD), and the Bay Institute. These organizations are members of the steering committee that is helping to guide preparation of the BDCP. The regulatory agencies, USFWS, NMFS, CDFG, and SWRCB are participating in the steering committee to provide technical input and guidance in support of the steering committee's efforts to complete the BDCP.

CDWR is currently evaluating the environmental impacts of the BDCP. A joint EIR/EIS for the BDCP is being prepared. CDWR will serve as the lead agency under CEQA and will work in cooperation with the federal lead and co-lead agencies: BOR, NMFS, and USFWS.

The draft EIR/EIS is expected to be ready for public review and comment by early 2011.

5.2.3 Delta Vision Strategic Plan (Delta Vision Blue Ribbon Task Force 2008) and Delta Vision Committee Implementation Report (Delta Vision Committee 2008)

Delta Vision was created by Executive Order S-17-06 of Governor Arnold Schwarzenegger on September 17, 2006, to find a durable vision for sustainable management of the Bay-Delta, so that it could continue to support environmental and economic functions critical to the people of California.

In February 2007, the governor appointed an independent seven-member Delta Vision "Blue Ribbon" Task Force that was responsible for recommending future actions to achieve a sustainable Delta. The governor also appointed the Delta Vision Committee, which consists of several gubernatorial cabinet members, and which was charged with reviewing the Delta Vision Task Force's recommendations and preparing the final Delta Vision Committee Implementation Report.

The Task Force evaluated the existing and proposed land and water uses, ecosystem functions and processes, and management practices in the Delta and identified alternative Delta management scenarios.

In October 2008, the Delta Vision Task Force issued its Delta Vision Strategic Plan, which includes various recommended measures and management practices to protect the Delta ecosystem and the state's water supply. These recommendations propose changes in the use of land and water resources, services to be provided within the Delta, governance, funding mechanisms, and ecosystem management practices.

On January 2, 2009, the Delta Vision Committee issued its Delta Vision Committee Implementation Report.

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5.2.4 Lower Yuba River Accord

In 2005, Licensee and 16 other interested parties signed memoranda of understanding that specify the terms of the Lower Yuba River Accord (Yuba Accord), a comprehensive, consensus-based program to protect and enhance aquatic habitat in the Yuba River downstream of the United States Army Corps of Engineers' (USACE) Englebright Dam. Following environmental review, Licensee executed the following four agreements in 2007, which together comprise the Yuba Accord: 1) the Lower Yuba River Fisheries Agreement, which specifies the Yuba Accord's lower Yuba River minimum streamflows and creates a detailed fisheries monitoring and evaluation program; 2) the Water Purchase Agreement, under which CDWR purchases water, some of which is provided by the Yuba Accord's minimum streamflows, from Licensee for CALFED's Environmental Water Account (the first long-term acquisition of water by this program), which protects Bay-Delta fish and wildlife and State Water Project and Central Valley Project contractors; 3) the Conjunctive Use Agreements with seven of Licensee's member units, which specify the terms of the Yuba Accord's groundwater conjunctive-use program; and 4) amendments to the 1966 Power Purchase Agreement between Licensee and Pacific Gas and Electric Company (PG&E). Together, this package of agreements provides more water for instream flows and greater reliability for both instream and consumptive uses than would have been possible without the agreements.

Licensee has been operating the Project in conformance with the Yuba Accord since 2006. The 2006, 2007 and early 2008 operations were under one-year pilot programs that were approved by SWRCB. On May 20, 2008, SWRCB adopted its Corrected Order WR 2008-0014, which approved the long-term amendments to Licensee's water-right permits that were necessary so that Licensee may continue to implement the Yuba Accord.

5.2.5 Lower Yuba River Fisheries Management Plan (CDFG 1991)

In February 1991, CDFG issued its final Lower Yuba River Fisheries Management Plan. This plan contained various management recommendations for the lower Yuba River, including proposed new instream flow and temperature requirements and recommendations for several additional fisheries studies. The SWRCB considered this plan in detail during its water-rights hearings in 1992 and 2000, which ultimately led to the SWRCB's water-rights Decision 1644 and Revised Decision 1644. The recommendations in the 1991 plan have been superseded by the Lower Yuba River Accord. The SWRCB's Revised Decision 1644 was substantially modified by the SWRCB's Corrected Order WR 2008-0014.

5.2.6 Biological Opinion for Amendment of Yuba River Development Project License (NMFS 2005b)

On November 4, 2005, NMFS issued its biological and conference opinion (BO) for YCWA's requested amendments to its FPA license: 1) to authorize YCWA to construct and operate its proposed flow bypass at its Narrows II Powerhouse at USACE's Englebright Dam; and 2) for revisions in the flow-reduction and flow-fluctuation criteria in YCWA's license. This BO analyzed the potential effects of the proposed action on Central Valley spring-run Chinook

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salmon and Central Valley steelhead and their critical habitats, and southern Distinct Population Segment (DPS) green sturgeon. The BO concluded that these proposed activities would not jeopardize the continued existences of these species or destroy or adversely modify these critical habitats. The BO specifies required reasonable and prudent measures and associated terms and conditions for these activities.

On November 22, 2005, FERC issued its order modifying and approving YCWA's proposed license amendments. This order directed YCWA to implement the BO's reasonable and prudent measures and terms and associated terms and conditions.

5.2.7 Draft Recovery Plan (NMFS 2009a)

On November 7, 2009, NMFS announced that its draft Central Valley Salmon and Steelhead Recovery Plan was available for public review and comment. On November 24, 2009, NMFS extended the deadline for public comments on this draft plan to February 3, 2010.

ESA recovery plans are authorized by section 4(f) of the ESA. Recovery plans are guidance documents, not regulatory documents. NMFS's November 7, 2009 notice states that the ESA envisions that recovery plans are the central organizing tools for guiding the recoveries of listed species, that recovery plans guide federal agencies in fulfilling their obligations under section 7(a)(1) of the ESA, and that recovery plans provide a context and framework for implementing other provisions of the ESA with respect to a particular species, including consultations under section 7(a)(2) of the ESA and the development of habitat conservation plans under section 10(a)(1(B) of the ESA.

The draft Central Valley Salmon and Steelhead Recovery Plan addresses the Sacramento River winter-run Chinook salmon ESU, the Central Valley spring-run Chinook salmon ESU and the DPS of Central Valley steelhead. The draft plan describes recovery strategies, lists recovery goals, objectives and criteria, and proposes recovery scenarios and numerous recovery actions throughout the Central Valley, including many proposed recovery actions in the Yuba River watershed.

On February 1, 2010, YCWA submitted detailed comments on the draft plan. NMFS has not taken any further public actions regarding the draft plan.

5.2.8 New USACE/NMFS ESA Consultation (NMFS 2007)

On March 23, 2007, USACE submitted to NMFS a Biological Assessment of USACE's existing operations of its Daguerre Point and Englebright dams on the Yuba River, and requested re-initiation of formal consultation for spring-run Chinook salmon and Central Valley steelhead, and initiation of formal consultation for North American green sturgeon, under section 7 of the ESA.

On November 21, 2007, NMFS issued its Biological Opinion for this consultation. The Biological Opinion concluded that USACE's proposed project (the existing operations of the two

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USACE dams) was not likely to jeopardize the continued existence of these fish species or result in the adverse modification of their respective designated critical habitats. Because there was a likelihood of incidental take of these species, the Biological Opinion contained an incidental take statement, which included the reasonable and prudent measures and associated terms and conditions that NMFS believed were necessary and appropriate to avoid, minimize and monitor project impacts.

This Biological Opinion was challenged in *South Yuba River Citizens League v. National Marine Fisheries Service,* No. CIV S-06-2845 LKK/JFM (E. D. Cal.). On July 8, 2010, the court issued an order in this case. The court concluded in this order that NMFS's adoption of this Biological Opinion was arbitrary and capricious. As a result, USACE and NMFS must re-initiate consultation under section 7 of the ESA for USACE's existing operations of Daguerre Point and Englebright dams. The new consultation ultimately will result in a new Biological Opinion for USACE's existing operations of these dams. At the time this Pre-Application Document (PAD) is filed with FERC, the court has not yet issued an order specifying the schedule for completion of this re-consultation.

5.3 Other Ongoing FERC Relicensings in the Yuba River Basin

At the time Licensee prepared this PAD, three hydro relicensing projects besides Licensee's Project relicensing were ongoing in the Yuba River Basin. The relicensings are upstream of the Project and include: 1) South Feather Water and Power Agency's (SFWPA) South Feather Power Project (FERC Project No. 2088); 2) Nevada Irrigation District's (NID) Yuba-Bear Hydroelectric Project (FERC Project No. 2266); and 3) PG&E's Drum-Spaulding Project (FERC Project No. 2310). SFWPA filed its application for a new license on March 6, 2007, and FERC issued a Final Environmental Impact Statement (FEIS) in June 2009. A new license has not been issued. The initial licenses for NID's and PG&E's projects each expire on April 30, 2013. NID and PG&E have stated they intend to file draft license applications on November 1, 2010, and final license applications by April 2011. The new licenses, once issued by FERC, may affect the Project. Refer to Sections 6.2, 6.3 and 6.4 of this PAD for more information regarding these three projects.

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SECTION 6

PROJECT LOCATION, FACILITIES, AND OPERATIONS

This section of the Pre-Application Document provides a description of Yuba County Water Agency's (YCWA or Licensee) Yuba River Development Project (Project).

This section is divided into seven subsections. Sections 6.1 and 6.2 describe the Project location and Project facilities, respectively. Section 6.3 provides a description of Project operations including operational considerations as well as figures that show reservoir levels and streamflows in representative normal, wet and dry water years. Section 6.4 contains an annotated version of the current Federal Energy Regulatory Commission (FERC) license, a list of Project maps and drawings, and a history of Licensee's compliance with the license. Section 6.5 summarizes Project generation and releases. Financial aspects of the Project are described in Section 6.6. The status of Licensee's evaluation of potential generation enhancements is described in Section 6.7. Photographs of Project facilities are at the end of this section.

6.1 Project Location

Licensee's Project is a water supply/flood control/power project located northeast of the city of Marysville on the west slope of the Sierra Nevada in the Yuba River watershed in Yuba, Nevada, and Sierra counties, California. A portion of the area within the FERC Project Boundary[1] is public land managed by the United States Department of Agriculture, Forest Service as part of the Plumas National Forest and Tahoe National Forest.

An overview of the Yuba River Basin is shown in Figure 6.1-1. Figure 6.1-2 shows the Project Vicinity[2] including Project facilities and features.

[1] For the purposes of this document, the existing FERC Project Boundary is the area Licensee uses for normal Project operations and maintenance, and is shown on Exhibits G, J, and K of the current license.

[2] For the purposes of this document, the Project Vicinity is defined as the area surrounding the Project on the order of a United States Geological Survey (USGS) 1:24,000 topographic quadrangle.

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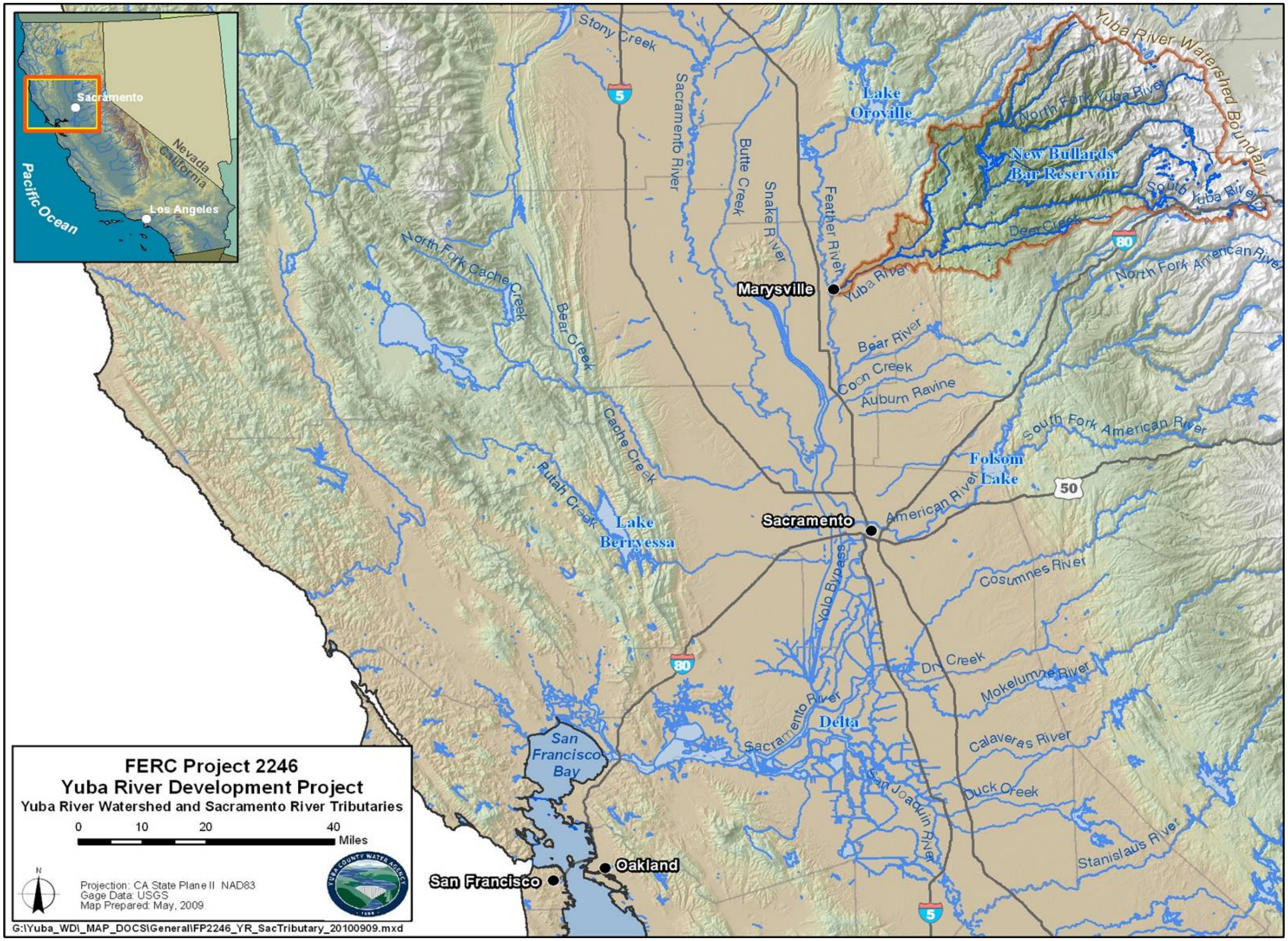

Figure 6.1-1. Yuba River Development Project in relation to the Yuba River and other tributaries to the Sacramento River.

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6.2 Project Facilities

The Project was constructed in the mid 1960s and began operating in spring 1970. The Project, which ranges in elevation from about 300 feet (ft) to 2,050 ft,[3] consists of three power developments: New Colgate, New Bullards Minimum Flow, and Narrows 2. In total, the Project includes:

- 1 dam and associated storage reservoir – New Bullards Bar
- 2 diversion dams – Our House and Log Cabin
- 2 diversion tunnels – Lohman Ridge and Camptonville
- 2 underground power tunnels – New Colgate and Narrows 2
- 1 above ground penstock – New Colgate
- 3 powerhouses – New Colgate, New Bullards Minimum Flow and Narrows 2
- 7 recreation areas - Emerald Cove Marina, Hornswoggle Group Camp, Schoolhouse Family Camp, Dark Day Campground, Dark Day Boat Ramp, Garden Point Campground, and Madrone Cove Campground

The Project does not include any other water conveyance facilities (i.e., canals, flumes, or ditches), or any transmission lines,[4] distribution lines, rights-of-way, recreation facilities, spoil piles, or borrow areas. The Project does not include any water conveyance systems or other facilities, features, or appurtenant structures that are used by Licensee or any other party solely for the purpose of providing consumptive water. The Project does not include the United States Army Corps of Engineers' (USACE) Englebright Dam and Reservoir or USACE's Daguerre Point Dam. The Project also does not include the Narrows Powerhouse, which is located near the USACE's Englebright Dam and is part of Pacific Gas and Electric's (PG&E) Narrows Project (FERC Project No. 1403).[5]

FERC-jurisdictional facilities that comprise each of the developments are described below.

6.2.1 New Colgate Development

6.2.1.1 Our House Diversion Dam

Our House Diversion Dam is a 130-foot radius, double curvature, concrete arch dam located on the Middle Yuba River 12.0 miles upstream of its confluence with the North Yuba River. The dam is 70 ft high with a crest length of 368 ft, a crest elevation of 2,049 ft, and a drainage area of 144.8 square miles. The dam has a capacity of 280 acre-feet (ac-ft), but storage and water levels

[3] All elevation data are in United States Department of Commerce (USDOC), National Oceanic and Atmospheric Association (NOAA), National Geodetic Survey (NGS) Vertical Datum of 1983 (NAVD 83).

[4] While the Yuba River Development Project does not include any transmission lines, PG&E is the owner, operator and holder of a FERC Minor-Part License (FERC Project No. 2678) for the 60 kilovolt (kv) transmission line that extends from YCWA's Narrows 2 Powerhouse Switchyard. The FERC license for Project 2678 expires on April 30, 2016. A copy of the Order Issuing Minor-Part License for Project 2678 can be found on the Relicensing Website (www.ycwa-relicensing.com).

[5] The Federal Energy Regulatory Commission (FERC) license for Pacific Gas and Electric Company's (PG&E) Narrows Project expires on January 31, 2023.

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do not fluctuate under Project operations. The diversion dam has a spillway capacity of 60,000 cfs.

The diversion dam has two outlets to the Middle Yuba River in addition to the uncontrolled spillway. The first is a 5-foot diameter steel pipe acting as a low-level outlet and controlled by a slide gate on the upstream face of the dam with a maximum capacity of 800 cubic feet per second (cfs). The outlet centerline is at elevation 1,990 ft, and the gate is operated by use of a motor. The second is a 24-inch diameter release pipe with a maximum capacity of 60 cfs located just above the low-level outlet. A downstream gate valve operated by hand controls this outlet.

6.2.1.2 Lohman Ridge Diversion Tunnel

The Lohman Ridge Diversion Tunnel is 12.5 ft high by 12.5 ft wide, and conveys a maximum flow of 860 cfs through its 19,410 ft (90% unlined and 10% lined) length from the Middle Yuba River to Oregon Creek.

6.2.1.3 Log Cabin Diversion Dam

The Log Cabin Diversion Dam is a 105-foot radius, concrete arch dam on Oregon Creek that has a drainage area of 29.1 square miles and a maximum spillway capacity of 12,000 cfs. The dam has a storage capacity of 90 ac-ft, but storage and water levels do not fluctuate under Project operations.

The diversion dam has two outlets to Oregon Creek in addition to the uncontrolled spillway. The first is a 5-foot diameter steel pipe acting as a low-level outlet and controlled by a slide gate on the upstream face of the dam with a maximum capacity of 800 cfs. The outlet centerline is at elevation 1,938 ft, and the gate is operated by use of a motor. The second is an 18-inch diameter release pipe with a maximum capacity of 13 cfs located just above the low-level outlet. A downstream gate valve operated by hand controls this outlet.

6.2.1.4 Camptonville Diversion Tunnel

The Camptonville Diversion Tunnel is 6,107 ft long and has the capacity to convey 1,100 cfs of water to New Bullards Bar Reservoir on the North Yuba River. The first 4,275 ft of the conduit is an unlined, horseshoe-shaped tunnel 14.5 ft wide by 14.5 ft high, which (for the last 1,832 ft) becomes a lined, horseshoe-shaped tunnel 11.7 ft wide by 13 ft high.

6.2.1.5 New Bullards Bar Reservoir

The New Bullards Bar Reservoir is a storage reservoir on the North Yuba River formed by New Bullards Bar Dam. At normal maximum water surface elevation (1,956 ft), New Bullards Bar Reservoir extends about 8.5 miles upstream, has an estimated storage capacity of 966,103 ac-ft, a surface area of 4,790 acres, a shoreline of about 71.9 miles, and a drainage area of 488.6 square miles.

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6.2.1.6 New Bullards Bar Dam

The New Bullards Bar Dam is a 1,110-foot radius, double curvature, concrete arch dam located on the North Yuba River about 2.3 miles upstream of its confluence with the Middle Yuba River. The dam is 645 ft high with a maximum elevation of 1,965 ft. The dam includes one low-level outlet — a 72-inch Hollow Jet Valve (invert elevation 1,395 ft) with a maximum design capacity of about 3,500 cfs at full reservoir pool, and an actual capacity of 1,250 cfs (actual release capacity is limited to 1,250 cfs because of valve vibrations at higher release rates).

6.2.1.7 New Bullards Bar Dam Spillway

The New Bullards Bar Dam Spillway is an overflow-type spillway with a width of 106 ft and a crest elevation of 1,902 ft. Control gates on the spillway consist of three Tainter Gates measuring 30 ft wide and 54 ft tall, and hoisted by 10 horsepower drum hoists. The maximum design capacity of the spillway is 160,000 cfs.

6.2.1.8 New Colgate Power Tunnel and Penstock

The New Colgate Power Tunnel and Penstock is 5.2 miles long and composed of four different types of conveyance structures: an unlined horseshoe-shaped tunnel 26 ft square; a lined horseshoe-shaped tunnel 20 ft wide and 14.5 ft high; a lined circular tunnel 14 ft in diameter; and 2,809 ft of steel penstock with a diameter ranging from 9 ft to 14.5 ft. The tunnel and penstock have a maximum flow capacity of 3,500 cfs.

6.2.1.9 New Colgate Powerhouse

The New Colgate Powerhouse is an aboveground, steel reinforced, concrete powerhouse located adjacent to the Yuba River. The powerhouse contains two Voith Siemens Pelton type turbines with a total actual measured capacity of 340 megawatts (MW) under a design head of 1,306 ft and a measured flow of 3,430 cfs.[6]

6.2.1.10 New Colgate Switchyard

The New Colgate Switchyard is located adjacent to New Colgate Powerhouse.

6.2.1.11 Project Recreation Facilities

Project Recreation Facilities are all located on New Bullards Bar Reservoir. These facilities include Emerald Cove Marina, Hornswoggle Group Camp, Schoolhouse Family Camp, Dark Day Campground, Dark Day Boat Ramp, Garden Point Campground, Madrone Cove Campground, and Cottage Creek Boat Ramp.

[6] Note that based on a June 10, 1992, FERC order, the FERC-authorized installed capacity in kilowatts (kW) for each of the two units in New Colgate Powerhouse is 157,500 kW, for a total powerhouse capacity of 315,000 kW.

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6.2.1.12 Appurtenant Facilities and Features

Appurtenant facilities and features include access roads within the FERC Project Boundary.

6.2.2 New Bullards Bar Minimum Flow Development

6.2.2.1 New Bullards Minimum Flow Powerhouse Penstock

The New Bullards Minimum Flow Powerhouse Penstock is a 70-foot long, 12-inch diameter steel penstock with a maximum flow capacity of 6 cfs.

6.2.2.2 New Bullards Minimum Flow Powerhouse

The New Bullards Minimum Flow Powerhouse includes a single Pelton turbine with a capacity of 150 kilowatts (kW) at a flow of 5 cfs. The flow through this Powerhouse is normally set at 6 cfs to ensure compliance with the license-required minimum streamflow of 5 cfs below New Bullards Bar Dam.

6.2.2.3 New Bullards Minimum Flow Transformer

The New Bullards Minimum Flow Transformer is located adjacent to the New Bullards Minimum Flow Powerhouse.

6.2.2.4 Appurtenant Facilities and Features

Appurtenant facilities and features include access roads within the FERC Project Boundary.

6.2.3 Narrows 2 Development

6.2.3.1 Narrows 2 Powerhouse Penstock

The Narrows 2 Powerhouse Penstock is a tunnel that is 20 ft in diameter and concrete lined in the upper 376 ft, and 14 ft in diameter and steel lined for the final 371.5 ft. The penstock has a maximum flow capacity of 3,400 cfs.[7]

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[7] In its Revised Decision 1644 adopted in 2003, the SWRCB directed Licensee to "diligently pursue" the development of a Narrows 2 Powerhouse Intake Extension Project in coordination with CDFG, USFWS, and NMFS. This project would involve extending the intake of the tunnel for the Narrows 2 Powerhouse Penstock upstream and deeper into the USACE's Englebright Reservoir where it would presumably receive cooler water, thereby reducing water temperatures in the lower Yuba River. Since 2003, new biological issues regarding lower Yuba River temperature conditions have arisen. For example, one issue is the question of whether warmer summer temperatures could trigger beneficial outmigrations of steelhead from the lower Yuba River. In addition, the Yuba Accord River Management Team is undertaking a comprehensive evaluation of lower Yuba River water-temperature conditions. This work, which is expected to be complete in 2012, should provide additional guidance on what temperature conditions in the lower Yuba River are beneficial for the fish there. For these reasons, and because Licensee construction of the Narrows 2 Powerhouse Intake Extension Project would require FERC approval, Licensee has proposed to the SWRCB that evaluation of this project be conducted through the Relicensing process for the Yuba River Development Project.

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Narrows 2 flow bypass is a valve and penstock branch off the main Narrows 2 penstock that was added to the Project in 2008 to provide the capability to bypass flows of up to 3,000 cfs around the Narrows 2 Powerhouse during times of full or partial Powerhouse shutdowns.

6.2.3.2 Narrows 2 Powerhouse

The Narrows 2 Powerhouse is an indoor powerhouse located at the base of the USACE's Englebright Dam. The powerhouse consists of one vertical axis Francis turbine with a capacity of 55 MW at a head of 236 ft and flow of 3,400 cfs.[8]

6.2.3.3 Narrows 2 Powerhouse Switchyard

The Narrows 2 Powerhouse Switchyard is located adjacent to the powerhouse.

6.2.3.4 Appurtenant Facilities and Features

Appurtenant facilities and features include access roads within the FERC Project Boundary.

6.3 Project Operations

6.3.1 Major Operational Considerations

This section describes in general Licensee's considerations when operating the Project, excluding the physical constraints related to Project facilities and features described in Section 6.2. The considerations are generally presented in order of decreasing priority.

6.3.1.1 Assurance of Public and Employee Safety

Safety is Licensee's first and foremost operational consideration. Licensee operates the Project in a safe manner and provides its employees with all necessary training and equipment to operate the Project safely. Licensee cooperates fully with FERC during inspections of Project facilities, including annual FERC inspections, Part 12 Dam Safety Inspections, and Environmental and Public Use Inspections, and in other similar safety-related areas such as requirements for appropriate Emergency Action Plans (EAP) and Public Safety Plans. These inspections and plans are discussed in more detail in Section 6.4.2.4.

6.3.1.2 Anticipated Water Availability

One of Licensee's major considerations each year is anticipated water availability. Licensee begins estimating water availability each year in January and continually updates the estimate throughout the spring runoff period. When estimating available water supply, Licensee considers current reservoir storage and California Department of Water Resources (CDWR)

[8] Note that based on a June 10, 1992, FERC order, the FERC-authorized installed capacity in kilowatts (kW) for the one unit Narrows 2 Powerhouse is 46,750 kW.

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Bulletin 120 forecasts of unimpaired flow at the Smartville[9] gage on the lower Yuba River and the Goodyears Bar gage on the North Yuba River. Estimates of available water supply and other water needs are compared to estimates of required releases, consumptive demands within YCWA, and target levels for fall carryover storage in New Bullards Bar Reservoir.

Although the specific hydrology of each year can vary widely, Licensee typically operates New Bullards Bar Reservoir by capturing winter and spring runoff from rain and snowmelt. The North Yuba River inflow to New Bullards Bar Reservoir is augmented by diversions from the Middle Yuba River to Oregon Creek through the Lohman Ridge Tunnel, and by diversions from Oregon Creek into the reservoir through the Camptonville Tunnel. Consequently, New Bullards Bar Reservoir normally reaches its peak storage at the end of the spring runoff season, and then is gradually drawn down until its lowest elevation in early to mid-winter. The reservoir does not undergo significant daily changes in elevation.

New Bullards Bar Reservoir has mandatory reserved flood storage space criteria from mid-September through the end of May that limit maximum authorized storage (See Section 6.3.1.5). The Our House and Log Cabin diversion dam impoundments have very little storage, and Licensee operates them exclusively to divert water to New Bullards Bar Reservoir in the winter and spring during high flow periods.

In the spring of each year, Licensee makes a determination of anticipated runoff into New Bullards Bar Reservoir relying upon snow course measurements and forecasts of runoff provided by CDWR. Licensee also makes estimates of water needs for local water deliveries and for releases to meet required instream flows for the current water year and for the following year. Based on these forecasts, a target carryover storage level for the end of the water year (i.e., end-of-September storage) is determined that will provide a level of drought protection for the following year. Carryover storage targets may be reduced to account for the amount of qualifying water transfers made during the current water year. New Bullards Bar Reservoir is operated to meet minimum carryover storage requirements designed to ensure that instream flow requirements and at least 50 percent of the surface water deliveries to Licensee's service area are met during the next year. The carryover storage requirement is a drought protection measure. Reservoir carryover storage is used to make up the difference between the available surface water supply and system demands (e.g., diversion demands, instream flow requirements, and system operational losses) under drought conditions.

In addition to a minimum target carryover storage level for New Bullards Bar Reservoir, in wetter years Licensee operates to an end-of-September target storage level for the Lower Yuba River Accord of 650,000 ac-ft, as well as other target storage levels for various times in mid-winter that are parts of power generation operations and flood control operations.

[9] In 2008, the people of this community petitioned to have the name changed to "Smartsville," with an 's' in the middle of the name. However, the USGS gage refers to the former spelling of the community name. Therefore, in this document, the community is referred to as such.

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The average total inflows to New Bullards Bar Reservoir from the North Yuba River and diversions from the Middle Yuba River and Oregon Creek are about 1,200,000 ac-ft per year, and have ranged from a low of 163,000 ac-ft in 1977 to a high of 2,800,000 ac-ft in 1982.

6.3.1.3 Compliance with Water Rights

Licensee holds pre-1914 appropriative rights dating from 1897, and post-1914 appropriative water rights confirmed by water-right licenses, for the purposes of operating the Project for hydroelectric power generation. Table 6.3.1-1 lists the post-1914 appropriative water-right licenses held by Licensee for power generation.

Table 6.3.1-1. Water right licenses held by Licensee for operation of the Project for power generation.

Priority (date)	SWRCB Designation (application)	SWRCB Designation (license)	Source (Waterbody)	Amount & Place of Diversion or Storage (amount & place)		Season (period)		Place of Beneficial Use (powerhouse)
2/11/1921	2197	435	North Yuba River	700 cfs at New Bullards Bar Dam		1/1 - 12/31		New Colgate Powerhouse
				5,000 ac-ft/yr at New Bullards Bar Dam		about 12/15 to about 7/15		
9/7/1922	3026	436	North Yuba River	10,000 ac-ft/yr at New Bullards Bar Dam		about 12/15 to about 7/15		New Colgate Powerhouse
4/30/1926	5004	777	North Yuba River	15,000 ac-ft/yr at New Bullards Bar Dam		about 12/15 to about 7/15		New Colgate Powerhouse
7/30/1927	5631	11565	Middle Yuba River	810 cfs at Our House Dam	490,000 ac-ft/yr storage in New Bullards Bar Res	1/1-12/31 (dir. div.)	10/15 to 6/30 (stor.)	New Colgate Powerhouse and Narrows 2 Powerhouse
			Oregon Creek	240 cfs at Log Cabin Dam		1/1-12/31 (dir. div.)		
			North Yuba River	1,800 cfs at New Bullards Bar Dam		11/1-7/31 (dir. div.)		
			Yuba River	1,800 cfs at USACE's Englebright Dam		1/1- 12/31		
3/1/1939	9516	3050	North Yuba River	100 cfs at New Bullards Bar Dam		1/1 - 12/31		New Colgate Powerhouse
9/12/1941	10282	5544	North Yuba River	5,335 ac-ft/yr at New Bullards Bar Dam		about 10/1 to about 3/1		New Colgate Powerhouse
								Narrows 2 Powerhouse
2/20/1953	15205	11566	Middle Yuba River	3,200 ac-ft/yr at Log Cabin Dam; storage in New Bullards Bar Res.		5/1- 6/30		New Colgate Powerhouse and Narrows 2 Powerhouse
			North Yuba River	245 cfs and 700 ac-ft/yr at New Bullards Bar Dam		3/15- 6/15 (dir. div.); 5/1- 6/30 (stor.)		
			Yuba River	800 cfs at USACE's Englebright Dam		11/1-7/15		

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Table 6.3.1-1. (continued)

<table>
<tr><th>Priority

(date)</th><th>SWRCB Designation (application)</th><th>SWRCB Designation (license)</th><th>Source

(Waterbody)</th><th colspan="2">Amount & Place of Diversion or Storage (amount & place)</th><th>Season

(period)</th><th>Place of Beneficial Use (powerhouse)</th></tr>
<tr><td rowspan="4">10/2/1953</td><td rowspan="4">15563</td><td rowspan="4">11567</td><td>Middle Yuba River</td><td>30,000 ac-ft/yr at Our House Dam</td><td rowspan="3">all storage in New Bullards Bar Res.</td><td>10/15 - 6/30</td><td rowspan="4">New Colgate Powerhouse and Narrows 2 Powerhouse</td></tr>
<tr><td>Oregon Creek</td><td>1,400 ac-ft/yr at Log Cabin Dam</td><td>10/15 - 6/30</td></tr>
<tr><td>North Yuba River</td><td>146,000 ac-ft/yr at New Bullards Bar Dam</td><td>10/15 - 6/30</td></tr>
<tr><td>Yuba River</td><td colspan="2">910 cfs at USACE’s Englebright Dam</td><td>11/1 - 6/30</td></tr>
</table>

Licensee operates the Project consistent with the terms and conditions of these water rights.

6.3.1.4 Compliance with the FERC License

Licensee operates the Project in compliance with the current FERC license. Articles 33, 34, 40, and 46 in the existing FERC license are most germane to Project operations. The texts of these four articles are in Section 6.4.1. Each of these articles is summarized below.

Article 33. This article requires Licensee to maintain the following minimum streamflow releases in wet and normal years during the periods from April 15 through June 15 and from June 16 through April 14: 50 cfs and 30 cfs, respectively, or the natural flow, whichever is less, below Our House Diversion Dam; 12 cfs and 8 cfs, respectively, or the natural flow, whichever is less, below Log Cabin Diversion Dam; and 5 cfs or the natural flow, whichever is less, in both periods below New Bullards Bar Dam. This article provides for reductions in these minimum streamflow requirements in critically dry water years.

This article requires that minimum streamflows of 245 cfs from January 1 through June 30, 70 cfs from July 1 through September 30, and 400 cfs from October 1 through December 31 be maintained downstream of USACE’s Daguerre Point Dam. Licensee measures these flows at the USGS Marysville Gage.

This article also requires that the following minimum streamflows be maintained immediately downstream of the Narrows and Narrows 2 powerhouses (which Licensee measures at the Smartville Gage): 600-1,050 cfs from October 16 through 31; 600-700 cfs in November; 600-1,400 cfs in December; 1,000-1,830 cfs from January 1 through 15; and 600 cfs from January 16 through March 31. (Although these latter streamflow requirements are stated as ranges in this article, actual river flows often exceed the upper ends of these ranges because of uncontrolled inflows into and outflows from USACE’s Englebright Reservoir and flood-control and related releases from New Bullards Bar Reservoir.) During 2001 and subsequent dry years, License has asked FERC to authorize variances from the 1,000-cfs minimum-flow requirement for January 1 through 15. NMFS, USFWS and CDFG have supported these requests and FERC has granted them.

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This article also specifies ramping rates for changes in releases downstream of USACE's Englebright Dam. These ramping rates were updated by a FERC order in November 2005.

Article 34. This requires Licensee to maintain a minimum pool in New Bullards Bar Reservoir of no less than elevation 1,730 ft, which is a storage level of 234,000 ac-ft.

Article 40. This article requires Licensee to operate within limits of the Project the multi-level power intakes at New Bullards Bar Dam to provide water of quality in the Yuba River below USACE's Englebright Dam for the production of anadromous fish. At the request of the California Department of Fish and Game, the multi-level power intakes in New Bullards Bar Dam have not been used since 1993, and instead water is always released through the low-level outlet at elevation 1620 ft. to the power penstock to provide a continuous flow of cold water.

Article 46. This article requires Licensee to operate the Project in accordance with an agreement with the USACE regarding flood control operations.

6.3.1.5 Adherence to USACE Flood Control Requirements[10]

New Bullards Bar Reservoir must be operated from September 16 to May 31 to comply with Part 208 "*Flood Control Regulations, New Bullards Bar Dam and Reservoir, North Yuba River, California*," pursuant to Section 7 of the Flood Control Act of 1944 (58 Stat. 890). Under the contract between the United States and Licensee that was entered into on May 9, 1966, Licensee agreed to reserve in New Bullards Bar Reservoir 170,000 ac-ft of storage space for flood control in accordance with rules and regulations enumerated in Appendix A of the Report on Reservoir Regulation for Flood Control (USACE 1972). The seasonal flood storage space allocation schedule is presented in Table 6.3.1-2.

Table 6.3.1-2. New Bullards Bar Reservoir flood storage space allocation in thousands of acre-feet.

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Storage Allocation	170	170	170	170	170	170	70	0	0	0	0	56

In addition to reservation of flood control space in New Bullards Bar Reservoir, the flood control regulations include rules governing ramping rates as well as target maximum flows in the lower Yuba River and in the Feather River below the confluence with the Yuba River.

Licensee also coordinates operations with PG&E's Narrows Powerhouse at USACE's Englebright Dam to use storage in USACE's Englebright Reservoir to capture winter storm freshets and reduce storm flows on the lower Yuba River. This operation is accomplished by evacuating storage space in USACE's Englebright Reservoir in anticipation of storm peak flows.

[10] The USACE contributed $12 million to the construction of New Bullards Bar Dam in exchange for flood control space the reservoir would provide.

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6.3.1.6 Adherence to the Lower Yuba River Accord Minimum Flow Schedules

In 2005, Licensee and 16 other interested parties signed memoranda of understanding that specify the terms of the Lower Yuba River Accord (Yuba Accord), a comprehensive, consensus-based program to protect and enhance aquatic habitat in the Yuba River downstream of USACE's Englebright Dam. Following environmental review, Licensee and parties executed the following four agreements in 2007, which together comprise the Yuba Accord: 1) the Lower Yuba River Fisheries Agreement, which specifies the Yuba Accord's lower Yuba River minimum streamflows and creates a detailed fisheries monitoring and evaluation program; 2) the Water Purchase Agreement, under which CDWR purchases water, some of which is provided by the Yuba Accord's minimum streamflows, from Licensee for CALFED's[11] Environmental Water Account and State Water Project and Central Valley Project contractors; 3) the Conjunctive Use Agreements with seven of Licensee's member units, which specify the terms of the Yuba Accord's groundwater conjunctive-use program; and 4) amendments to the 1966 Power Purchase Contract between Licensee and PG&E. Together, this package of agreements provides more water for instream flows and greater reliability for both instream and consumptive uses than would have been possible without the agreements.

The Yuba Accord was developed by a multi-agency resource team, including representatives from the National Marine Fisheries Service, the US Fish and Wildlife Service, the California Department of Fish and Game (CDFG), and a group of non-governmental organizations. The Yuba Accord flow schedules were developed to essentially optimize habitat conditions during high flow years for this highly regulated river system. Subsequently additional flow schedules were developed by the resources team for drier conditions that included a "balancing of resources" approach.

Licensee has been operating the Project in conformance with the Yuba Accord since 2006. The 2006, 2007, and early 2008 operations were under one-year pilot programs that were approved by the State Water Resources Control Board (SWRCB). On May 20, 2008, SWRCB adopted its Corrected Order WR 2008-0014, which approved the long-term amendments to Licensee's water-right permits that were necessary so that Licensee may continue to implement the Yuba Accord.

The Yuba Accord includes a specific set of flow schedules for the lower Yuba River. The flow schedule that is in effect at any particular time is determined by the North Yuba Index (NYI), a hydrologic index that was developed as a part of the Yuba Accord. The flow schedules are listed in Table 6.3.1-3. The NYI is shown in Figure 6.3.1-1.

Table 6.3.1-3. Yuba Accord flow schedules.

Schedule	Oct	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Aug	Sep	Total Annual Vol. (ac-ft)
	1-15	16-30	1-30	1-31	1-31	1-29	1-31	1-15	16-30	1-15	16-31	1-15	16-30	1-31	1-31	1-30	
MARYSVILLE GAGE (cfs)																	
1	500	500	500	500	500	500	700	1,000	1,000	2,000	2,000	1,500	1,500	700	600	500	574,200
2	500	500	500	500	500	500	700	700	800	1,000	1,00	800	500	500	500	500	429,066
3	500	500	500	500	500	500	500	700	700	900	900	500	500	500	500	500	398,722

11 Interagency committee with management and regulatory responsibility for Bay-Delta Estuary.

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Table 6.3.1-3. (continued)

Schedule	Oct	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Apr	May	May	Jun	Jun	Jul	Aug	Sep	Total Annual Vol. (ac-ft)
	1-15	16-30	1-30	1-31	1-31	1-29	1-31	1-15	16-30	1-15	16-31	1-15	16-30	1-31	1-31	1-30	
MARYSVILLE GAGE (cfs) (continued)																	
4	400	400	500	500	500	500	500	600	900	900	600	400	400	400	400	400	361, 944
5	400	400	500	500	500	500	500	500	600	600	400	400	400	400	400	400	334,818
6	350	350	350	350	350	350	350	350	500	500	400	300	150	150	150	350	232,155
SMARTVILLE GAGE (cfs)																	
A	700	700	700	700	700	700	700	700	--	--	--	--	--	--	--	700	--
B	600	600	600	550	550	550	550	600	--	--	--	--	--	--	--	500	--

Notes:

Marysville Gage flows represent average volumes for the specified period. Actual flows may vary from the indicated flows according to established criteria.

Marysville Gage Schedule 6 flows do not include an additional 30,000 ac-ft that must be made available from groundwater substitution and that will be allocated to instream flows according to established criteria during Schedule 6 years.

Smartville Gage Schedule A is used with Marysville Schedules 1, 2, 3, and 4.

Smartville Gage Schedule B is used with Marysville Schedules 5 and 6.

FLOW SCHEDULE YEAR TYPES
BASED ON THE NORTH YUBA INDEX
FOR ESTABLISHING REQUIRED FLOWS IN THE LOWER YUBA RIVER FISHERIES AGREEMENT

The water year hydrologic classification for the Yuba River to determine the flow requirements of Yuba County Water Agency's water right permits shall be based on the North Yuba Index. Determinations of a year's flow schedule year type shall be made in February, March, April, and May and for any subsequent updates.

Flow Schedule Year Type	North Yuba Index Thousand Acre-Feet (TAF)
Schedule 1.................	Equal to or greater than 1400
Schedule 2.................	Equal to or greater than 1040 and less than 1400
Schedule 3.................	Equal to or greater than 920 and less than 1040
Schedule 4.................	Equal to or greater than 820 and less than 920
Schedule 5.................	Equal to or greater than 693 and less than 820
Schedule 6.................	Equal to or greater than 500 and less than 693
Conference Year	Less than 500

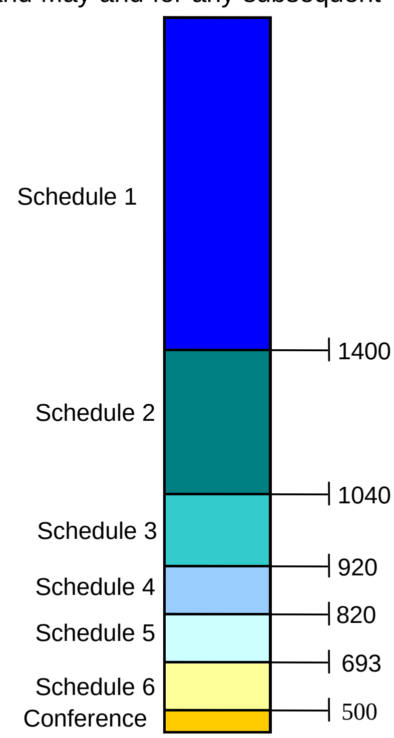

Figure 6.3.1-1. Yuba Accord North Yuba Water Year Type Index.

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During Conference Years (or years when the NYI is less than 500,000 ac-ft, which are expected to occur approximately 1% of the time), YCWA is required: 1) to maintain minimum instream flows in the lower Yuba River at the levels specified in Article 33 of Licensee's existing FERC license without the reductions authorized by subsections (c) and (d) of that article; 2) to release any supplemental flows recommended by the Lower Yuba Accord River Management Team (RMT) Planning Group and approved by the SWRCB's Deputy Director for Water Rights or, if no such recommended flows are effective by April 11 of such a Conference Year, then to release any supplemental flows ordered by the SWRCB, after a hearing under California Code of Regulations, title 23, section 767; and 3) to limit total water supply diversions at Daguerre Point Dam to 250,000 ac-ft.

For additional information regarding the Yuba Accord, refer to http://www.ycwa.com/.

6.3.1.7 Compliance with Minimum Flow Requirements

Licensee complies with the terms of the prevailing minimum flow requirements for the Project diversion reaches. Historically, before the Yuba Accord was adopted and implemented, minimum instream flow requirements were much lower, and due to the need to manage the Project to accommodate natural flows, storm flows, flood-control releases, and releases for consumptive uses and generation, instream flows significantly exceeded these earlier minimum instream flow requirements during many months of most years. Now, under the Yuba Accord, Project operations more closely match the higher minimum instream flow requirements for much of the year. However, instream releases higher than the Yuba Accord instream flow schedules still occur at certain times of the year, due to storm flows, flood control requirements, and for Groundwater Substitution and other water transfers. Since the Project went into operation in 1970, three different sets of minimum flow requirements have successively governed Project operations. These are: 1) the minimum flow requirements in the current FERC license, which were adopted from a 1965 agreement between YCWA and CDFG (1965 Agreement); 2) the interim flow requirements in SWRCB water rights Decision 1644 (D-1644), which were in effect from May 2001 through March 2008; and 3) the Lower Yuba River Accord requirements, which YCWA began to implement in late April 2006 when the SWRCB issued the first of two one-year orders for the Lower Yuba River Accord pilot programs for 2006 and 2007. In March 2008, the Accord flow schedules went into effect on a long-term basis.

From 1970 to 2001, the 1965 Agreement flow requirements were in place. During this period, YCWA water rights permit terms specifying minimum flows were identical to these requirements. These requirements specified minimum flows below all Project facilities including Our House Diversion Dam, Log Cabin Diversion Dam, New Bullards Bar Dam, and Narrows 2 Powerhouse. With the exceptions of storm and flood flows, typically flows below Our House, Log Cabin, and New Bullards Bar Dam were the minimum specified flows. However, typical flows in the Yuba River below the USACE's Englebright Dam releases for consumptive use or generation significantly exceeded required minimum flows, except in the fall of very dry years.

The D-1644 interim flow requirements that were in effect from 2001 to 2006 did not change minimum release requirements below Our House Diversion Dam, Log Cabin Diversion Dam, or

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New Bullards Bar Dam. The D-1644 interim flow requirements did specify different minimum flows below Narrows 2 Powerhouse. Flows in the Yuba River below Narrows 2 Powerhouse typically were higher than required minimum flows because of additional releases to meet consumptive and other water management targets. In some years, however, D-1644 minimum releases governed spring, early summer and fall flows.

The Yuba Accord flow requirements did not change minimum release requirements below Our House Diversion Dam, Log Cabin Diversion Dam, or New Bullards Bar Dam. The Yuba Accord flow requirements do include minimum flow requirements for the Lower Yuba River below Narrows 2 Powerhouse that are substantially higher than the corresponding requirements in the FERC license and the interim requirements in D-1644. Implementation of the Yuba Accord flow requirements, which started in spring 2006 with a pilot program, has resulted in operational changes that affect Project operations during all seasons of the year. The Accord flow requirements are higher than previous requirements in most months of most years. Figures 6.3.1-2 and 6.3.1-3 show the flow requirements in place at the Smartville and Marysville gages, respectively, for 2008, and also show the D-1644 and 1965 Agreement (FERC License) requirements. Actual flows are also shown. The actual flows from June 1 to August 30, 2008, also included releases of water to implement a groundwater substitution transfer.

Summer flows in July and August in drier water years have included water transfer releases, which in turn resulted in flows substantially above minimum instream flows. Water transfer releases of varying magnitude occurred in all of the drier years from 1987 to 2009.

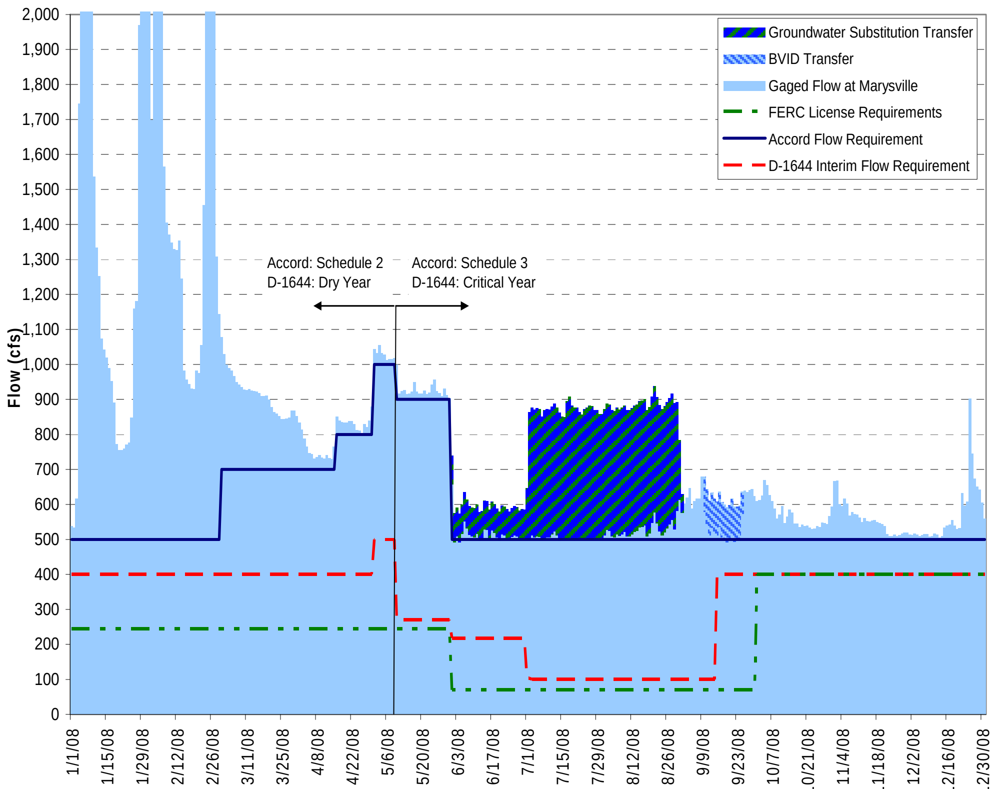

Figure 6.3.1-2. Minimum instream flow requirements and actual flows at Marysville Gage in 2008

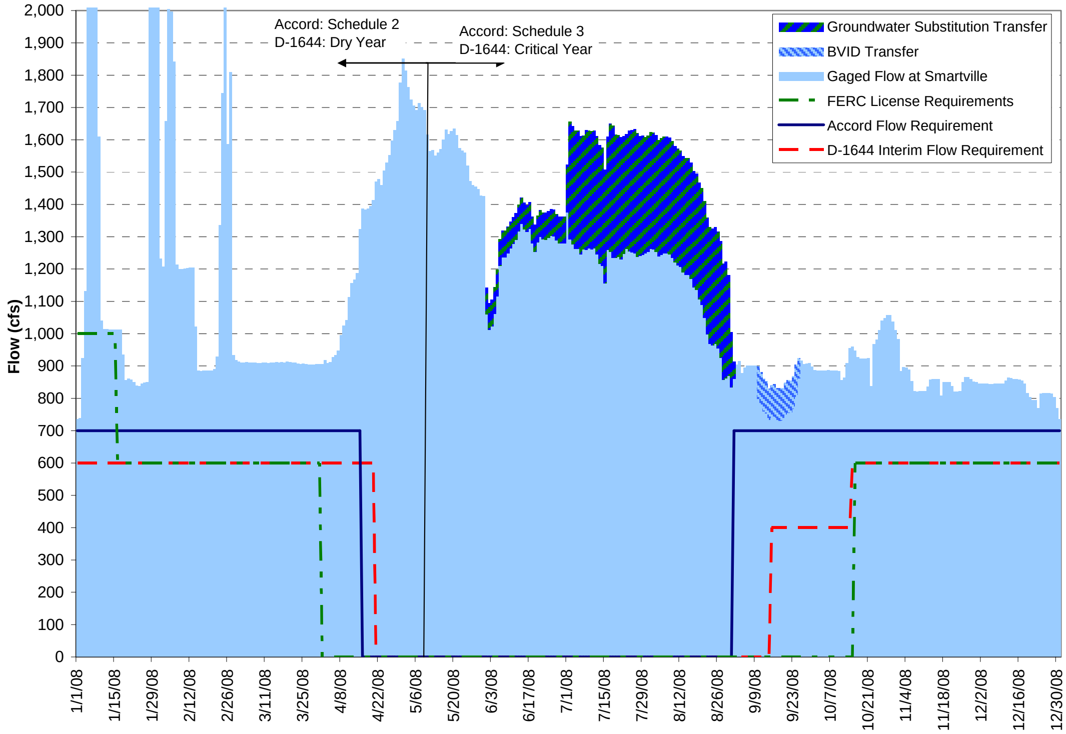

Figure 6.3.1-3. Minimum instream flow requirements and actual flows at Smartville Gage in 2008

In addition to changes to minimum instream flows for the Yuba River below Narrows 2 Powerhouse, the Lower Yuba River Accord agreements specify additional operations requirements. Annual minimum flow requirements are set based on the NYI, which is specific to the Lower Yuba River Accord. Additionally, the Lower Yuba River Accord includes a target reservoir storage in New Bullards Bar Reservoir of 650,000 ac-ft on September 30. Typically, the New Bullards Bar Reservoir storage will continue to decline through the fall, depending on precipitation and runoff patterns. Under the Lower Yuba River Accord, end of year storage (December 31) in New Bullards Bar Reservoir may be substantially lower than under the 1965 Agreement or D-1644 flow requirements, reflecting the additional water that is released under the Lower Yuba River Accord.

6.3.1.8 Water Supply Deliveries

6.3.1.8.1 From Project Reservoir

Licensee pumps some water directly from New Bullards Bar Reservoir to supply water to the Cottage Creek Water Treatment Plant for domestic and recreational uses adjacent to the reservoir. The amount of this pumping averages approximately 6 ac-ft per year. The amount of this pumping is so small that it does not affect operations of the Project. Licensee anticipates that pumping of these small amounts of water for these purposes will continue during the period of the new license.

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6.3.1.8.2 Downstream of the Project

YCWA is a major water rights holder on the Yuba River. YCWA diverts water for consumptive and other beneficial uses under SWRCB water right Permits 15026, 15027, and 15030. YCWA's permits authorize direct diversions from the lower Yuba River from September 1 to June 30 at total rates up to 1,593 cfs for irrigation and other uses, and diversions of up to 1,250,000 ac-ft per water year from October 1 to June 30 to storage in New Bullards Bar Reservoir. During the summer and early fall, stored water is released from New Bullards Bar Reservoir and re-diverted just above USACE's Daguerre Point Dam for use by YCWA Member Units for irrigation.

Various water districts, irrigation districts, and mutual water companies have contracts with YCWA for delivery of water. Some of the parties that receive water from YCWA also have their own appropriative rights for direct diversions of water from the Yuba River. Annual water diversions at Daguerre Point Dam for irrigation have totaled about 300,000 ac-ft in recent years.

In 2009, the Wheatland Canal was completed. This canal provides up to 40,000 ac-ft per year of surface water to the Wheatland Water District, which until now has relied solely upon groundwater for irrigation.

Refer to Section 7.2.8 for more detail regarding upstream and downstream water deliveries.

6.3.1.9 Power Generation

After meeting all of the considerations described above, Licensee schedules releases from Project facilities for power generation when water is available for this purpose. Seasonal release patterns are typically developed 2 to 8 months in advance, in consultation with PG&E, and considering hydrologic and meteorological factors, seasonal instream flows, and consumptive needs.

The New Bullards Bar Minimum Flow Powerhouse is operated as a "base load" facility, where flows are set at a constant rate to provide the required instream flows below New Bullards Bar Dam. Similarly, the Narrows 2 Powerhouse is operated as a base load facility, with stable flows, as required by the Yuba Accord flow schedules and seasonal irrigation demands.

The New Colgate Powerhouse is a highly versatile facility, and is used for a combination of peaking and base generation. Depending upon energy demand, the New Colgate Powerhouse generation can be fluctuated in less than 10 minutes from a minimum of 1 MW with only one unit operating to maximum load of 340 MW with both units operating, if both units are ramped up at the same time. This ability to rapidly fluctuate generation, together with substantial storage available in New Bullards Bar Reservoir, makes the New Colgate Powerhouse important and unique to the Northern California power grid. The average annual flow through the New Colgate Powerhouse from water year 1970 through water year 2008 was 1,078,776 ac-ft. Modeled flows through New Colgate Powerhouse for the same period average 1,033,127 ac-ft per year. The modeled average annual generation for this period is 1,188,257 megawatt hours (MWh). With a theoretical powerhouse capacity of almost 3 million MWh per year (if the powerhouse were always operated at full capacity), New Colgate Powerhouse has a plant factor of 40 percent. This is comparable to the national average hydropower plant factor of 43 percent.

For most of the year, New Colgate Powerhouse is operated as a peaking facility, or to provide ancillary services such as spinning reserves or regulation. Under peaking operations, releases through the powerhouse are concentrated to hours of the day when power is most valuable or when power is needed most (such as weekdays from mid-morning through early evening, largely corresponding to warmer times of the day and/or peak workday and early evening hours). Under ancillary services operations, the generating station may be ramped upwards or downwards quickly, to respond to power system load changes on a near-real-time basis, and generating station output and flows may vary substantially minute-to-minute. The New Colgate Powerhouse also often operates under a combined peaking/ancillary service protocol, with one unit operating in peaking mode and the other unit responding to ancillary service requirements. During some of the late 1990s and early 2000s, New Colgate Powerhouse operations were focused on weekday peak generation. More recently, power generation has shifted to a schedule driven by a balance of peak period generation and providing ancillary services to the region.

At many times, New Colgate Powerhouse provides a significant percentage of the required ancillary service for grid regulation of the region, as dispatched by the California Independent System Operator (ISO), the entity responsible for maintaining grid reliability in California. Peaking operations dominate power generation operations at New Colgate Powerhouse. However, under high flow conditions some or all of the available capacity is used for base load generation, generating inexpensive power while excess water must be moved through the system anyway.

6.3.1.10 Ramping and Flow Fluctuations

Releases from the Narrows 2 Powerhouse are governed by the ramping and flow fluctuation criteria specified in FERC License Article 33 (see Section 6.4, below). Additionally, the Lower Yuba River Accord gives the RMT some discretion (subject to review by the SWRCB's Division of Water Rights) to adjust flow patterns for fisheries benefits. For additional information regarding the Lower Yuba River Accord.

6.3.2 Typical Operations

This section provides an overview of typical Project operations in representative water years.

6.3.2.1 Baseflow, Storm Runoff, and Flood Control Flows

Releases from New Bullards Bar Reservoir are made through the New Colgate Powerhouse, and through the dam's bottom outlet or its gated spillway. Operations of New Bullards Bar Reservoir can be described in terms of: 1) water management operations (baseflow operations); 2) storm runoff operations; and 3) flood control operations.

Baseflow operations describe the normal reservoir operations that occur when system flows are controlled or controllable through storage regulation. These operations occur outside periods of

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flood control operations, spilling, bypassing uncontrolled flows into USACE's Englebright Reservoir, and outside periods of high, unregulated inflows from tributary streams downstream from USACE's Englebright Dam.

Storm runoff operations occur during the storm season, typically between October and May, and include operations of the reservoirs or powerhouses to avoid or reduce uncontrolled flows. Typically, storm runoff operations are driven by the USACE's Englebright Reservoir operations, because it is the downstream control point for releasing water into the lower Yuba River. Storm runoff standard operating procedures for USACE's Englebright Reservoir use target storage levels, maximum release rates, coordination considerations based on flow targets at the confluence of the Feather and Yuba rivers, and ramping criteria for USACE's Englebright Reservoir to guide operations.

Flood control operations typically are conducted in accordance with directives of the USACE Water Control Manual for New Bullards Bar Reservoir. During flood control operations, the seasonal flood pool specified in the USACE Water Control Manual for New Bullards Bar Reservoir is utilized for flood protection, and to avoid unnecessary high flood control releases. Reservoir releases may be required to maintain flood control space between September 15 and June 1.

Baseflow operations can be further separated into two distinct release patterns: 1) baseflow operations that are responding to downstream demands; and 2) baseflow operations to reach a target storage level.

Baseflow operations that are responding to downstream demands typically involve releases to implement minimum instream flow requirements and to meet consumptive requirements. Downstream demand response baseflow operations occur frequently in drier water years, as well as during the fall and early winter of most years.

Baseflow operations involve release patterns designed to meet specific storage targets and are scheduled to meet power generation objectives. The predominant target storage level for New Bullards Bar Reservoir is the end of water year storage level, which occurs on September 30. From 1970 to 2005, this level was established by the YCWA/PG&E Power Purchase Agreement, which included terms for a September 30 storage level of 705,000 ac-ft. With the implementation of the Yuba Accord, which included an amended YCWA/PG&E Power Purchase Agreement, the target storage level for September 30 is now 650,000 ac-ft. For late winter through September, if operations to meet the required downstream minimum flows and downstream demands will result in a storage level less than the target September 30 storage level, then the downstream required flows and demands will govern operations. Generally, operations in September through the time of significant winter runoff are to meet downstream requirements. As discussed in Section 6.3.1.7, prior to implementation of the Yuba Accord, operations during most times of most years were under baseflow storage operations. With the Yuba Accord's higher required minimum flows, operations for downstream requirements now occur more often.

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For most of the year when storm and flood control regulations do not govern Project releases, USACE's Englebright Reservoir is used as an afterbay for releases from New Bullards Bar Reservoir through the New Colgate Powerhouse and is used as a regulating reservoir to capture uncontrolled flows from the Middle and South Yuba rivers to manage downstream releases to the lower Yuba River. USACE's Englebright Reservoir levels are maintained within a range of roughly 517 ft to 525 ft in the spring, summer, and fall during the recreational boating season to accommodate marina and boating operations. This range of water levels is used on a daily and weekly basis for moderating the power generation peaking operations of the New Colgate Powerhouse.

Additional storage target operations include the flood pool reservation mandated by the USACE flood control manual.

6.3.2.2 Representative Water Year Examples

Licensee has selected 1998, 2005, and 2001 as representative Wet, Normal, and Dry water years, respectively, because these years approximate the 10, 50, and 90 percent exceedance intervals for unimpaired annual runoff in the Yuba River at the USGS's Smartville Gage. Figures 6.3.2-1 through 6.3.2-3 show for each representative water year: 1) daily water surface elevations in New Bullards Bar Reservoir; 2) mean daily water releases from New Bullards Bar Reservoir; 3) mean daily flows below USACE's Englebright Dam; and 4) mean daily flows at the Marysville Gage.

All three of these years were before the implementation of the Yuba Accord. The 50 percent and 10 percent exceedance years both ended with New Bullards Bar Reservoir storage at or near 705,000 ac-ft, which was the target storage level for these years. As stated above, under the Yuba Accord, the target storage level is 650,000 ac-ft. Releases from New Bullards Bar Reservoir were at the maximum New Colgate Powerhouse flow capacity for most of January through July of 1998, while New Colgate Powerhouse releases in 2001 reached this level regularly in the summer with the higher transfer releases, but only on a weekday peaking schedule. There were no releases on many weekends in 2001.

These figures demonstrate that in the 90 percent exceedance year, flows are significantly lower during all times of the year, and that storage drawdown begins in late May, compared to the 50 and 10 percent years when storage reductions begin in late June or early July. During the 90 percent exceedance year of 2001, flows at the Marysville Gage at or below 300 cfs started in early May and only increased in July with the start of a water transfer release for the months of July through September. Without the transfer flows in these months, flows would have been in the range of 300 cfs. With the Yuba Accord, the minimum flow for this period of 2001 would have been at or above 400 cfs for the months of July through September and as much as 900 cfs in May. Figure 6.3.2-3 also clearly shows the fluctuations in releases from New Bullards Bar Reservoir through the New Colgate Powerhouse to provide weekday peaking operations.

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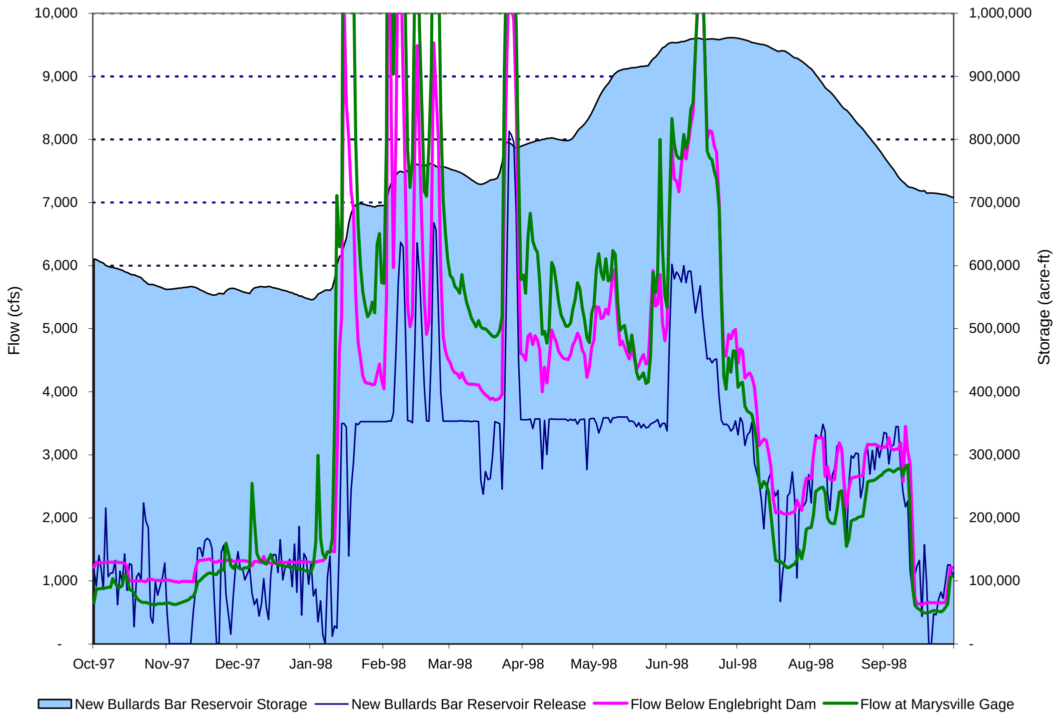

Figure 6.3.2-1. Project releases and storage in a representative Wet Water Year – 1998.

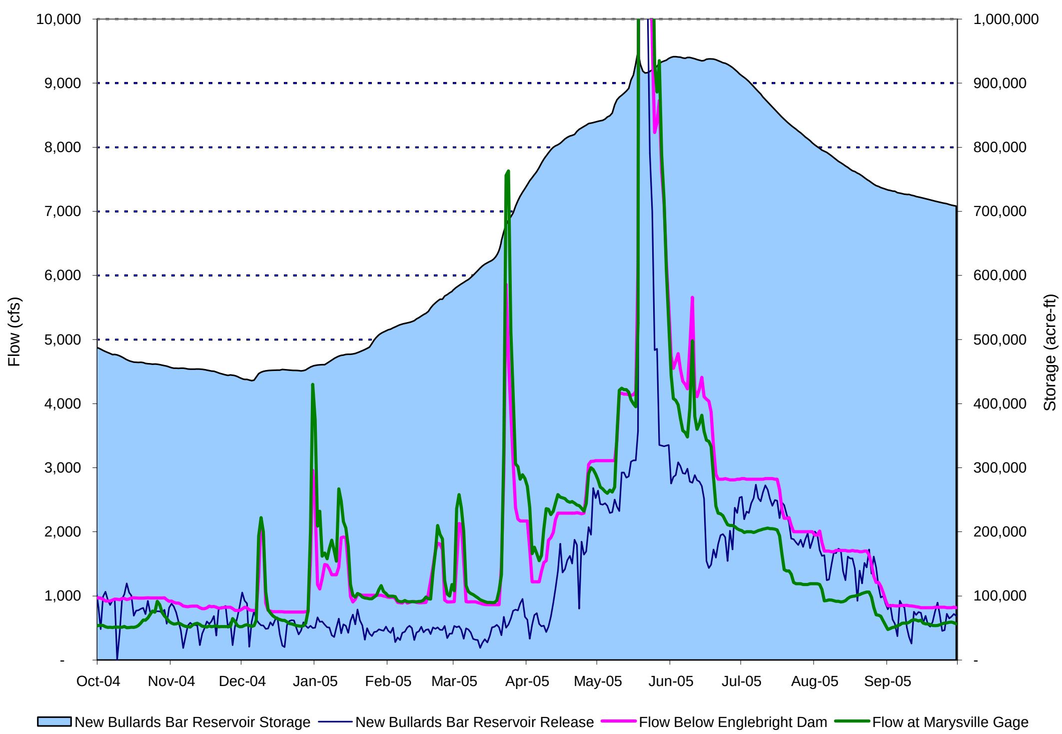

Figure 6.3.2-2. Project releases and storage in a representative Normal Water Year – 2005.

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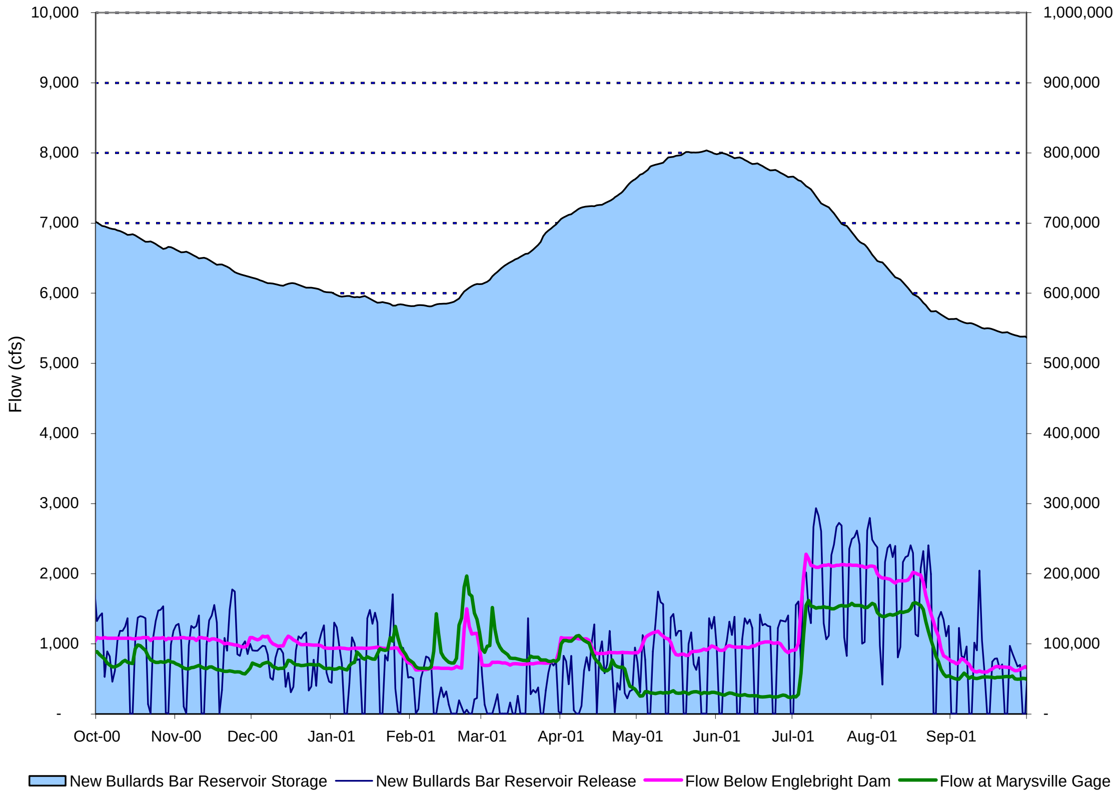

Figure 6.3.2-3. Project releases and storage in a representative Dry Water Year – 2001.

More recently, daily and weekly power generation have shifted to a schedule driven by a balance of peak period generation and providing ancillary services to the region.

6.4 FERC License and Other Project Information

6.4.1 Current FERC License Requirements

The Federal Power Commission (FPC), FERC's predecessor, issued the Project initial license to Licensee on May 16, 1963. Subsequently, on May 6, 1966, the FPC issued an order ruling that the license would be effective for the period from May 1, 1966 through April 30, 2016. The initial license included 50 articles numbered 1 through 57 (articles 9, 14, 15, 16, 17, 23, and 24 were left blank by the FPC). Since the initial license was issued, the FPC and FERC have added 10 articles to the license, numbers 58 through 67. As a result, the existing license contains 60 articles. Of these, Licensee considers 19 articles (articles 28, 29, 30, 35, 36, 41, 42, 43, 44, 48, 50, 51, 52, 58, 60, 62, 65, 66, and 67), "expired" or "out of date" because each pertains to a construction activity that has been completed, a filing related to a construction activity that has been completed, or another activity that has been completed. As a result, the existing license contains 41 "active" articles. The general topic that each of the 41 active articles addresses is listed below.

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Table 6.4.1-1. List of active requirements in Yuba County Water Agency's current Federal Energy Regulatory Commission license for the Yuba River Development Project (FERC Project No. 2246).

Article	Description	Article	Description
1	General - Compliance	32	Construction of fish handling facilities by US
2 & 3	FERC approval of changes	33	Minimum flow
4	FERC inspection and supervision	34	Minimum pool
5	Project boundary	37	Sediment control
6	Gaging and stream gaging	38	Minimization of habitat alteration
7	Public access to Project waters and permitting of roads, boat docks, piers, etc.	39	Mitigation of damage to wildlife
8	Approval of facilities by US land management agency	40	Operation of New Bullards Bar Dam to maintain water quality for anadromous fish
10	Public safety related to safety of transmission lines, telephone lines, etc.	45	Fire suppression
11	Avoid inductive interference	46	Flood control
12	Clear t-line right-of-ways on federally owned lands	47	Supplying storage for water in USACE's Englebright Reservoir for New Narrows Power Plant
13	Merchantable timber on federally owned lands	49	Interference with future water projects
18	US rights to waters	53	Additional transmission facilities if ordered by FERC
19	Use of water for fire suppression, sanitary, and domestic needs on federally owned lands	54	Install additional capacity if ordered by FERC
20	Construction liability	55	Coordinate with others if ordered by FERC
21	Permit use of federally owned lands for transportation and communication	56	Recreation facilities
22	Takeover of Project roads	57	Annual fees to US for administration of authorized capacity and compensation for lands
25	Lease of Project lands	59	US not liable for damages to New Narrows Power Plant from construction of Federal reservoir downstream
26	Ownership of Project property	61	Recreation plan
27	Terms and conditions of Federal Power Act	63	DO monitoring plan
31	Construction of fish and wildlife protective devices and structures by Licensee	64	SHPO consultation prior to construction activities

Articles in the existing FERC Project license are shown below. Comments, including specifying any subsequent orders related to the article, are listed at the end of the article if the article has been modified from the initial Order Issuing License. Unless otherwise noted, the article was included in the May 16, 1963, Order Issuing the License, and has not been amended. Articles Licensee considers out-of-date are noted. Primary FERC orders (i.e., an order that modified an existing license article) can be found on Licensee's Relicensing Website (www.ycwa-relicensing.com) under the folder labeled "Initial License" and the subfolder labeled "FERC Orders."

Article 1. The entire project, as described in the order of the Commission, shall be subject to all the provisions, terms, and conditions of the license.

Article 2. No substantial change shall be made in the maps, plans, specifications, and statements described and designated as exhibits and approved by the Commission in its order as a part of the license until such change shall have been approved by the Commission: provided, however, that if the license or the Commission deems it necessary or desirable that said approved exhibits, or

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any of them, be changed, there shall be submitted to the Commission for approval amended, supplemental, or additional exhibit or exhibits covering the proposed changes which, upon approval by the Commission, shall become a part of the license and shall supersede, in whole or in part, such exhibit or exhibits theretofore made a part of the license as may be specified by the Commission.

Article 3. Said project works shall be in substantial conformity with the approved exhibits referred to in Article 2 herein or as changed in accordance with the provisions of said article. Except when emergency shall require for the protection of navigation, life, health, or property, there shall not be made without prior approval of the Commission any substantial alteration or addition not in conformity with the approved plans to any dam or other project works under the license or any substantial use of project lands and waters not authorized herein; and any emergency alteration, addition, or use so made shall thereafter be subject to such modification and change as the Commission may direct. Minor changes in project works or divergence from such approved exhibits may be made if such changes will not result in a decrease in efficiency, in a material increase in cost, or in impairment of the general scheme of development; but any of such minor changes made without the prior approval of the Commission, which in its judgment have produced or will produce any of such results, shall be subject to such alteration as the Commission may direct. The Licensee shall comply with such rules and regulations of general or special applicability as the commission may from time to time prescribe for the protection of life, health, or property.

Article 4. The construction, operation, and maintenance of the project and any work incident to additions or alterations shall be subject to the inspection and supervision of the Regional Engineer, Federal Power Commission, San Francisco, or of such other officer or agent as the Commission may designate, who shall be the authorized representative of the Commission for such purposes. The Licensee shall cooperate fully with said representative and shall furnish him a detailed program of inspection by the Licensee that will provide for an adequate and qualified inspection force for construction of any such alterations to the project. Construction of the project works or any feature thereof shall not be initiated until the program of inspection for the alterations or any feature thereof has been approved by said representative. The Licensee shall also furnish to said representative such information as he may require concerning the construction, operation, and maintenance of the project, and any alteration thereof, and shall notify him of the date upon which work will begin, as far in advance thereof as said representative may reasonably specify, and shall notify him promptly in writing of any suspension of work for a period of more than one week, and of its resumption and completion. The Licensee shall allow him and other officers or employees of the United States, showing proper credentials, free and unrestricted access to, through, and across the project lands and project works in the performance of their official duties.

[*Included in May 16, 1963 Order Issuing License, and amended by P-2246 35 FPC Order Amending License (Major) issued May 6, 1966 to read as shown above.*]

Article 5. Upon the completion of the project, or at such other time as the Commission may direct, the Licensee shall submit to the Commission for approval revised maps, plans, specifications, and statements insofar as necessary to show any divergence from or variations in

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the project area and project boundary as finally located or in the project works as actually constructed when compared with the area and boundary shown and the works described in the license or in the maps, plans, specifications, and statements approved by the Commission, together with a statement in writing setting forth the reasons which in the opinion of the Licensee necessitated or justified variations in or divergence from the approved maps, plans, specifications, and statements. Such revised maps, plans, specifications, and statements shall, if and when approved by the Commission, be made a part of the license under the provisions of article 2 hereof.

Article 6. For the purpose of determining the stage and flow of the stream or streams from which water is to be diverted for the operation of the project works, the amount of water held in and withdrawn from storage, and the effective head on the turbines, the Licensee shall install and thereafter maintain such gages and stream-gaging stations as the Commission may deem necessary and best adapted to the requirements; and shall provide for the required readings of such gages and for the adequate rating of such stations. The Licensee shall also install and maintain standard meters adequate for the determination of the amount of electric energy generated by said project works. The number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, shall at all times be satisfactory to the Commission and may be altered from time to time if necessary to secure adequate determinations, but such alteration shall not be made except with the approval of the Commission or upon the specific direction of the Commission. The installation of gages, the ratings of said stream or streams, and the determination of the flow thereof, shall be under the supervision of, or in cooperation with, the District Engineer of the United States Geological Survey having charge of stream-gaging operations in the region of said project, and the Licensee shall advance to the United States Geological Survey the amount of funds estimated to be necessary for such supervision or cooperation for such periods as may be mutually agreed upon. The Licensee shall keep accurate and sufficient record of the foregoing determinations to the satisfaction of the Commission, and shall make return of such records annually at such time and in such form as the Commission may prescribe.

Article 7. So far as is consistent with the proper operation of the project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and adjacent project lands owned by the Licensee for the purpose of full public utilization of such lands and waters for navigation and recreational purposes, including fishing and hunting, and shall allow to a reasonable extent for such purposes the construction of access roads, wharves, landings, and other facilities on its lands the occupancy of which may, in appropriate circumstances, be subject to payment of rent to the Licensee in a reasonable amount: Provided, that the Licensee may reserve from public access, such portions of the project waters, adjacent lands, and project facilities as may be necessary for the protection of life, health, and property and Provided further, that the Licensee's consent to the construction of access roads, wharves, landings, and other facilities shall not, without its express agreement, place upon the Licensee any obligation to construct or maintain such facilities.

Article 8. In the construction and maintenance of the project the location and standards of roads and trails, and other land uses, including the location and condition of quarries, borrow pits, spoil

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disposal areas, and sanitary facilities, shall be subject to the approval of the department or agency of the United States having supervision over the lands involved.

Article 9. [*The May 16, 1963, Order Issuing License did not include an Article 9.*]

Article 10. In the construction and maintenance of the project works, the Licensee shall place and maintain suitable structures and devices to reduce to a reasonable degree the liability of contact between its transmission lines, and telegraph, telephone, and other signal wires or power transmission lines constructed prior to its transmission lines and not owned by the Licensee, and shall also place and maintain suitable structures and devices to reduce to a reasonable degree the liability of any structures or wires falling and obstructing traffic and endangering life on highways, streets, or railroads.

Article 11. The Licensee shall make provision, or shall bear the reasonable cost, as determined by the agency of the United States affected, of making provision for avoiding inductive interference between any project transmission line or other project facility constructed, operated, or maintained under the license, and any radio installation, telephone line, or other communication facility installed or constructed before or after construction of such project transmission line or other project facility and owned, operated, or used by such agency of the United States in administering the lands under its jurisdiction.

Article 12. The Licensee shall clear such portions of transmission line rights-of-way across lands of the United States as are designated by the officer of the United States in charge of the lands; shall keep the areas so designated clear of new growth, all refuse, and inflammable material to the satisfaction of such officer; shall trim all branches of trees in contact with or liable to contact the transmission line; shall cut and remove all dead or leaning trees which might fall in contact with the transmission line; and shall take such other precautions against fire as may be required by such officer. No fires for the burning of waste material shall be set except with the prior written consent of the officer of the United States in charge of the lands as to time and place.

Article 13. Timber on lands of the United States cut, used, or destroyed in the construction and maintenance of the project works or in the clearing of said lands shall be paid for in accordance with requirements of and at the current stumpage rates applicable to the sale of similar timber by the agency of the United States having jurisdiction over said lands; and all slash and debris resulting from the cutting or destruction of such timber shall be disposed of as the officer of such agency may direct.

Article 14. [*The May 16, 1963, Order Issuing License did not include an Article 14.*]

Article 15. [*The May 16, 1963, Order Issuing License did not include an Article 15.*]

Article 16. [*The May 16, 1963, Order Issuing License did not include an Article 16.*]

Article 17. [*The May 16, 1963, Order Issuing License did not include an Article 17.*]

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Article 18. The United States specifically retains and safeguards the right to use water in such amount, as determined by the Secretary of the Army, as may be necessary for the purposes of navigation on the navigable waterway affected; and the operations of the Licensee, so far as they affect the use, storage, and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Secretary of the Army may prescribe in the interest of navigation, and as the Commission may prescribe for the protection of life, health, and property, and in the interest of the fullest practicable conservation and utilization of waters for power purposes and for other beneficial public uses, including recreational purposes; and the Licensee shall release water from the project reservoir at such rate in cubic feet per second, or such volume in acre-feet per specified period of time, as the Secretary of the Army may prescribe in the interest of navigation, or as the Commission may prescribe for the other purposes hereinbefore mentioned.

Article 19. The Licensee shall interpose no objection to, and shall in no way prevent, the use by the agency of the United States having jurisdiction over the lands of the United States affected, or by persons or corporations occupying lands of the United States under permit, of water for fire suppression from any stream, conduit or body of water, natural or artificial, used by the Licensee in the operation of the project works covered by the license, or to the use by said parties of water for sanitary and domestic purposes from any stream or body of water, natural or artificial, used by the Licensee in the operation of the project works covered by the license.

Article 20. The Licensee shall be liable for injury to, or destruction of, any buildings, bridges, roads, trails, lands, or other property of the United States, occasioned by the construction, maintenance, or operation of the project works or of the works appurtenant or accessory thereto under the license. Arrangements to meet such liability, either by compensation for such injury or destruction, or by reconstruction or repair of damaged property, or otherwise, shall be made with the appropriate department or agency of the United States.

Article 21. The Licensee shall allow any agency of the United States, without charge, to construct or permit to be constructed on, through, and across the project lands, conduits, chutes, ditches, railroads, roads, trails, telephone and power lines, and other means of transportation and communication not inconsistent with the enjoyment of said lands by the Licensee for the purposes stated in the license. This article shall not be construed as conferring upon the Licensee any right of use, occupancy, or enjoyment of the lands of the United States other than for the construction, operation, and maintenance of the project as stated in the license.

Article 22. There is reserved to the appropriate department or agency of the United States, or of the state or county involved, the right to take over, maintain, and supervise the use of any project road as a public road after construction of the project works is completed.

Article 23. [*The May 16, 1963, Order Issuing License did not include an Article 23.*]

Article 24. [*The May 16, 1963, Order Issuing License did not include an Article 24.*]

Article 25. No lease of the project or part thereof whereby the lessee is granted the exclusive occupancy, possession, or use of project works for purposes of generating, transmitting, or

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distributing power shall be made without the prior written approval of the Commission; and the Commission may, if in its judgment the situation warrants, require that all the conditions of the license, of the act, and of the rules and regulations of the Commission shall be applicable to such property so leased to the same extent as if the lessee were the Licensee: Provided, that the provisions of this article shall not apply to parts of the project or project works which may be used by another jointly with the Licensee under a contract or agreement whereby the Licensee retains the occupancy, possession, and control of the property so used and receives adequate consideration for such joint use, or to leases of land while not required for purposes of generating, transmitting, or distributing power, or to buildings or other property not built or used for said purposes, or to minor parts of the project or project works, the leasing of which will not interfere with the usefulness or efficient operation of the project by the Licensee for such purposes.

Article 26. The Licensee, its successors and assigns shall, during the period of the license, retain the possession of all project property covered by the license as issued or as later amended, including the project area, the project works, and all franchises, easements, water rights, and rights of occupancy and use; and none of such properties necessary or useful to the project and to the development, transmission, and distribution of power there from will be voluntarily sold, transferred, abandoned, or otherwise disposed of without the approval of the Commission: Provided, that a mortgage or trust deed or judicial sales made there under, or tax sales, shall not be deemed voluntary transfers within the meaning of this article. In the event the project is taken over by the United States upon the termination of the license, as provided in section 14 of the act, or is transferred to a new Licensee under the provisions of section 15 of the act, the Licensee, its successors and assigns will be responsible for and will make good any defect of title to or of right of user in any of such project property which is necessary or appropriate or valuable and serviceable in the maintenance and operation of the project, and will pay and discharge, or will assume responsibility for payment and discharge, of all liens or encumbrances upon the project or project property created by the Licensee or created or incurred after the issuance of the license: Provided, that the provisions of this article are not intended to prevent the abandonment or the retirement from service of structures, equipment of other project works in connection with replacements thereof when they become obsolete, inadequate, or inefficient for further service due to wear and tear, or to require the Licensee, for the purpose of transferring the project to the United States or to a new Licensee, to acquire any different title to or right of user in any of such project property than was necessary to acquire for its own purposes as Licensee.

Article 27. The terms and conditions expressly set forth in the license shall not be construed as impairing any terms or conditions of the Federal Power Act which are not expressly set forth herein.

Article 28. The Licensee shall commence construction of the project works within one year from May 1, 1966, shall thereafter in good faith and with due diligence prosecute such construction, and shall complete construction within 4 ½ years from May 1, 1966.

[*Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

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Article 29. The Licensee shall within one year from the date of completion of the project, file with the Commission revised Exhibits F and K to define the final project boundary in accordance with the rules and regulations of the Commission.

[*Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 30. The Licensee shall submit, in accordance with the Commission's rules and regulations, final design Exhibit L drawings for the finally adopted New Bullards Bar Dam and Spillway and shall not begin construction of these or any project works contingent thereon until the Commission has approved the Exhibit L drawings.

[*FPC Order 05-06-66 deleted this article from the license.*]

Article 31. The Licensee shall construct, maintain and operate such protective devices and shall comply with such reasonable modifications of the project structures and operation in the interest of fish and wildlife resources, provided that such modifications shall be reasonably consistent with the primary purpose of the project, as may be prescribed hereafter by the Commission upon its own motion or upon recommendation of the Secretary of the Interior or the California Department of Fish and Game after notice and opportunity for hearing and upon a finding that such modifications are necessary and desirable and consistent with the provisions of the Act: *Provided further*, that subsequent to approval of the final design drawings prior to commencement of construction no modifications of project structures in the interest of fish and wildlife resources which involve a change in the location, height or main structure of a dam, or the addition of or changes in outlets at or through a dam, or a major change in generating units, or a rearrangement or relocation of a powerhouse, or major changes in a spillway structure shall be required.

Article 32. Whenever the United States shall desire, in connection with the project, to construct fish handling facilities or to improve the existing fish handling facilities at its expense, the Licensee shall permit the United States or its designated agency to use, free of cost, such of Licensee's lands and interests in lands, reservoirs, waterways and project works as may be reasonably required to complete such fish handling facilities or such improvements thereof. In addition, after notice and opportunity for hearing the Licensee shall modify the project operation as may be prescribed by the Commission, consistent with the primary purpose of the project, in order to permit the maintenance and operation of the fish handling facilities constructed or improved by the United States under the provision of this article. This article shall not be interpreted to place any obligation on the United States to construct or improve fish handling facilities or to relieve the Licensee of any obligation under this license.

Article 33. The Licensee shall maintain the following minimum streamflow schedules for maintenance of fishlife in the several streams listed:

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(a)

Stream	Flow (cfs)[1]	
	April 15 to June 15	June 16 to April 14
Middle Yuba (below Our House Diversion)	50	30
Oregon Creek (below Log Cabin Diversion)	12	8
North Yuba (below New Colgate Diversion)	5	5

[1] Or natural flow, whichever is less. Maximum 24-hour fluctuations of plus or minus 10 percent are permitted for flows in Middle Yuba below Our House Diversion and in Oregon Creek below Low Cabin Diversion.

(b)

Stream	Flow (cfs)[1]		
	January 1 to June 30	July 1 to September 30	October 1 to December 31
Yuba River (below Timbuctoo Dam)	245	70	400

[1] Measured at a point not more than one-half mile downstream from the Irrigation Diversion Weir and provided that these flows shall be in addition to releases made to satisfy existing downstream water rights.

(c) Water releases for fish life as specified in paragraphs (a) and (b) of this article shall be subject to the following reduction in any critical dry year, defined as a water year for which the April 1 forecast of the California Department of Water Resources predicts that streamflow in the Yuba River at Smartville be 50 percent or less of normal:

(d)

Yuba River at Smartville streamflow forecast percent of normal	Reduction in water Release for fishlife, percent
50	15
45	20
40 or less	30

However, in no event shall releases for fishlife below USACE's Daguerre Point Dam be reduced to less than 70 cfs. The critical dry year provisions herein shall be effective from the time the aforesaid forecast is available until the April 1 forecast of the following year.

(e) In addition to maintaining winter minimum water releases for fishlife in Yuba River below USACE's Daguerre Point Dam, as specified in paragraphs (b) and (c) of this article, the Licensee shall maintain uniform and continuous releases from USACE's Englebright Dam within the limits of the following schedule:

(f)

Period	Releases (cfs)[1]	Measurement Point
October 16 to 31	600-1,050	New station to be built downstream from the two Narrows powerhouses.
November	600-700	
December	600-1,400	
Jan. 1 to 15	1,000-1,850	
Jan. 16 to Mar. 31	800	

[1] Provided that:

A. Variations from this schedule are permissible during emergencies, uncontrollable flood flows, and critical dry year curtailments.

B. With the exception of emergencies, releases required by USACE's flood control criteria, releases required to maintain a flood control buffer or for other flood control purposes, bypasses of uncontrolled flows into USACE's Englebright Lake, uncontrolled spilling, or uncontrolled flows of tributary streams downstream of USACE's Englebright Dam, Licensee shall make reasonable efforts to operate New Bullards Bar Reservoir and USACE's Englebright Lake to avoid fluctuations in the flow of the lower Yuba River downstream of USACE's Englebright Dam, and daily changes in project operations affecting releases or bypasses of flow from USACE's Englebright Dam shall be continuously measured at the USGS gage at Smartville, and shall be made in accordance with the following conditions:

i. Project releases or bypasses that increase streamflow downstream of USACE's Englebright Dam shall not exceed a rate of change of more than 500 cfs per hour.

ii. Project releases or bypasses that reduce streamflow downstream of USACE's Englebright Dam shall be gradual and, over the course of any 24-hour period, shall not be reduced below 70 percent of the prior day's average flow release or bypass flow.

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iii. Once the daily project release or bypass level is achieved, fluctuations in the streamflow level downstream of USACE's Englebright Dam due to changes in project operations shall not vary up or down by more than 15 percent of the average daily flow.
iv. During the period from September 15 to October 31, the Licensee shall not reduce the flow downstream of USACE's Englebright Dam to less than 55 percent of the maximum five-day average release or bypass level that has occurred during that September 15 to October 31 period or the minimum streamflow requirement that would otherwise apply, whichever is greater.
v. During the period from November 1 to March 31, the Licensee shall not reduce the flow downstream of USACE's Englebright Dam to less than the minimum streamflow release or bypass established under (iv) above; or 65 percent of the maximum five-day average flow release or bypass that has occurred during that November 1 to March 31 period; or the minimum streamflow requirement that would otherwise apply, whichever is greater.

[*Initial Article 33 revised by P-2246 30 FPC 1610 Order Modifying Order on Rehearing issued December 27, 1963 and P-2246 35 FPC Order Amending License (Major) issued May 6, 1966. Order amended by 113 FERC 62,137 Order Modifying and Approving Amendment of License issued November 22, 2005.*]

Article 34. The Licensee shall maintain a minimum pool in New Bullards Bar Reservoir at Elevation 1,730 feet.

[*Included in May 16, 1963 Order Issuing License and amended by P-2246 35 FPC Order Amending License (Major) issued on May 6 1966. Temporarily waived by 13 FERC 62,225 Order Approving Temporary Waiver of the Requirement of License Article 34 issued December 2, 1980.*]

Article 35. The Licensee shall so regulate releases from Timbuctoo Afterbay Dam during normal operation that they shall not fluctuate at an hourly rate of more than 300 cfs, such fluctuations to be measured within one-half mile below Timbuctoo Afterbay Dam.

[*FPC Order 05-06-66 deleted this article from the license.*]

Article 36. The Licensee shall construct and maintain at Timbuctoo Afterbay Dam such facilities for trapping and removing salmon and steelhead trout as have been approved by the Commission.

[*FPC Order 05-06-66 deleted this article from the license.*]

Article 37. The Licensee shall take whatever steps are required to prevent entry into any streams or waters in or below the project area of any clay, silt, fines, sand, gravel, detritus, oil, or other substance deleterious to fish and aquatic life and/or their habitat, resulting from construction or operation of the project.

Article 38. The Licensee shall construct and operate the project in a manner providing minimum possible alteration of fish and wildlife habitat, consistent with reasonable economic practices, except where habitat changes result from specific modifications of construction and operation designed to enhance fish and wildlife under ways and means approved by the California Department of Fish and Game, the Secretary of Agriculture, and the Secretary of the Interior.

Article 39. Mitigation of damages to wildlife resulting from project activities shall be made by the Licensee as directed by the Commission based upon investigations by the California Department of Fish and Game and the Licensee as to the extent of such damages and means of

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mitigation, or upon recommendation of the Secretary of the Interior or of the Secretary of Agriculture.

Article 40. Consistent with the primary purpose of the power intakes in the New Bullards Bar Dam, the Licensee shall operate, within limits of the project, the multiple-level power intakes in New Bullards Dam to provide water of suitable quality in the Yuba River downstream from the New Narrows Power Plant for the production of anadromous fish as may be prescribed by the Commission upon the recommendations of the Director of the California Department of Fish and Game and the Fish and Wildlife Service, Department of the Interior.

[*Included in May 16, 1963 Order Issuing License, and amended by P-2246 30 FPC 1610 Order Modifying Order on Rehearing issued December 27, 1963 and the P-2246 35 FPC 691 Order Amending License (Major) issued May 6, 1966, to read as shown above.*][12]

Article 41. The Licensee shall, prior to the impounding of water, clear the area of project reservoirs as follows: *New Bullards Bar Reservoir*—All vegetation between elevation 1,700 feet and 1,955 feet, except that in precipitous and inaccessible areas of the reservoir. Timber, slash, and woody debris from logging and clearing operations may be removed by flotation in accordance with the "YUBA RIVER DEVELOPMENT CLEARING PLAN FOR THE NEW BULLARDS BAR RESERVOIR" and *Other Project Reservoirs* (not including USACE's Englebright Lake)—all lands in the bottom and margins up to high-water level; shall clear and keep clear to an adequate width lands of the United States along open conduits; and shall dispose of all temporary structures, unused timber, brush, refuse, or inflammable material resulting from the clearing of the lands or from the construction and maintenance of the project works. In addition, all trees along the margins of reservoirs that may die from the operation of the reservoir shall be removed. The clearing of the lands and the disposal of the material shall be done with a due diligence and to the satisfaction of the authorized representative of the Commission. Any debris permitted to be floated to central disposal points shall be removed from the reservoir as soon as possible during the initial storage of water in the reservoir.

[*Included in May 16, 1963 Order Issuing License and amended by P-2246 40 FPC 1001 Order Further Amending License (Major) issued October 3, 1968. Authorizing Commencement of Construction of Power Intake at New Bullards Bar Dam of Project. Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 42. The Licensee shall strip and stockpile top soil from all borrow areas prior to borrow operations, and shall regrade these areas as practicable and replace top soil upon completion of borrow operations. Additionally, all borrow areas on lands of the United States shall be

[12] In 1993, Licensee convened a Temperature Advisory Committee to obtain more refined recommendations for the operation of New Bullards Bar Reservoir's multilevel outlet. The committee was composed of Licensee, USFWS, and CDFG. After reviewing temperature model data and the operating options, USFWS and CDFG recommended that water releases from New Bullards Bar Reservoir be as cold as possible at all times. Licensee immediately implemented this recommendation and, since 1993, all controlled releases of water from New Bullards Bar Reservoir through New Bullards Bar Minimum Flow Powerhouse into the north Yuba River and through New Colgate Powerhouse into the Yuba River have been from the deepest port of the New Bullards Bar Power Intake.

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revegetated with browse species. This stipulation does not apply to areas inundated by reservoirs.

[*Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 43. All construction activity shall be carried on with the least possible erosion damage and least possible disfiguration of the landscape. Insofar as practicable, spillways from dams and conduits shall be located in natural stream channels and and/or on relatively stable material.

[*Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 44. During construction of the project, the Licensee shall keep a road open across the North Yuba River in the vicinity of Bullards Bar, at all times, for National Forest use and protection.

[*Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 45. The Licensee shall do everything reasonably within its power and shall require its employees, contractors, and employees of contractors to do everything reasonably within their power, both independently and upon the request of officers of the agency concerned to prevent, make advance preparations for suppression, and suppress fires on the lands to be occupied or used under the license. The Licensee shall be liable for and pay the costs incurred by the United States in suppressing fires caused from the construction, operation, or maintenance of the project works or of the work appurtenant or accessory thereto under the license.

Article 46. The Licensee shall operate the project reservoirs for flood control in accordance with rules prescribed by the secretary of the Army, such rules to be specified in a formal agreement between the Licensee and the District Engineer, U.S. Army Engineers District, Sacramento, California. Said agreement shall be subject to review from time to time at the request of either party; provided, however, that a different procedure of review may be prescribed by formal agreement.

[*Included in May 16, 1963 Order Issuing License, and amended by P-2246 30 FPC 1610 Order Amending Order on Rehearing issued December 27, 1963 to read as shown above.*]

Article 47. The Licensee shall enter into contractual arrangements with the District Engineer, U.S. Army Engineer district, Sacramento, California, pursuant to the River and Harbor Act of June 25, 1938, with respect to supplying storage for water in USACE's Englebright Reservoir for power development at the New Narrows Power Plant, upon such conditions of delivery, use and payment as the Secretary of the Army may approve, such payments to be deposited to the credit of the Englebright Reservoir.

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Article 48. The Licensee shall assume liability for any structural damage to USACE's Englebright Project incurred as a result of construction of the proposed New Narrows power facilities.

[*Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 49. The Licensee shall operate the project in such manner as will not conflict with future depletion of the water of the Yuba River and its tributaries or prevent or interfere with the future diversion and use of such water for the irrigation of lands or other beneficial consumptive uses.

[*Included in May 16, 1963 Order Issuing License.*]

Article 50. The Licensee shall enter into a formal agreement with the Bureau of Reclamation on river operations within the Yuba Basin which agreement shall be subject to the approval of the commission.

[*Included in May 16, 1963 Order Issuing License. Agreement date June 12, 1963 approved by P-2246 30 FPC 1610 Order Modifying Order on Rehearing issued December 27, 1963. [Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 51. The Licensee shall negotiate with the National Park Service for archeological survey and salvage within project reservoir sites to be accomplished prior to inundation and to be financed by the Licensee in an amount not to exceed $60,000.

[*Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 52. The Licensee shall not commence construction of any of the project works of the New Colgate Development until the Commission has approved the final design for New Bullards Bar Dam.

[*Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 53. The Commission reserves the right to determine at a later date what additional transmission facilities, if any, shall be included in this license as part of the project works.

Article 54. The Licensee shall install additional capacity and make other changes in the project as directed by the Commission, to the extent that it is economically sound and in the public interest to do so, after notice and opportunity for hearing.

Article 55. The Licensee shall, after notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with such other power systems and in such manner as the Commission may direct in the interest of power and other beneficial uses of water

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resources, and on such conditions concerning the equitable sharing of benefits by the Licensee as the Commission may order.

Article 56. The Licensee shall, within one year from the effective date of this license, file with the Commission a recreational use plan, which shall include not only recreational improvements, which may be provided by others, but the recreational improvements the Licensee plans to provide.

Article 57. The Licensee shall pay to the United States the following annual charges:

(i) For the purpose of reimbursing the United States for the cost of administration of Part I of the Act, a reasonable annual charge in accordance with the provisions of Part II of the Commission's regulations in effect from time to time. The authorized capacity for that purpose is 482,500 horsepower.
(ii) For the purpose of recompensing the United States for the use, occupancy, and enjoyment of 3834.47 acres of its lands, exclusive of transmission line rights-of-way, an amount to be determined from time to time pursuant to the Commission's Regulations

[*Included in May 16, 1963 Order Issuing License and amended by P-2246 35 FPC Order Amending License issued May 6, 1966; P-2246 47 FPC Order Approving Revised Exhibit L Drawings and Revised Exhibit M and Adjusting Authorized Installed Capacity issued January 4, 1972; 12 FERC 62,014 Order Approving As-Built Exhibit K and Amending License issued July 8, 1980; 31 FERC 62,186 Order Amending License issued May 9, 1985; and 59 FERC 62,257 Order Amending License, Approving Revised Exhibit M, and Revising Annual Changes issued June 10, 1992.*]

Article 58. The Licensee shall engage at least three qualified, independent consultants for the purpose of reviewing and reporting on the foundation treatment of the New Bullards Bar arch dam and other hydraulic structures, including tunnels. The report of the consultant shall be submitted prior to the initiation of foundation treatment. The Licensee shall also submit a final report of the board covering the construction of the project upon completion.

[*Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 59. The Licensee shall not hold the United States liable for any damage to New Narrows Power Plant due to inundation or backwater resulting from a downstream Federal reservoir with a water surface elevation of up to and including 345 feet (USGS datum) measured at the downstream dam, nor shall the Licensee hold the United States liable for any loss of power head or reduction in power protection due to said reservoir within the limits of a normal water surface elevation not in excess of 340 feet (USGS datum) measured at the downstream dam.

Article 60. The Licensee shall not commence construction of the multi-level power intake at New Bullards Bar Dam until specifically authorized by the Commission following concurrence

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with the Licensee by the Director of the California Department of Fish and Game and by the Fish and Wildlife Service, Department of the Interior, on the location and functional design of the intake.

[*Added to license by P-2246 35 FPC Order Amending License. Authorized to commence construction by October 3, 1968 issued May 6 1966. P-2246 40 FPC Order Further Amending License (Major) and Authorizing Commencement of Construction of Power Intake at New Bullards Bar Dam of Project. Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 61. The Licensee shall construct, maintain and operate or shall arrange for the construction, maintenance and operation of such recreational facilities including modifications thereto, such as access roads, wharves, launching ramps, beaches, picnic and camping areas, sanitary facilities and utilities, as may be prescribed hereafter by the Commission during the term of this license upon its own motion or upon the recommendation of the Secretary of the Interior or other interested Federal and State agencies, after notice and opportunity for hearing and upon findings based upon substantial evidence that such facilities are necessary and desirable, and reasonably consistent with the primary purpose of the project.

[*Added to license by P-2246 35 FPC Order Amending License issued May 6, 1966. Recreation study plan approved by 54 FERC 62,082 Order Modifying and Approving Recreation Study Plan issued February 4, 1991. Article 61 amended as read above by 64 FERC 62,117 Order Approving Recreation Plan with Modification, Requiring Study Plan, and Amending License issued August 19, 1993. Study Plan for the Assessment of Recreation at Log Cabin and Our House Diversion Dams made part of license by 66 FERC 62,182 Order Approving Recreation Study and Boating Speed Restriction Plan issued March 25, 1994. The amendment to the Yuba River Project recreation plan for the continued use of the Cottage Creek Picnic Area for overflow camping was approved by 104 FERC 62,226 Order Amending Recreation Plan issued September 30, 2003. Recreation Plan modified by 107 FERC 62,004 Order Approving Revision of the Recreation Plan with a seasonal closure of Moran Road to vehicular traffic from October 15 to May 1 each year, road surface and drainage improvements, a parking area for approximately 7 cars, an accessible portable toilet, and all construction and maintenance activities scheduled between May 2 and October 14 issued April 5, 2004.*]

Article 62. The License shall install instruments in the dam and foundation for the purpose of measuring foundation stresses and movements, deflections in the dam, and stresses and temperatures in the concrete, and shall submit to the Commission annually, for a period of five years after completion of construction of the New Bullards Bar Dam, reports evaluating the results of the instrumentation.

[*Licensee considers this article out-of-date since it pertains to initial Project construction, which has been completed.*]

Article 63. The Licensee shall maintain the State of California dissolved oxygen (DO) standard in the North Fork of the Yuba River, as measured downstream of the minimum flow release tailrace, for the protection of water quality. Further, Licensee, in cooperation with the Central

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Valley Regional Water Quality Control Board, the California Department of Fish and Game, and the U.S. Fish and Wildlife Service, shall develop and implement a mutually satisfactory monitoring plan to assess the impact of project operation on the DO concentrations of the North Fork of the Yuba River. Within 6 months from the date of issuance of this license, the Licensee shall file a description of the monitoring plan, a schedule for completion, and a date for filing a final report with the Director, Office of Hydropower Licensing, along with comments from the above agencies on the adequacy of the plan. The Director may require modification of the plan. The results of the monitoring program shall be submitted to the Commission. If the results of the monitoring program indicate that changes in project structures or operations are necessary to maintain the State of California DO standard, the Licensee also shall file for Commission approval, as part of the final report, a schedule for implementing the specific changes in project structures or operations, along with comments from the agencies listed above on the adequacy of the specific changes in project structures or operations. At the same time that the implementation schedule is filed with the Commission, copies of the schedule shall be served on the agencies consulted.

[*Added by 31 FERC 62,186 Order Amending License issued May 9, 1985. Dissolved oxygen monitoring plan filed on September 24, 1985, supplemented March 7, 1986, and added to license by Order Approving Dissolved Oxygen Monitoring Plan issued April 16, 1986.*]

Article 64. The Licensee shall, prior to any future construction at the project, consult with the California State Historic Preservation Officer (SHPO) about the need for cultural resource survey and salvage work. Documentation of the nature and extent of consultation, including a cultural resources management plan, shall be filed with the Commission 6 months before any construction activity. The Licensee shall make available funds in a reasonable amount for any such work, as required. If any previously unrecorded archeological or historical sites are discovered during the course of the construction or development of any project works or other facilities at the project, construction activity in the vicinity shall be halted, a qualified archeologist shall be consulted to determine the significance of the sites, and the Licensee shall consult with the SHPO to develop a mitigative plan for the protection of significant archeological or historical resources. If the Licensee and the SHPO cannot agree on the amount of money to be expended on archeological or historical work related to the project, the Commission reserves the right to require the Licensee, at its own expense, to conduct any such work found necessary.

Article 65. The Licensee shall commence construction of the New Bullards Bar Dam Project within two years from the issuance date of this order and shall complete construction of the project within four years from the issuance date of this order.

[*Added to License in 31 FERC 62,186 Order Amending License issued May 9, 1985. Licensee considers this article out-of-date since it pertains to Project construction, which has been completed.*]

Article 66. The Licensee shall provide one copy to the Commission's Regional Engineer and two copies to the Director, Division of Inspections, of the final contract drawings and specifications for pertinent features of the project, such as water retention structures, powerhouse, and water conveyance structures, at least 60 days prior to start of construction. The

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Director, Division of Inspections, may require changes in the plans and specifications to assure a safe and adequate project.

[*Added to License in 31 FERC 62,186 Order Amending License issued May 9, 1985. Licensee considers this article out-of-date since it pertains to Project construction, which has been completed.*]

Article 67. The Licensee shall within 90 days of completion of construction file with the Commission for approval by the Director, Division of Project Management, revised Exhibits A and F to describe and show the project as-built.

[*Added to License in 31 FERC 62,186 Order Amending License issued May 9, 1985. Licensee considers this article out-of-date since it pertains to Project construction, which has been completed.*]

6.4.2 Current FERC License Maps, Design Drawings and Plans

6.4.2.1 Project Maps (Exhibits J and K)[13]

The current FERC license includes 14 maps that show the area within the existing FERC Project Boundary. These maps include:

Exhibit No.	FERC Map No.	Title
2246-88	J-1	Yuba River Development Project – General Map
2246-89	J-2	Oregon Creek Diversion – General Map
2246-90	J-3	Colgate and Narrows 2 – General Map
2246-129	K-1-A	Bullards Bar Project—Reservoir Map
2246-130	K-2-A	Bullards Bar Project—Reservoir Map
2246-131	K-3-A	Bullards Bar Project—Reservoir Map
2246-132	K-4-A	Bullards Bar Project—Reservoir Map
2246-133	K-5-A	Bullards Bar Project—Reservoir Map
2246-134	K-6-A	Bullards Bar Project—Reservoir Map
2246-135	K-7-A	Bullards Bar Project—Reservoir Map
2246-136	K-8-A	Bullards Bar Project—Reservoir Map
2246-137	K-9-A	Middle Yuba—Oregon Creek Diversion Project—Log Cabin and Our House Reservoir Map
2246-154	K-10-A	New Colgate Project Map
2246-139	K-11-A	Narrows Project—Detailed Map

Copies of Project maps are available on request from Licensee. For maps that show the existing FERC Project Boundary, refer to Appendix D.

[13] All Exhibit J and K maps depicting the existing FERC Project Boundary will be included in Exhibit G of the application for a new license, in conformance with 18 CFR § 4.51(h).

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6.4.2.2 Project Design Drawings (Exhibit L)[14]

The current FERC license for the Project includes 35 plan-and-profile design drawings of Project facilities:

Exhibit No.	FERC Drawing No.	Title
2246-149	F-1	New Bullards Bar Dam – Site Plan
2246-144	F-2	Bullards Bar Dam – Site Plan and Profile
2246-150	F-2	New Bullards Bar Dam – Turbine Building
2246-145	F-3	Bullards Bar Dam – Powerhouse Site Plan
2246-146	F-4	Bullards Bar Dam – Penstock Profile and Details
2246-147	F-5	Bullards Bar Dam – Powerhouse Plan and Details
2246-148	F-6	Bullards Bar Dam – Powerhouse Sections and Details
	L-14	Dam Spillway Power Intake
	L-15	New Bullards Bar Project Dam Layout and Geometric Data
	L-16	New Bullards Bar Project – Plan Profile and Rating Curves
	L-17	New Bullards Bar Project Powerplant Plans El. 1378.5 & El.1394.5
	L-18	New Bullards Bar Project Power Plant Plans El. 1358.0 & 1370.0
	L-19	New Bullards Bar Project Powerplant Sections
	L-20	Log Cabin Dam and Camptonville Tunnel – Dam General Arrangement
	L-21	Log Cabin Dam and Camptonville Tunnel – Camptonville Tunnel Plan – Profile & Sections
	L-22	Our House Dam & Lohman Ridge Tunnel – Dam General Arrangement
	L-23	Our House Dam & Lohman Ridge Tunnel – Lohman Ridge Tunnel Plan – Profile & Sections
2246-155	L-24	New Colgate Project – Tunnel Plan, Profile, and Sections
	L-25	New Colgate Project – General Arrangement Plan – Control Room
	L-27	New Narrows Project – Site Plan Sht 1 of 2
	L-28	New Narrows Project – Site Plan Sht 2 of 2
	L-29	New Narrows Project – Profile Sections and Steel Liner
	L-30	New Narrows Project – Powerplant General Arrangement Longitudinal Section
	L-31	New Narrows Project – Powerplant General Arrangement Plan El. 348 & 324
	L-32	New Narrows Project – General Arrangement Plan El. 304 & 292
	L-35	New Colgate Project – Powerplant Site Plan

[14] All design drawings showing plan-and-profiles of Project facilities will be included in Exhibit F of the application for a new license, in conformance with 18 CFR § 4.51(g).

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Exhibit No.	FERC Drawing No.	Title
	L-36	New Colgate Project – General Arrangement Cross Section B-B
	L-37	New Bullards Bar Project – Dam Right Thrust Block Details
	L-38	New Bullards Bar Project – Dam Left Thrust Block Details
	L-39	New Colgate Project – General Arrangement Plan – Generator Deck El. 598.00
	L-40	New Narrows Project – Powerplant General Arrangement Sections
	L-41	Powerplant General Arrangement Cross Section A-A
2246-156	L-42	General Arrangement Site Plan – Option A, Wye Junction
2246-157	L-43	General Arrangement Site Plan – Option B, Tee Junction
2246-158	L-44	Turbine Shutoff Valve – General Arrangement
2246-159	L-45	Bypass Valve Structure – Equipment Arrangement – Sheet 1
2246-160	L-46	Bypass Valve Structure – Equipment Arrangement – Sheet 2

Copies of Exhibit L drawings are available on request from Licensee.

6.4.2.3 Project Recreation Map (Exhibit R)

The current FERC license includes 20 maps that show Project recreation areas and facilities. These include:

Exhibit No.	FERC Map No.	Title
2246-140	R-1-2	New Bullards Bar Project – Recreational Facilities
2246-141	R-1-3	New Bullards Bar Project – Recreational Facilities
2246-119	R-2-2	New Bullards Bar Project – Recreational Facilities
2246-120	R-3	New Bullards Bar Project – Recreational Facilities
2246-121	R-4-1	New Bullards Bar Project – Recreational Facilities
2246-122	R-4-2	New Bullards Bar Project – Recreational Facilities
2246-123	R-5	New Bullards Bar Project – Recreational Facilities
2246-124	R-6-1	New Bullards Bar Project – Recreational Facilities
2246-125	R-6-2	New Bullards Bar Project – Recreational Facilities
2246-126	R-7-1	New Bullards Bar Project – Recreational Facilities
2246-127	R-7-2	New Bullards Bar Project – Recreational Facilities
2246-128	R-7-3	New Bullards Bar Project – Recreational Facilities
2246-156	R-9	Moran Road Improvements
2246-157	R-10	Cottage Creek Layout
2246-158	R-11	Cottage Creek Layout
2246-159	R-12	Cottage Creek Layout
2246-160	R-13	Cottage Creek Pavement Delineation
2246-161	R-14	Cottage Creek Restroom Plan

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Exhibit No.	**FERC Map No.**	**Title**
2246-162	R-15	Bullards Bar Road Work
2246-163	R-16	Dark Day Test Campground

Copies of Exhibit R maps are available on request from Licensee.

6.4.2.4 Other FERC License Plans

Outside of the existing license but still under FERC jurisdiction, Licensee has developed and now maintains two plans related to the Project. These are:

- Yuba River Development Project Public Safety Plan (1995). This plan was prepared by Licensee at the direction of FERC's Regional Engineer, and filed with FERC. The plan describes the facilities and measures undertaken by Licensee for public safety purposes at Project facilities. Licensee participates in FERC public safety inspections on a regular basis.
- Yuba River Development Project Emergency Action Plan (2006). This plan was prepared by Licensee at the direction of FERC's Regional Engineer and filed with FERC. The plan describes the procedures Licensee and emergency response agencies would take in the event of imminent failure of Project dams. The EAP is tested (i.e., tabletop and functional exercise) every 5 years with the last test in 2005.

6.4.3 Compliance History of the Project

Licensee is in compliance with terms and conditions of the existing license. During annual FERC Project inspections and the 5-year public safety, environmental, and recreation inspections, various remedial actions are recommended as a result of the inspections. Licensee initiates actions and proposes plans and schedules for more significant actions to correct any issues of safety, compliance, or other issues as recommended from the inspections and provides written confirmation of the actions taken.

In the event of a non-compliance action such as deviation from the required minimum flows, Licensee immediately notifies FERC, initiates an investigation and provides a written report to FERC regarding the incident and corrective action. There have been no such events since 2000.

6.5 Summary of Project Generation and Outflow Records

6.5.1 Flow and Generation

Appendix F provides regulated and synthesized hydrology in mean daily flow at Project powerhouses and downstream of dams, as well as at other nodes in the Project Area, for Water Year 1970 through Water Year 2008. The appendix also includes reservoir elevations. Data are provided in USACE Hydrologic Engineering Center's (HEC) Data Storage System (DSS) and in Microsoft Excel formats.

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In general, Project facilities normally generate their maximum electrical outputs during the late spring and early summer months when streamflows are high from winter precipitation and snowmelt and downstream consumptive water demands are high. However, considerable variation occurs in any given year due to storm timing as well as timing and magnitude of snowmelt.

6.5.2 Monthly and Annual Energy Generation and Dependable Capacity

6.5.2.1 Monthly and Annual Energy Generation

Table 6.5.2-1 shows the total monthly generation at New Colgate, New Bullards Bar Minimum Flow, and Narrows 2 powerhouses, and combined generation from these powerhouses from 2004 through 2005. Table 6.5.2-1 also shows the annual average generation for each powerhouse and the Project over this 5-year period.

Table 6.5.2-1. Average monthly gross generation for calendar year 2004 through 2008 at Project powerhouses.

Month	Monthly Total Generation (MWH)					Average Generation (MWH)
	2004	2005	2006	2007	2008	
NEW COLGATE POWERHOUSE						
January	112,385	36,481	194,527	71,218	45,647	92,051
February	97,448	28,596	183,246	75,358	43,080	85,546
March	122,271	36,088	199,789	73,689	28,437	92,055
April	125,198	91,081	194,846	53,995	63,738	105,771
May	144,370	198,253	213,307	96,829	88,863	148,325
June	117,850	176,738	171,297	89,962	79,965	127,162
July	131,456	167,583	166,315	108,352	108,906	136,523
August	99,761	104,314	95,808	92,342	93,987	97,242
September	43,512	45,904	44,167	56,190	57,691	49,493
October	57,729	56,970	44,079	56,300	663	43,148
November	40,330	68,131	46,627	61,650	0	43,347
December	41,423	116,875	42,667	44,565	17,512	52,608
Subtotal	*1,133,732*	*1,127,014*	*1,596,674*	*880,450*	*628,488*	*1,073,272*
NEW BULLARDS BAR MINIMUM FLOW POWERHOUSE						
January	93	87	82	97	71	86
February	85	85	88	55	70	77
March	94	99	43	96	99	86
April	82	94	57	95	71	80
May	101	102	100	95	0	80
June	92	100	96	82	0	74
July	104	100	97	92	0	79
August	64	100	94	97	57	82
September	101	90	95	95	95	95
October	97	99	97	96	76	93
November	101	98	88	94	102	97
December	100	99	94	97	83	95
Subtotal	*1,113*	*1,154*	*1,032*	*1,090*	*723*	*1,022*
NARROWS 2 POWERHOUSE						
January	26,315	11,923	39,431	11,668	11,454	20,158
February	26,725	9,017	34,075	16,367	10,636	19,364
March	30,099	17,659	38,376	18,107	0	20,848
April	25,315	25,612	35,286	10,487	11,737	21,687
May	29,224	37,756	33,646	19,180	18,279	27,617
June	21,941	36,923	28,100	13,973	13,251	22,838
July	24,054	32,497	31,158	18,381	18,397	24,897

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Table 6.5.2-1. (continued)

Month	Monthly Total Generation (MWH)					Average Generation (MWH)
	2004	2005	2006	2007	2008	
NARROWS 2 POWERHOUSE						
August	18,159	19,768	16,862	15,197	16,821	17,361
September	3,061	0	0	1,449	35	909
October	8,727	4,566	0	5,381	2,598	4,254
November	4,962	11,791	0	9,924	1,442	5,624
December	5,197	25,168	0	5,679	0	7,209
Subtotal	*223,778*	*232,681*	*256,933*	*145,794*	*104,649*	*192,767*
TOTAL PROJECT						
January	138,793	48,490	234,040	82,983	57,172	112,295
February	124,258	37,698	217,409	91,781	53,785	104,986
March	152,464	53,846	238,208	91,892	28,536	112,989
April	150,595	116,788	230,189	64,577	75,545	127,539
May	173,695	236,112	247,053	116,104	107,142	176,021
June	139,883	213,761	199,493	104,016	93,216	150,074
July	155,613	200,180	197,570	126,825	127,303	161,498
August	117,984	124,182	112,764	107,637	110,864	114,686
September	46,674	45,994	44,261	57,734	57,820	50,497
October	66,552	61,635	44,176	61,776	3,337	47,495
November	45,392	80,020	46,715	71,668	1,543	49,068
December	46,721	142,142	42,761	50,341	17,596	59,912
Total	**1,358,624**	**1,360,850**	**1,854,639**	**1,027,335**	**733,860**	**1,267,061**

Some of the generated power is used at the powerhouses for station use. Station power use annually is about 1 MW hr at New Colgate Powerhouse, less than 0.1 MW hr at New Bullards Bar Minimum Flow Powerhouse, and negligible at Narrows 2 Powerhouse.

6.5.2.2 Dependable Capacity

The dependable capacity of a generating facility is defined as "the generating capacity that the plant can deliver under the most adverse water supply conditions to meet the needs of an electric power system with a given maximum demand."[15] One of the critical parameters for defining dependable capacity is the period over which the capacity must be provided. Traditionally, a year or season from time of maximum storage to minimum storage, is used for the time period over which capacity is calculated. For a peaking plant, the dependable capacity critical period is less precisely defined and is specific to the plant demand and constraints. Because the New Colgate Powerhouse provides both base load generation and peaking, its dependable capacity can be calculated for both types of generation.

For base load generation, the time period of the most adverse hydrology was the 1977 Water Year, which was characterized by the most extreme one-year drought conditions that followed a critically Dry Water Year, 1976. The annual unimpaired runoff of the Yuba River measured at the Smartville Gage was 370,000 ac-ft in Water Year 1977, which was about a 1-in-200 year drought year. In the 1977 Water Year, the amount of inflow to New Bullards Bar Reservoir, including diversions from the Middle Yuba River and Oregon Creek, totaled about 164,000 ac-ft of water, or an annual average flow rate of 226 cfs. For the 1977 Water Year, storage in New Bullards Bar Reservoir played a significant role in augmenting the water supply available for

[15] Standard Handbook of Powerplant Engineering, Second Edition; Thomas C. Elliott, Kao Chen, Robert C. Swanekamp.

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release through the New Colgate Powerhouse. Modeling studies made for the Yuba Accord Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) of releases and generation for the 1977 Water Year, using current minimum flow requirements (the Lower Yuba River Accord) and current consumptive demands, indicates that a total annual release of 319,000 ac-ft would occur during a repeat of 1977 Water Year hydrological conditions and there would be an annual generation of 328,000 MWh of electricity. This represents the annual dependable capacity of the New Colgate Powerhouse.

New Colgate Powerhouse generation is operated for peaking on hourly, daily, and weekly schedules. USACE's Englebright Reservoir, which is directly downstream of the New Colgate Powerhouse, has storage that may fluctuate from day to day, but that is generally brought back to a preferred target storage level within a week. Flow below the USACE's Englebright Dam is constrained by downstream demands, minimum flow requirements, and flow fluctuation restrictions. Therefore, USACE's Englebright Reservoir storage is used for daily and weekly fluctuations in peaking load demand, and the available amount of storage that can be fluctuated is used to augment the range of releases for peaking operations while maintaining a relatively constant flow below USACE's Englebright Dam.

Calculation of the dependable capacity of the New Colgate Powerhouse can be made by determining the minimum constant release from USACE's Englebright Reservoir, subtracting the amount of uncontrolled inflow, and adding the amount of storage that can be fluctuated in USACE's Englebright Reservoir. This approach assumes that for a week time period of maximum peaking demand, USACE's Englebright Reservoir would be drawn down so that the full amount of usable storage is available to capture New Colgate Powerhouse releases that are above the net of outflow from and inflow to USACE's Englebright Reservoir.

The maximum demand for peaking generation from New Colgate Powerhouse is usually in the hot summer months of June to October. USACE's Englebright Reservoir usable storage for weekly peaking generation during this period is governed by recreation on the reservoir. Reservoir water levels can be drawn down to about 516 feet and increased to about 523 feet without causing safety concerns or operational limitations on the marina at the reservoir. This range of elevations corresponds to a storage change of 5,300 ac-ft (i.e., 61,500 ac-ft to 66,800 ac-ft). Examination of Water Years 1970 to 2008 shows that the most constrained month for that period of record was August of 1977 when the average monthly release rate was 154 cfs. This release rate is extremely low compared to the normal release rate and is affected by the fact that diversion demand on the lower Yuba River was severely restricted in 1977. A more representative period of dependable capacity that does not have such a low probability of occurrence has a release rate of about 600 cfs. This occurred during several months of the driest years of record. The inflow to USACE's Englebright Reservoir varied during these periods, but averaged about 30 cfs. Therefore, the dependable generation for this adverse period would be based on a net outflow of 570 cfs from USACE's Englebright Dam, and a storage fluctuation of 5,300 ac-ft.

Given the re-regulating capability of USACE's Englebright Reservoir, the hourly dependable capacity of the New Colgate Powerhouse would be the full capacity of the powerhouse, or 340 MW. Weekly dependable capacity can be calculated based on the average weekly flow through

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the reservoir. For a one-week period, this would result in a total release rate of 951 cfs (i.e., 381 cfs storage plus 570 cfs outflow). The release rate of 951 cfs, with a storage level of about 1800 feet (i.e., about 500,000 ac-ft storage) results in an average generation capacity of 82.6 MW for a week.

Inspection of historical system operations shows many months with significantly less than the calculated dependable capacity for the New Colgate Powerhouse release, which occurs almost always in the winter months. However, these release rates were low due to the priority of increasing storage in New Bullards Bar Reservoir for water supply, which was an operational decision based on system preference and which was at a time of less than maximum peak load demand, therefore these lower release time periods do not meet the criteria for demand capacity that is constrained. Also, major overhauls and maintenance activities are often scheduled during the winter months.

As discussed in previous sections, the Narrows 2 Powerhouse is a base-loaded power generation facility. Therefore, the dependable capacity of the Narrows 2 Powerhouse is determined by the period of the most adverse hydrology, which was the 1977 Water Year. The annual flow volume at USACE's Englebright Reservoir for Water Year 1977, based on Yuba Accord EIR/EIS model studies, was 392,500 acre-ft, which included 318,000 ac-ft of releases from New Bullards Bar Reservoir and the remaining 74,500 ac-ft from local accretions and flows from the Middle and South Yuba rivers. Not all of the flow at USACE's Englebright Reservoir Dam was available for power generation through the Narrows 2 Powerhouse because some of this water was used to generate power at PG&E's Narrows Powerhouse. The annual flow volume available to Narrows 2 Powerhouse in 1977 was 193,000 ac-ft, with an annual generation of about 51,000 MWh, which is the dependable capacity of the Narrows 2 Powerhouse.

6.6 Current Net Investment

Licensee estimates the Project's net book value (assets minus liabilities) at this time (2010) is about $131,000,000.

6.7 Proposed New Generation Facilities and/or Changes in Project Operation to Increase Generation

Licensee is in the process of evaluating potential physical enhancements to increase Project power generation. The status of Licensee's evaluation of potential generation enhancements that Licensee might propose for inclusion in the new license will be described in the Proposed Study Plan.

6.8 List of Attachments

None.

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Photo 1. Our House Diversion Dam.

Photo 2. Log Cabin Diversion Dam.

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Photo 3. New Bullards Bar Dam and New Bullards Bar Minimum Flow Powerhouse.

Photo 4. New Colgate Powerhouse and Penstock.

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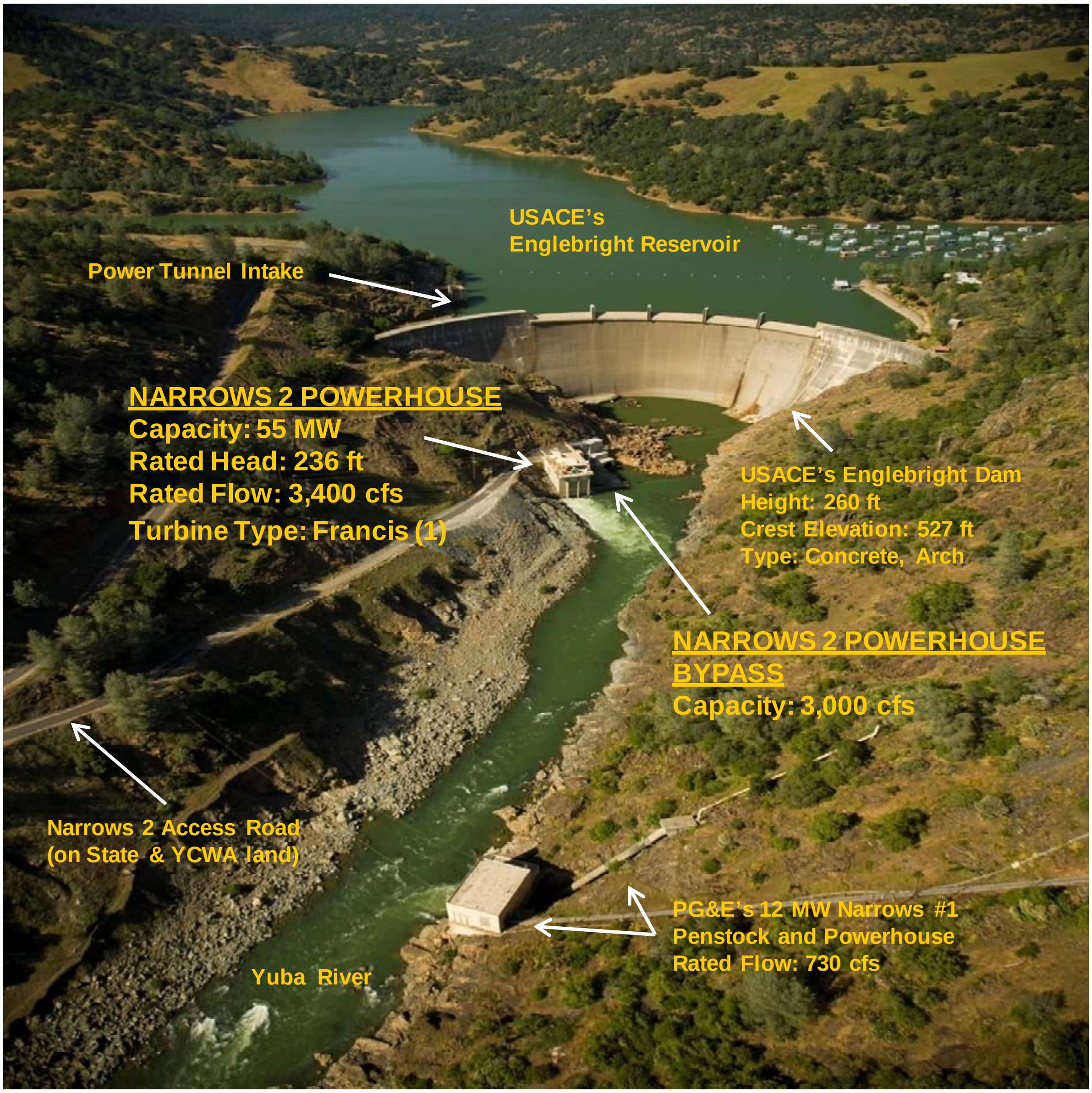

Photo 5. Narrows 2 Powerhouse.

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Photo 6. Dark Day Boat Launch, New Bullards Bar Reservoir.

Photo 7. Dark Day Campground, New Bullards Bar Reservoir.

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Photo 8. Schoolhouse Campground, New Bullards Bar Reservoir.

Photo 9. Hornswoggle Group Campground (Madrone Unit), New Bullards Bar Reservoir.

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Photo 10. Sunset Vista Point picnic unit, New Bullards Bar Reservoir.

Photo 11. Cottage Creek Boat Launch parking area, New Bullards Bar Reservoir.

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Photo 12. Emerald Cove Marina from Cottage Creek Boat Launch ramp, New Bullards Bar Reservoir.

SECTION 7

DESCRIPTION OF EXISTING ENVIRONMENT

This section describes the existing environment in the general vicinity[1] of Yuba County Water Agency's (YCWA or Licensee) Yuba River Development Project (Project). The section is organized by the following major resources:

- Geology and Soils
- Water Resources
- Aquatic Resources
- Wildlife Resources
- Botanical Resources
- Wetland, Riparian and Littoral Habitats
- Threatened, Endangered and Fully Protected Species
- Recreation Resources
- Land Use Resources
- Aesthetic Resources
- Socio-economic Resources
- Cultural Resources
- Tribal Interests

In general, and with some exceptions where appropriate, each major resource section is organized by geographic relationship to the Project. These sections are generally organized thus: 1) resources upstream of the Project; 2) resources in the Project Area;[2] and 3) resources downstream of the Project.

In addition, where appropriate, existing information is noted as either a source document (i.e., contains original data collected by the author) or anecdotal information. The amount of detail included in the description of each existing resource is commensurate with the importance of the resource in the relicensing.

[1] For the purposes of this document, Project Vicinity is defined as the area surrounding the Project on the order of a United States Geological Survey (USGS) 1:24,000 topographic quadrangle.

[2] For the purposes of this document, Project Area is defined as the area within the existing Federal Energy Regulatory Commission (FERC) Project Boundary and the land immediately surrounding the FERC Project Boundary (*i.e.,* within about 0.25 mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature or structure.

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7.1 Geology and Soils

7.1.1 Overview

This section provides information regarding existing geology and soil conditions in the vicinity[1] of Yuba County Water Agency's (YCWA or Licensee) Yuba River Development Project (Project). Besides this general introductory information, this section is divided into six subsections: Sections 7.1.2 through 7.1.7 provide general information regarding geologic features, tectonic history, mineral resources, physiography, geomorphology, and soils in the Project Region[2] and Section 7.1.8 describes existing, relevant, and reasonably available information regarding geology and soils in areas upstream of the Project (i.e., on the Middle Yuba River upstream of Our House Diversion Dam, on Oregon Creek upstream of Log Cabin Diversion Dam, and on the North Yuba River upstream of New Bullards Bar Reservoir), within the Project Area,[3] and downstream of the Project (i.e., on the Yuba River downstream of the United States Army Corps of Engineers' (USACE) Daguerre Point Dam).

7.1.2 Geologic Features

The Project Region is located within the Sierra Nevada physiographic and geologic province. The geology within the Project Region has evolved through many complex interactions within and beneath the earth's crust. These processes include plate tectonics, where continents are created by various mechanisms and are transformed by other mechanisms. Other smaller-scale local processes, such as mass wasting, weathering, erosion, and sedimentation also constantly change the landscape.

The geologic history of the Project Region spans the period from the mid-Paleozoic (i.e., approximately 300-400 million years ago, or mya) to the present day. The deepest basement rocks were emplaced about 225 mya, but are actually younger than many of the overlying metamorphic, volcanic, and sedimentary rocks exposed in the Project Region. The basement rock and overlying rocks began to move westward with the formation of a subduction boundary on what was then the western margin of the North American land mass (Schweickert et al. 1984), located east of the present day Sierra Nevada. Paleozoic and Mesozoic terrains were both accreted upon and subducted beneath the continent. Accretion occurred along the continental margin in long, linear strips, striking roughly parallel to the present day Sierra crest. The subduction zone supplied the mantle with new rock to a depth great enough for the subducting plate to melt. The resulting magma eventually rose as both surface volcanic rock and as subsurface granitic plutons. The granitic plutons compose much of the core of the current Sierra Nevada. Concurrent with the development of the plutons, the hot magma intruded into the

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1 For the purposes of this document, Project Vicinity is defined as the area surrounding the Project on the order of a United States Geological Survey (USGS) 1:24,000 topographic quadrangle.

2 For the purpose of this document, the Project Region is defined as the area surrounding the Project on the order of a county or national forest.

3 For the purposes of this document, the Project Area is defined as the area within the Federal Energy Regulatory Commission (FERC) Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within approximately 0.25-mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature, or structure.

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folded sedimentary rocks, resulting in metamorphism and the creation of the famous Sierra Nevada gold deposits in the fractures (USFS and BLM 2002).

Uplift along the eastern margin of the Sierra produced erosion through the beginning of the Tertiary Period (65 mya), exposing the gold veins that had been created during the Mesozoic. These gold veins were eroded and the gold-laden sediments re-deposited throughout the ancestral Yuba River drainage, which ran approximately north to south across the peneplain that existed at the time. The "Tertiary River Gravels" are the source for much of the gold mined during the 19th century in the Yuba River drainage (USFS and BLM 2002).

The middle Tertiary was a time of volcanic eruptions that deposited lava, mudflows, pyroclastic flows, and ash throughout the Yuba River basin. These deposits filled many pre-existing drainages such as the ancestral Yuba River, as well as emplacing a cap of volcanic rock and volcanic debris on both the plutonic rocks and the eroded and intruded remnants of the pre-existing early Mesozoic rocks.

Uplift along the eastern Sierra Nevada margin resulted in the predominantly east-to-west trends of incised drainages evident today. Subsequent to the middle Tertiary volcanic eruptions and mudflows, three late Quaternary glacial stages, each with multiple sub-stages, occurred in the northwestern Sierra Nevada (James 2003; James et al. 2002).

The bedrock geology in the Project Region is composed of Paleozoic metasediments and metavolcanics (undifferentiated), Paleozoic and Mesozoic granitics (i.e., Valley Pluton, Cascade Pluton [see Day et al. 1985], Yuba Rivers Pluton [see Day et al. 1985, Day and Bickford 2004]), and a Mesozoic ophiolite complex (i.e., Smartville[4] Complex; see Beard and Day 1987, Day et al. 1985, Day and Bickford 2004). Tertiary auriferous (gold-bearing) sediments, including auriferous river gravels deposited by the ancestral Yuba River, are present in the eastern portions of the Project Region. Figure 7.1.2-1, located at the end of this section, presents a generalized geologic map of the parent material in the Project Vicinity. Table 7.1.2-1 below presents the relative percent of each rock type to the total acreage in the Project Vicinity.

Table 7.1.2-1. Description of generalized geologic rock types in the Project Vicinity.

Rock Type	Area (acres)	Percent (%)	Description	Age
Granodiorite	62,967	27	granitic rocks, mostly granodiorite	Permian to Tertiary
Mafic Volcanic Rocks	63,554	27	metavolcanic rock, part of ophiolite complex	Jurassic
Gabbro	25,198	11	part of ophiolite complex	Triassic to Cretaceous
Alluvium	22,050	10	Terraces, alluvium, riverbanks associated with Yuba River corridor	Pliocene to Holocene
Argillite	21,181	9	weakly metamorphosed metasedimentary rock	Permian to Jurassic
Intermediate Volcanic Rock	18,772	8	metavolcanic rock	Permian to Jurassic
Andesite	4,852	2	lava flows/pyroclastic flows	Mid to late Tertiary (2-24 mya)
Peridotite	2,439	1	ultramafic rock associated with the Big Bend Wolf Creek Fault Zone	Later Proterozoic to Early Jurassic
Sandstone	2,315	1	ancestral Yuba River deposits	Eocene to Pleistocene

[4] In 2008, the people of this community petitioned to have the name changed to Smartsville, with an 's' in the middle of the name. However, the USGS gage refers to the former spelling of the community name. Therefore in this document, the community is referred to as such.

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Table 7.1.2-1. (continued)

Rock Type	Area (acres)	Percent (%)	Description	Age
Slate	2,484	1	undifferentiated metamorphosed sedimentary	Triassic to Late Cretaceous
Schist	3,235	1	Metamorphosed sedimentary rock	Early Proterozoic to Cretaceous
Water	3,814	2	N/A	N/A
Total	**232,861**	**100%**		

Source: Ludington et al. 2005

7.1.3 Tectonic History

Uplift of the Sierra Nevada began approximately 3 to 5 mya (Unruh 1991; Wakabayashi and Sawyer 2001; Henry and Perkins 2001), which is approximately coeval (synchronous) with the uplift of the Carson Range, bordering the Tahoe basin on the east, at 3 mya (Surpless et al. 2000). The uplift was accompanied by westward tilting of the range, stream incision, and downwarping of the Central Valley.

Most faults resulted from late Paleozoic and Mesozoic tectonic collisions. Faults that were re-activated in the late-Cenozoic are predominantly high-angle, northwest-trending, east-dipping, normal faults resulting from extensional stresses (Schwartz et al. 1977). Deformation is pronounced in bands of weak, ultramafic rock (Bennett 1983).

The Big Bend–Wolf Creek Fault Zone transects the Project's New Bullards Bar Reservoir in the western portion of the reservoir. This fault system marks the western margin of the Foothills fault system. The northern portion of this fault zone can be broken into three different segments. The southern segment, south of Highway 49, named the Wolf Creek fault, extends from Auburn to Grass Valley. The central segment, which includes the Marys Ravine, Pine Grove, Jones Ravine, and Birchville faults, extends from Grass Valley to New Bullards Bar Dam. New Bullards Bar Dam lies within the northern portion of the Foothills fault system, which is composed of a major Mesozoic fault system that extends from south of Fresno to north of Oroville and marks the location of ancient subduction and accretion (Geomatrix 2004). The northern segment, composed of the Oroleve-Woodleaf, Sucker Run, and Maynards Ranch faults, extends from southwest of New Bullards Bar Dam northwest to Fields Ridge (Geomatrix 2004).

Geomatrix Services, Inc. (Geomatrix) completed a review of existing data in 2004 for the above faults. Most of the faults were found to be inactive and are not considered a seismic source for the New Bullards Bar Dam. The two faults that were considered active were the Little Grass Valley fault and the Cleveland Hill fault, at 18 miles and 19 miles from the dam site, respectively. The Sanborn Mine (Camel Peak) fault is also considered active due to the lack of consensus on the activity status. Of these potential seismic sources, the controlling fault is the Little Grass Valley fault with a Maximum Credible Earthquake magnitude of 6.75 at a distance of 14.9 miles from the dam. The estimated median (50^{th} percentile) horizontal peak bedrock acceleration at the site due to a maximum magnitude earthquake on this source is 0.12g.[5] In addition, a random minimum earthquake was analyzed. The "minimum earthquake"

[5] The "g" is a common value at acceleration equal to 9.8 meters per second per second.

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recommended by the Division of Safety of Dams (Fraser and Howard 2002) has a magnitude of 6.25 with a duration of 14 seconds and a peak horizontal acceleration of 0.15g at the median level, and 0.2g at the 84th percentile. It is recommended at the conclusion of Geomatrix's report that the "minimum earthquake" of 6.25 should be used for analyses of the main dam (Geomatrix 2004).

The Swain Ravine Fault Zone is located approximately 18 miles east of the confluence of the Feather and Yuba rivers, parallel to the Big Bend Wolf Creek Fault Zone. The Cleveland Hill Fault is the northern extension of this zone near Lake Oroville. The 1975 Oroville earthquake, which occurred on the Cleveland Hill fault, also developed cracks over the northern portions of the Swain Ravine Fault (Page and Sawyer 2004 [Appendix E of Geomatrix 2004]). The locations of the Swain Ravine and Big Bend–Wolf Creek Fault Zones are depicted on Figure 7.1.2-1.

7.1.4 Mineral Resources

Gold mining is the dominant mineral resource activity, the dominant influence on how the Yuba River looks today, and the primary reason people settled in the area. Lode gold mining began in 1853 (CDOC 2003) with exploitation of surface deposits of placer gold, followed by riverbed, quartz, and alluvial gravel mining. Deep mines and gigantic hydraulic operations followed as the more-easily accessed deposits were depleted (SNEP 1997). After 1900, quartz gold mining grew in importance.

Many abandoned and active mines are scattered throughout the Yuba River system, and environmental damage from historic hydraulic mining for gold is visible throughout the river corridor. Mercury was imported from the Coast Range and used for gold extraction. Mercury remains sequestered in sediments within the Project Region and continues to be a potential source of mercury to Yuba River surface water. For a discussion of mercury, refer to the Water Resources section of this Pre-Application Document (Section 7.2).

Erosion of exposed mining material and transport of it to local river channels are the most likely indirect effects of mining operations, with sediment transport potentially affecting stream channel morphology.

The western edge of the northern half of the Sierra Nevada range has many other important minerals (Diggles et al. 1996). While the Sawyer Decision of 1884 caused the end of hydraulic gold mining, other gold mining techniques also declined after 1900. More than 20 other minerals were mined between 1900 and 1960. Most of the western belt is geologically permissive for gold, chromium (i.e., chromite ore), copper, and manganese. "Geologically permissive" is defined by the environment of formation, including estimates of undiscovered resources to a depth of 0.6 mile, though not all deposits are known. About a third of the belt has one or more of these metals. Also included are barite, molybdenite, and tungsten, which were also important in the development of the communities near the Sierra Nevada range. Chrysotile (i.e., white asbestos) is found in veins in serpentinized ultramafic rocks near margins of

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serpentinite bodies. Serpentine and ultramafic rocks are generally found along fault zones such as the Big Bend–Wolf Creek Fault Zone in the Project Area.

The California Debris Commission constructed USACE's Daguerre Point Dam in 1906 to prevent hydraulic mining debris originating in the Yuba River watershed from flowing into the Feather and Sacramento rivers. USACE's Englebright Dam was constructed in 1941 by the California Debris Commission. Although no hydraulic mining has occurred in the upper Yuba River watershed since construction of Englebright Dam, the historical mine sites continue to contribute sediment to the river.

As of 1994, sand and gravel mining exceeded gold mining in economic importance in California. California leads the nation in sand and gravel aggregate production, and virtually all aggregate is mined from alluvial deposits (Kondolf 1995). Sand and gravel are mined from channel deposits of the Bear, Feather, Yuba, and American rivers (WE&T 1991). Aggregate deposits are abundant in the alluvium in the lower parts of the drainage basins. Though demand for aggregate remains high in California, there is little likelihood of new aggregate mining operations in the Project Region due to access and location limitations (Aspen 2000). Aggregate extraction can have effects upon the river profile (e.g., knickpoint migration upstream), can cause loss of spawning gravels, and can undermine instream structures.

Potential hazards associated with historic or inactive mining operations include hidden or abandoned tunnels and mine shafts (Aspen 2000). The mines with exposed and erodible spoil materials located adjacent to an active channel are the sites most likely to be indirectly affected by Project operations of streamflow management. The potential delivery and mobility of instream sediment has not been assessed for every mine. Figure 7.1.4-1, located at the end of this section, shows all active and inactive mines in the Project Region. Table 7.1.4-1 below summarizes the number of active and inactive mineral extraction/exploration activities and current activity in the Project Region.

Table 7.1.4-1. Mines in the Yuba River Development Project Vicinity.

Mineral	Current Activity	Number
Unknown Mineral	Occurrence	15
	Prospect	2
	Unknown	3
Asbestos	Occurrence	1
Chromium	Occurrence	4
	Past Producer	4
	Producer	1
	Unknown	1
Clay	Occurrence	3
Copper	Occurrence	5
	Past Producer	1
	Prospect	4
	Unknown	1

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Table 7.1.4-1. (continued)

Mineral	Current Activity	Number
Gold	Occurrence	83
	Past Producer	106
	Plant	2
	Producer	15
	Prospect	9
	Unknown	59
Gold, Copper	Past Producer	1
Gold, Silver	Producer	1
Iron	Occurrence	5
	Prospect	1
	Unknown	3
Limestone	Occurrence	1
Manganese	Occurrence	3
	Prospect	2
Molybdenum	Unknown	1
Molybdenum, Arsenic, Gold	Occurrence	1
Nickel	Unknown	1
Sand, Gravel, Construction	Occurrence	1
	Past Producer	1
	Producer	19
	Unknown	4
Silica	Producer	1
Stone – Crushed, Dimension, Stone	Producer	1
	Occurrence	2
Tungsten	Occurrence	1
Total	**--**	**369**

7.1.5 Physiography and Geomorphology

The Sierra Nevada crest forms the eastern limit of the Yuba Basin and trends north-northwest with steep, eastward-dipping escarpments to the Tahoe Basin. Downfaulting of the eastern Sierra face has affected drainage evolution by beheading channels and creating channels that now have their headwaters facing east (James and Davis 1994). Uplifting and tilting of the Sierra Block reorganized drainage networks and initiated a period of sustained channel incision (Curtis et al. 2005a, 2005b), and many of the modern channels have elevations below the Tertiary channels. The ancestral (Tertiary) Yuba River has cut about 985 feet below a surface defined by the San Juan, Washington, and Harmony ridges (James 2003). These ancestral deep channels drained north-northwest across the strike of the modern drainages (James 1991). The channels were filled first by very coarse, bouldery material rich in gold, followed by finer gravel and sand filling also rich in gold (James and Davis 1994). These Tertiary gravel deposits are the source of the gold heavily mined in the late 1800s.

Tertiary channels and gravels were buried first by rhyolitic and then by andesitic volcanics, then were severely eroded and exposed by deep fluvial incision. The modern Yuba River began incising 5 mya (Curtis et al. 2005a). Modern foothill channels strike perpendicular to the paleochannel and have downcut, leaving the deposits of the paleochannels as upland gravels (Merwin 1968). The basin was also affected by extensive Quaternary glacial erosion.

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The current Yuba River basin drains the northwestern Sierra Nevada through a series of deep canyons cut by mountain channels, separated by high, steep-sided ridges and a parallel drainage network. The parallel drainage network results in narrow interfluves, small tributary contributing areas, and low tributary sediment loads under natural conditions; prehistoric debris fans at tributary junctions were not common (James and Davis 1994). Stratigraphic evidence indicates the presence of stepped, Quaternary terraces similar to piedmont channels flowing out of the Sierra (James 1988), but these terraces are generally now buried by mining sediment.

Tahoe National Forest (TNF) has compiled a geomorphic data layer primarily differentiating colluvial hillslopes and eroding hillslopes (USFS 2010b). Geomorphology interpretation of the TNF was performed by Adaptive Management Services Enterprise Team (AMSET) geologists. The mapping followed the revised mapping standards set forth in the national geomorphology guidelines (Haskins et al. 1998). Geomorphological mapping was accomplished by viewing 1987 1:24,000 scale aerial photographs through a stereoscope and drawing geomorphic "map unit" polygons on mylar sheets overlying the photographs. The geomorphology layer was developed from a mass wasting map “Geology and Slope Instability map of a Portion of the Tahoe National Forest, California” by Don Lewis, TNF Geologist. Initially mapped units by Lewis that were presented on the hard-copy map include: block slides, debris slides, slides of intermittent type, and areas of shallow slope failure and slope creep. There is no known documentation of the mapping; however, it is known that the mapping was based on field work. Because the mapping had been field verified, it was presumed to represent slope stability features with a greater degree of accuracy. The full metadata are available from the TNF AMSET.

Not surprisingly, water dominates the geomorphic type within the existing FERC Project Boundary. If that is removed for consideration, then colluvial hillslopes represent 56 percent of the area, eroding hillslopes represent 18 percent, and inner gorges and human influence represent the remainder. These percentages are based on using the first descriptor only (Description 1). The second and third descriptors, which are the less active geomorphic types, also show that there is potential mass wasting within many of the Map Units. There is no information about the erodibility or stability of the material or the amount or whether the material is delivered to a water body. Mass wasting was fairly broadly defined and it is unclear as to the potential actual failure any of these units may incur.

Table 7.1.5-1. Description of geomorphology map units designated on the Tahoe National Forest within the FERC boundary.

Map Unit	Description 1	Description 2	Description 3	Total Acres within FERC Boundary	% of Total Coverage within FERC Boundary	% of FERC Boundary[1]
Ch	colluvial hillslope	--	--	10.9	0.19%	0.14%
Ch/Ds3	colluvial hillslope	debris slide	--	23.0	0.39%	0.29%
Ch/Ds5	colluvial hillslope	debris slide	--	18.1	0.31%	0.23%
Ch/Dsb3	colluvial hillslope	debris slide basin	--	11.3	0.19%	0.14%
Ch/Eh	colluvial hillslope	eroding hillslope	--	13.7	0.24%	0.18%
Ch/Sc2	colluvial hillslope	undifferentiated stream channel	--	1,323.1	22.70%	16.95%
Ch/Sc2/Ds3	colluvial hillslope	undifferentiated stream channel	debris slide	1.9	0.03%	0.02%

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Table 7.1.5-1. (continued)

Map Unit	Description 1	Description 2	Description 3	Total Acres within FERC Boundary	% of Total Coverage within FERC Boundary	% of FERC Boundary[1]
Ch/Sc2/Hi	colluvial hillslope	undifferentiated stream channel	human influence	31.0	0.53%	0.40%
Eh	eroding hillslope	--	--	225.0	3.86%	2.88%
Eh/Ch	eroding hillslope	colluvial hillslope	--	10.6	0.18%	0.14%
Eh/Ch/Sc2	eroding hillslope	colluvial hillslope	undifferentiated stream channel	211.9	3.63%	2.71%
Eh/Sc2/Hi	eroding hillslope	undifferentiated stream channel	human influence	5.4	0.09%	0.07%
Hi/Ig	human influence	inner gorge	--	51.1	0.88%	0.65%
Ig	inner gorge	--	--	617.7	10.60%	7.91%
W	water	--	--	3,273.7	56.17%	41.94%
			Total	**5,828.4**	**100.00%**	**74.68%**

[1] The coverage does not include the Plumas National Forest within the FERC Project Boundary, so there are 1,977 acres not included in the geomorphology data layer that fall within the FERC boundary.

The effects of hydraulic mining are particularly significant where the Feather and Yuba rivers converge near Marysville (EDAW 2006). At the mouth of the Yuba River at the south edge of Marysville, 70 feet or more of sediment eventually filled the river channel. Upstream of Marysville, entire communities were buried under more than 40 feet of silt and gravel (Hoover et al. 1990). Sacramento River Flood Control Project levees were constructed along the Feather and Yuba rivers and their tributaries to prevent flooding of valley communities. These levees prevented these communities from becoming buried under the sediments that were washed down from the mountains. The levees were built even higher and designed to confine the floodwaters to a relatively narrow channel that would maintain sufficiently high velocities to efficiently convey sediment through the system, reducing the amount of dredging necessary to maintain navigation. As a result of the levees, Marysville, Olivehurst, and Linda are now many feet below the floodwater levels of the Feather and Yuba rivers.

Between 1852 and 1906, an estimated 366,500,000 cubic yards (yd^3) of hydraulic mining debris moved downstream from the upland mining areas of the greater Yuba River watershed and was deposited in the lower Yuba River, causing aggradation on the order of 26-85 feet (Adler 1980). This massive sedimentation in the channel and floodplains transformed the lower Yuba River into a braided, unstable stream system. Adler (1980) states that by 1906, the inflow of hydraulic mining debris from upland areas to the Lower Yuba had peaked and degradation became the dominant process along the lower Yuba River. Based upon historical channel cross-section data collected along the lower Yuba River during the late 1800s and early 1900s and updated in 1979, Adler concluded that the lower Yuba River channel below USACE's Englebright Dam had attained equilibrium by 1940 to a channel morphology similar to its pre-1849 channel configuration (i.e., a single stable channel with similar channel elevation), except the stream channel is now bordered by large cobble training walls that constrain the channel width in many sections (Adler 1980). The study further concludes that since 1940, almost 90 percent of the hydraulic mining debris deposited in the lower Yuba River remains today as quasi-permanent deposits in the floodplains. The cobble training walls, along with the massive deposits of

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hydraulic mining debris behind the training walls, are now a stable, generally immobile part of the Lower Yuba River system.

More recently, studies by the Three Rivers Levee Improvement Authority broadly state that as hydraulic mining sediment supplies decline, the rivers again will adjust to a new equilibrium. Ultimately, hundreds to thousands of years in the future, it is likely that the river channels will cut down to their pre-mining elevations and will begin migrating laterally (TRLIA 2006).

7.1.6 Erosion and Sedimentation

Hill slopes in the Project Region are generally less than 50 percent. The exceptions are within the inner gorges where channels have cut deeply into the underlying parent material. Hillslope steepness is shown Figure 7.1.6-1, located at the end of this section.

In the Project Region, undisturbed hillslope erosion rates are low compared to more rapidly eroding landscapes such as the Pacific Northwest. The Sierra Nevada mountain block continues to uplift, and the rate of downcutting and erosion depends in large part on the rate of tectonic uplift. In the upper Yuba River basin, hillslope sediment sources indicate low hillslope erosion rates and 95 percent of the watershed has negligible to moderate hillslope erosion potential (Curtis et al. 2005b, 2006). While the vast majority of hydraulic mining sediments were transported downstream to the lower Yuba River during the late 1800s to early 1900s, continued transport of stored channel sediments from gold mining is the primary contributor to annual sediment yield in the Project vicinity. Historic mining sediment remains the dominant sediment source; more recent modern 20th century hydraulic mining sediment constitutes less than 2 percent of the total volume, with logging, road construction, and other sources of increasing importance in the basin (James 1988).

A distributed-parameter model was developed as part of the CALFED Upper Yuba River Studies Program. This model, using Hydrologic Simulation Program-Fortran, a module of the United States Environmental Protection Agency's Better Assessment Science Integrating Point and Nonpoint Sources software, was developed to assess sediment transport as it relates to fish habitat, and the influences of land-use practices, dam management, and climate (Flint et al. 2004). This model was also used as a preliminary screening tool to evaluate the effect of incremental flow increases on water temperature. Numerous products have resulted from the studies in support of the model development (e.g., Flint et al. 2004; Snyder et al. 2004; Curtis et al. 2005b), which provide a comprehensive analysis of sediment sources, transport, and storage in the upper Yuba River watershed (Curtis et al. 2005a, 2006). The final model will be a tool for estimating sediment transport in channels and sediment accumulation in USACE's Englebright Reservoir (Curtis and Flint 2003; Flint et al. 2004). USACE's Englebright Reservoir was originally constructed as a debris dam to capture hydraulic mining debris. A later study on the sedimentation rate between 1940 and 2001 within USACE's Englebright Reservoir was completed by Snyder et al. (2004). Over the 61-year period, USACE's Englebright Reservoir accumulated 21.9×10^6 cubic meters of material, which now occupies 25.5 percent of the original storage capacity of the reservoir.

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Mining gravel composes a significant portion of the bedload in the Yuba River. As discussed above, hydraulic mining has occurred in the upper watershed, and channel dredge mining has occurred in the lower watershed below USACE's Daguerre Point Dam. The amount of mining-derived sediment introduced into the Yuba River is greater than that introduced into the Feather, Bear, and American rivers combined (WE&T 1991). Channel reaches within the mining districts remain dominated by mining tailings after more than 100 years (James 1991). Nineteen percent of the total deposit in USACE's Englebright Reservoir is composed of gravels, indicating that bed load transport is significant in the Yuba River (Snyder et al. 2004), though Curtis et al. (2004, 2006) states that sediment discharge calculations indicate that bedload represents less than one percent of the total load for the Middle and South Yuba rivers in WY 2001, 2002 and 2003. The total deposit is equivalent to 21.9 x 10^6 cubic meters of material, of which about 65-69 percent is sand and gravel. Assuming no contribution of sediment from upstream areas impounded by other dams, the basin-wide sediment yield to USACE's Englebright Reservoir is about 340 tons/km^2/yr (873 tons/mi^2/yr). This yield is at the high end of the range for regional reservoirs, and is attributable to the history of hydraulic mining in the basin. Sixty years after cessation of down-valley sediment transport of hydraulic mine tailings, remobilized stored tailings provide 50 percent of the sediment budget. Tailings are mixed with sediment from other sources downstream. Twenty-two percent of the alluvium sediment 37 miles downstream in the Sacramento Valley is other alluvial sediment produced by human activities other than mining. Dilution is due to depletion of in-channel storage of tailings and to increased importance of local sediment sources. Sediment supplies to the lower basin are limited to local floodplain and channel storage, which are dominated by tailings and other alluvium respectively.

Sediment supply is very high in the Yuba River due to continued movement and availability of hydraulic mining debris. Curtis et al. (2006) estimates the Middle and South Yuba as annually transporting 5 tons/mi^2 (2 tonnes/km^2/yr) and 14 tons/mi^2 (5 tonnes/km^2/yr), respectively However, downstream of some dams the channel can respond either with coarsening of the bed, or there may be no change if the downstream channel was originally transport-dominated (e.g., channel was always bedrock control with little storage of sediment).

7.1.7 Soils

Soil types are strongly influenced by underlying bedrock. Soil orders in the Project Vicinity include Alfisols, Andisols, Entisols, Inceptisols, Mollisols, and Ultisols in combination with mesic or frigid soil temperature regimes and xeric, ustic, aridic, or aquic soil moisture regimes. Figure 7.1.7-1 located at the end of this section shows the dominant soil associations in the Project Vicinity. Table 7.1.7-1 summarizes the soil associations and their relative acreages.

Table 7.1.7-1. Soil associations in the Yuba River Hydroelectric Project Vicinity.

Soil No.	Soil Association	Acres	% of Total
s525	Josephine-Holland-Aiken	6,975	3
s620	McCarthy-Cohasset-Aiken	34,010	2
s1109	McCarthy-Ledmount	4,858	2
s844	Musick-Holland-Hoda-Chaix	41,669	18
s873	Orose-Mildred-Flanly	16,580	7
s821	Redding-Corning	1,966	1
s845	Rock outcrop-Mariposa-Jocal	32,869	14

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Table 7.1.7-1. (continued)

Soil No.	Soil Association	Acres	% of Total
s825	San Joaquin	2,962	1
s837	Secca-Rock outcrop-Boomer	134	trace
s841	Sierra-Rock outcrop-Auberry-Ahwahnee	13419	6
s848	Sites-Rock outcrop-Boomer	9,225	4
s840	Sobrante-Rock outcrop-Auburn	38,755	17
s855	Sycamore-Shanghai-Nueva-Columbia	9,963	4
s870	Tisdale-Kilaga-Conejo	16	trace
s528	Wapi-Holland-Chaix-Arrastre	1,975	1
s8369	Water	2,401	1
s523	Weitchpec-Rock outcrop-Ishi Pishi-Ipish-Grell-Beaughton	302	trace
s874	Woodleaf-Surnuf-Sites-Mariposa	37,837	16
s822	Xerorthents-Xerofluvents	7,546	3
	Total	**2,328,601**	**100%**

The Project soil distribution coincides with the underlying bedrock. Table 7.1.7-2 below provides a summary of the soil series characteristics including parent material, geomorphic position, slope, elevation range, average precipitation, mean annual temperature, and drainage.

Erosion hazard within a soil series is often strongly dependent upon slope; in general, the steeper the slope, the more erosive the soil, although erosion potential on steeper slopes may be moderated by coarse, well drained soils, such as those derived from granitic parent material.

Table 7.1.7-2. Soil series and order summary description in the Project Vicinity.

Series	Parent Material	Geomorphic Position	Slope (%)	Elevation (feet)	Avg. Annual Precipitation (inches)	Mean Annual Temperature (°F)	Drainage
Ahwahnee	Granitic	Footslopes, mountains	2-75	200-2,800	30	60	Mod deep, well drained
Aiken	Basic Volcanic	Gently sloping ridges, moderately steep to steep sideslopes	2-70	1,200-5,000	47	55	Very deep, well drained
Auberry	Intrusive, acid igneous	Foothills, mountainous uplands	5-75	400-3,500	22	62	Deep, well drained
Auburn	Amphibolite schist	Foothills	2-75	125-3,000	24	60	Shallow to moderately deep, well drained
Beaughton	Serpentinized peridotite	Mountains	5-60	1,500-5,000	45	55	Shallow, well drained
Boomer	Metavolcanic	Uplands	2-75	500-5,000	45	55	Deep and very deep, well drained
Chaix	Acid Intrusive Igneous	Mountains	5-75	1,200-6,500	40	54	Mod deep, somewhat excessively drained
Cohasset	Volcanic	Plateau-like uplands	2-50	800-5,500	53	51	Deep and very deep, well drained
Columbia	Alluvium	Flood plains and natural levees	0-8	10-155	12-25	61	Very deep, mod well drained
Conejo	Alluvium from basic igneous or sedimentary rocks	Alluvial fans/stream terraces	0-9	30-2,000	20	62	Very deep, well drained
Corning	Gravelly alluvium	High terraces with mound, intermound relief	0-30	75-1,300	23	62	Very deep, well or moderately well drained
Flanly	Acid intrusive igneous	Foothills	2-75	125-1,200	28	60	Mod deep, well drained

Table 7.1.7-2. (continued)

Series	Parent Material	Geomorphic Position	Slope (%)	Elevation (feet)	Avg. Annual Precipitation (inches)	Mean Annual Temperature (°F)	Drainage
Grell	Serpentine/ Ultramafic	Hills	7-50	3,000-5,000	15	47	Shallow, well drained
Hoda	Granodioirite/ Acid igneous	Mountains	2-75	2,000-4,000	60	55	Very deep, well drained
Holland	Granitic	Mountains	2-75	1,200-5,600	55	55	Very deep, well drained
Ipish	Ultrabasic	Mountainous uplands	5-50	200-5,000	30	48	Deep, well drained
Ishi Pishi	Serpentinitic meta ultramafic	Mountains	15-75	400-5,000	75	55	Deep, well drained
Jocal	Meta-Sedimentary	Mountains	2-75	2,000-5,000	50	50	Deep and very deep, well drained
Josephine	Colluvium from altered sandstone and extrusive igneous	Broad ridgetops, toeslopes, footslopes, sideslopes	2-75	200-5,500	45	50	Deep, well drained
Kilaga	Alluvium from mixed sources	Terraces	0-9	50-200	20	62	Deep and very deep, well drained
Ledmount	Andesitic Tuff Breccia	Mountain side slopes and narrow ridge tops	2-75	2,000-6,000	53	52	Shallow, well to somewhat excessively drained
Mariposa	Tilted slates/schists	Ridges and sides of mountains	2-75	1,600-5,600	55	53	Moderately deep, well drained
McCarthy	Andesitic mudflows	Gently to very steep sloping dissected plateau	2-75	2,000-6,000	55	52	Mod deep, well drained
Mildred	Basic intrusive igneous rock	Mountains	3-50	1,500-2,500	45	57	Mod deep, well drained
Musick	Colluvium from granitic rocks	Mountains	2-75	2,000-5,000	50	54	Very deep, well drained
Nueva	Alluvium from mixed sources	Floodplains	0-2	20-80	16	62	Very deep, somewhat poorly drained
Orose	Basic intrusive igneous	Foothills	3-30	125-1,900	28	60	Shallow, well drained
Redding	Alluvium	High terraces	0-30	40-2,000	22	61	Moderately deep to duripan, well or mod well drained
San Joaquin	Alluvium from predom. Granitic source	Undulating low terraces	0-9	20-500	15	61	Mod deep to duripan, well and mod well drained
Secca	Metabasic, basic, and ultrabasic volcanic	Gently sloping to steep mountainous	Gentle to steep	1,700-3,000	35-55	56	Mod well drained
Shanghai	Alluvium from mixed sources	Floodplains	0-2	20-150	18	62	Very deep, somewhat poorly drained
Sierra	Acid igneous	Foothills	Gently sloping to steep	200-3,500	20-38	59-62	Deep, well drained
Sobrante	Basic igneous and metamorphic	Foothills	2-75	125-3,500	32	60	Mod deep well drained
Surnuf	Gabbrodiorite	Mountains	8-50	1,400-2,800	45	57	Very deep, well drained
Sycamore	Mixed sedimentary alluvium	Floodplains	Nearly level	10-100	15-20	60-62	Poorly drained
Tisdale	Alluvium from mixed sources	Low terraces	0-2	20-80	18	62	Mod deep, well drained
Wapi	Eolian sand and overlying basalt	Basalt plain	0-20	4,000-4,400	8	52	Shallow, excessively drained
Weitchpec	Serpentinitic	Mountains	30-75	850-5,500	50	53	Mod deep, well drained

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Table 7.1.7-2. (continued)

Series	Parent Material	Geomorphic Position	Slope (%)	Elevation (feet)	Avg. Annual Precipitation (inches)	Mean Annual Temperature (°F)	Drainage
Woodleaf	Ultramafic	Mountains	3-30	2,000-3,000	65	53	Mod deep, well drained
Xerorthent	Young soils not differentiated enough to separate from soil suborder. Shallow, developed in Mediterranean climate, not meeting the requirements of the other Entisols; associated with low-gradient alluvial material adjacent to the lower Merced River corridor.						
Xerofluvents	Young soils not differentiated enough to separate from soil suborder. Shallow, developed in Mediterranean climate, slopes of less than 25% and mean annual soil temperature above freezing and Holocene-age carbon; associated with low-gradient alluvial material adjacent to the lower Yuba River corridor.						

7.1.8 Existing Information

7.1.8.1 Upstream of the Project Area

Relevant and reasonably available information on generalized geology and soils upstream of the Project within the Sierra Nevada foothills and range has been incorporated into Sections 7.1.1 through 7.1.6. In addition, Licensee found six source documents regarding geology and soil conditions upstream of the Project. These are summarized here:

7.1.8.1.1 Yuba-River Hydroelectric Project and Drum-Spaulding Project Relicensings

Upstream of the Project Area in the Middle Yuba River and South Yuba River, Nevada Irrigation District (NID) and Pacific Gas & Electric Company (PG&E) have been conducting relicensing studies, including several related to geology, such as channel morphology, hydrologic alteration, instream flow/habitat mapping, and roads and trails. The full reports for these studies are available on NID's and PG&E's relicensing website (http://www.ycwa-relicensing.com).

Middle Yuba River - Habitat Mapping and Channel Characterization

Habitat mapping and channel characterization were conducted in the Middle Yuba River between Jackson Meadows Reservoir and Our House Diversion, and on Wilson Creek, which is a tributary to the Middle Yuba below Milton Diversion Dam. The Middle Yuba River between Milton Diversion and Our House dams was separated into three sub-reaches based on gradient, confinement, and geologic parent material. Overall, the channel is mostly bedrock-controlled with lateral and vertical stability. There is limited floodplain development, usually narrow floodplains or low terraces in a narrow band along the valley. As the channel proceeds downstream from Jackson Meadows Dam, it transitions from a steep bedrock-controlled transport stream to a low-gradient and low-lying, depositional riparian stream and forest. Floods and spill channel erosion have created some coarse lag deposits that have caused flow diversions into the adjacent riparian forest. Another sediment source is a high terrace that is being undermined, which is a source of gravel and fine sediment to a short section of stream just before numerous splits into the wetlands above Milton Reservoir. The lower half of the reach between Jackson Meadows Dam and Milton Diversion Dam is strongly affected by backwater effects from Milton Reservoir where the main channel splits into many smaller channels and wetlands dominate.

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Large woody debris was quantified in ground-mapped sections of the Middle Yuba River, and the amount of wood removed from Jackson Meadows Reservoir and Milton Diversion Reservoir was estimated. Large woody debris is not common, with about 25 pieces/mile in the Middle Yuba River (within bankfull) below Milton Diversion Dam, and 52 pieces/mile above Milton Diversion Dam Impoundment. There is about 70 yd^3/yr removed from Jackson Meadows Reservoir and 10 yd^3/yr removed from Milton Diversion Reservoir.

The full study report, Technical Memorandum 2.3.2, is posted on NID's and PG&E's relicensing website (NID and PG&E 2010a). A digital video disk (DVD) of the low-altitude helicopter video, used to assist in the habitat mapping portion of the study, is available from NID and/or PG&E upon request as the size of the data precludes it being posted on the relicensing website.

Middle Yuba River - Channel Morphology Study

There were two sites selected for a 2009 channel morphology study: the Middle Yuba River above Wolf Creek, and the Middle Yuba River above the Milton Diversion Dam impoundment (Jackson Meadows Dam Reach). Current conditions were measured at three transects per site and along a longitudinal profile. Parameters measured included cross-section and longitudinal profiles, bankfull elevation and discharge, floodprone width, channel gradient, particle sizes of the channel bed and spawning gravel, bank and channel stability, and fine material quantity in pools and in spawning gravels. Much of the data was used in the development of a sediment mobility model and analysis. An assessment of "proper functioning condition" of the riparian zone was also conducted working closely with riparian and hydrology specialists. The study report, Technical Memorandum 2.1-1, is posted on NID's and PG&E's relicensing website (NID and PG&E 2010b).

Jackson Meadows Reservoir Bathymetric Survey

Licensees performed bathymetric surveys of Jackson Meadows Reservoir. Changes in volume were estimated based on as-built surveys, and the accuracy of these surveys cannot be independently verified. Oftentimes the amount of sedimentation is close to the "noise" of the uncertainty in the as-built data. Jackson Meadows Reservoir had a net change of -1,783 ac-ft, which leads to an estimate of sediment accumulation of about 1.1 ac-ft/mi^2/yr. Compare to Englebright Reservoir, which has an accumulation rate of about 0.6 ac-ft/mi^2/yr.

A digital video disk DVD with the complete report is available from NID and/or PG&E upon request as the size of the data precludes it being posted on the relicensing website.

Middle Yuba River - Hydrologic Alteration Study

One site on the Middle Yuba was selected for ramping rate analysis: Middle Yuba River below Milton Diversion Dam. Using historical 15-minute flow data collected at the YB-304 gage during water years 1997-2003, both flow and stage were analyzed for ten representative up-ramp and ten down-ramp events. Up-ramp events ranged in duration from 2 hours to 17 hours and had an increase in flows of approximately 10 cfs to 310 cfs. Down-ramp events ranged in duration

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from 2 hours to 5.5 hours and had a decrease in flows of approximately 350 cfs to 15 cfs. At the YB-304 gage site, these flow increases equate to a range of stage change of 0.6 and 2.4 feet, while the flow decreases equate to a range of stage change of 0.3 feet and 2.4 feet.

A spill cataloging analysis calculated the magnitude, duration, and volume of spill events for one location on the Middle Yuba River, at the Middle Yuba River below Milton Diversion Dam. Spills occurred at this location in 11 of the 20 years analyzed, during water years 1989 - 2008.

Indicators of Hydrologic Alteration (IHA) analysis was completed for two locations on the Middle River: Middle Yuba River below Milton Diversion Dam, and Middle Yuba River above Our House Diversion Impoundment. The IHA analysis was run for post-project water years 1989 through 2008 to determine the five groups of traditional IHA statistics that Richter suggests characterize the hydrologic attributes of a stream (Richter et al. 1996). The IHA results were presented in their entirety as well as a summary of results such as monthly median flows, 3-day maximum flows, and 7-day minimum flows. IHA results were also parsed by water year types for monthly median flows.

Flood frequency analysis was completed using the PeakFQ program at three locations on the Middle Yuba River: below Milton Diversion Dam; above Our House Diversion Dam; and below Our House Diversion Dam. Results included calculated flows for the 1, 1.5, 2, 5, 10, 25, 50, 100, 200 and 500-year recurrence intervals. The calculated results for the 1.5-yr recurrence interval were compared to bankfull flow as determined in the field.

The full study report, Technical Memorandum 2.2-4, is posted on NID's and PG&E's relicensing website (NID and PG&E 2010c).

Middle Yuba River – Roads and Trails Study

In 2008 and 2009, NID and PG&E conducted inventories of primary access roads and trails potentially affected by PG&E's Drum-Spaulding Project and NID's Yuba-Bear Hydroelectric Project. A field inventory was performed to identify how continued use of the transportation network could influence the condition of the Primary Project Roads and Trails. The field inventory provided data on specific attributes along each segment of road or trail, including locations of water crossings and road drainage features, and erosional features. About 30 percent of the segments were ranked as "poor," generally because of the condition of crossings (e.g., typically undersized), drainage features (e.g., damaged), or environmental damage (e.g., erosion and sedimentation). Most of the factors that lead to a poor road condition rating were related to conveyance of runoff, surface erosion of the road prism, and unstable areas. The full study report, Technical Memorandum 9-1, is posted on NID's and PG&E's relicensing website. (NID and PG&E 2010d)

7.1.8.1.2 South Feather Power Project Relicensing

The Slate Creek diversion tunnel transfers water from the Slate Creek Diversion Dam in the Yuba River basin to Sly Creek Reservoir in the Feather River basin (South Feather Power Project, FERC 2088). A Final Environmental Impact Statement (FEIS) was completed for this

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relicensing project in 2009 (FERC 2009). As part of the relicensing, several studies were conducted in the Project area; the Slate Creek Diversion Dam bypass reach is tributary to the North Yuba River above New Bullards Bar Reservoir.

7.1.8.1.3 Slate Creek Sediment Pass-Through

The Slate Creek Diversion Dam is operated by the South Feather Water and Power Agency (SFWPA) to divert water from the Slate Creek watershed (Yuba River basin) to Sly Creek Reservoir (South Fork Feather River basin). Much of the Slate Creek Diversion Dam impoundment is filled with cobble, gravel, sand, and silt (SFWPA 2007). The high rate of sedimentation is related to past hydraulic mining in the upstream source area. Delivery of material from upstream hydraulic mine sites and aggraded channel reaches to the Slate Creek Diversion Dam impoundment was exacerbated in the 1950's by the breaching of St. Louis Debris Dam, located approximately one mile upstream of the Slate Creek Diversion Dam on federally owned land administered by the United States Department of Agriculture, Forest Service (Forest Service). Sediment accumulation behind Slate Creek Diversion Dam currently affects the diversion tunnel, interferes with the low-level outlet in the dam, jeopardizes the release of minimum instream flows, and limits use of the impoundment for water storage (EA Engineering 2000).

Prior to 1986, the Licensee regularly passed bedload and suspended load sediment from upstream sources through a low-level outlet in the Slate Creek Diversion Dam during high flows, with the goal of maintaining reservoir storage capacity and flow regulation capabilities. Sediment pass through was discontinued in 1986 due to concerns by resource agencies over the effects of delivery of fine sediment and potentially contaminated sediment to downstream reaches of Slate Creek.

Under the SPT program approved in 2001, the low-level outlet in Slate Creek Diversion Dam may be opened for up to 24 hours to pass sediment downstream, subject to various seasonal, flow, and water quality constraints. SPT events were attempted in 2002, 2003, 2004, and 2005. Most of these events were unsuccessful at moving any significant amount of sediment due to hydraulic conditions at the dam. Prior to 2005, opening the low-level outlet resulted in only a brief pulse (30 seconds) of turbid water, probably from finer sediments that had settled in the outlet pipe, before the water ran completely clear. In 2005, sediment was cleared from the entrance to the diversion tunnel and the low level outlet. In December 2006, sediment was passed for only 60 minutes due to concerns of mechanical damage to the low-level outlet and valve. SFWPA is currently adaptively managing the SPT to increase the amount and size of sediment that flows downstream into Slate Creek.

7.1.8.1.4 Sediment Supply and Transport Study

A sediment supply and transport study was conducted by SFWPA in 2004-2005 that included a study site in Slate Creek, a tributary to the North Yuba River (SFWPA 2007). Information collected to support hypothesis testing at study sites included:

- identify geomorphically responsive channel study sites in Project reaches

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- characterize regulated and unimpaired hydrology
- survey channel morphology and condition
- compare estimates of dominant discharge
- estimate average annual coarse sediment supply rates based on reservoir sedimentation
- model bed mobility thresholds and bedload transport rates
- compare mass balance of estimated coarse sediment supply and estimated bedload transport capacity
- identify sediment sources in the vicinity of Project facilities
- determine if a preponderance of empirical evidence and modeling results support or refute the hypotheses

The results showed that Slate Creek is in an "indeterminate response domain," indicating proportional reductions in sediment supply and the frequency of sediment transport. Bankfull discharge and regulated $Q_{1.5}$ (discharge at 1.5 yr return interval) were similar and greater than Q_{cr} (critical flow for bedload transport). Low Q_{cr} reflects the abundant supply of coarse sediment available for transport, evidenced by the high frequency of mobile sand and gravel patches occurring over much of the bed surface. Comparison of coarse sediment supply and transport at two Slate Creek study sites (upper site at about 0.8 mi downstream of Slate Creek Diversion Dam, and lower site at 7.5 miles below the diversion dam) indicated an approximate equilibrium at the upper site, and supply-limitation prior to and as a result of Project operation at the lower site. There was little or no apparent change in active sediment storage interpreted from historical aerial photography. Empirical evidence and modeling results do not indicate that Project operation and maintenance (O&M) has or will result in channel aggradation or degradation. The lack of Project-related geomorphic effects at these study sites reflects the limited ability of the Slate Creek Diversion to alter peak flows and the high sediment supply rate resulting from tributary inputs and sediment-pass-through at Slate Creek Diversion Dam.

SFWPA also evaluated reservoir sedimentation basin yield in the South Feather River basin (SFWPA 2007) and compared against Englebright Reservoir. Table E11.4.2-4 from the results of the study is reproduced below as Table 7.1.8-1. Also as a comparison, Lake Oroville experienced an annual sediment input from upstream sources of 470 ac-ft (579,510 m^3/year) (CDWR 2004a), two orders of magnitude less than estimated accumulation rates in Englebright Lake.

Table 7.1.8-1. Reservoir sedimentation and sediment yield (SFWPA 2007).

		South Feather Project Reservoirs				Yuba River Reservoir
		Little Grass Valley	Ponderosa[1]	Sly Creek	Lost Creek[2]	Englebright[3]
Placed in service		1961	1961	1961	1924	1940
Date of modern bathymetry		2004	2004	2004	2004	2001
Duration of accumulation	years (y)	43	43	43	37	61
Unimpaired drainage area	km^2	67	269	62	78	2,870
Regulated source area	km^2	67	42	62	78	1,192

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Table 7.1.8-1. (continued)

		South Feather Project Reservoirs				Yuba River Reservoir
		Little Grass Valley	Ponderosa[1]	Sly Creek	Lost Creek[2]	Englebright[3]
Trap efficiency [4]	%	100%	80%	100%	35%	100%
Total accumulated sediment volume [5]	m^3	5,900,000	754,900	1,613,000	322,700	21,900,000
Total accumulated sediment mass [6]	tonnes (t)	6,769,000	853,000	1,822,700	376,000	24,747,000
Annual sediment accumulation rate	$t\ y^{-1}$	157,420	19,840	42,390	10,160	405,690
Annual coarse sediment accumulation rate [7]	$t\ y^{-1}$	29,910	3,700	8,050	1,930	77,080
Total average annual sediment yield [8]	$t\ km^{-2}\ y^{-1}$	2,360	594	682	374	340
Average annual coarse sediment yield	$t\ km^{-2}\ y^{-1}$	448	90	130	25	65
Denudation rate	$mm\ y^{-1}$	0.89	0.22	0.26	0.14	0.13
Unimpaired drainage area	km^2	67	269	62	78	2,870
Regulated source area	km^2	67	42	62	78	1,192
Trap efficiency [4]	%	100%	80%	100%	35%	100%
Total accumulated sediment volume [5]	m^3	5,900,000	754,900	1,613,000	322,700	21,900,000
Total accumulated sediment mass [6]	tonnes (t)	6,769,000	853,000	1,822,700	376,000	24,747,000
Annual sediment accumulation rate	$t\ y^{-1}$	157,420	19,840	42,390	10,160	405,690
Annual coarse sediment accumulation rate [7]	$t\ y^{-1}$	29,910	3,700	8,050	1,930	77,080
Total average annual sediment yield [8]	$t\ km^{-2}\ y^{-1}$	2,360	594	682	374	340
Average annual coarse sediment yield	$t\ km^{-2}\ y^{-1}$	448	90	130	25	65
Denudation rate	$mm\ y^{-1}$	0.89	0.22	0.26	0.14	0.13

1 Assumes 100 percent coarse sediment (>2 mm) trap efficiency in South Fork Diversion and Forbestown Diversion impoundments.
2 Assumes sediment accumulated 1924-1961 and negligible yield after 1961 due to trapping in Sly Creek Reservoir.
3 Englebright Reservoir data from Snyder et al. 2004.
4 Trap efficiency averaged from empirical relations by Brune (1953), Churchill (1948), and Brown (1943).
5 Accumulated sediment volume calculated from the difference between reservoir topography prior to sediment filling and the 2004 bathymetric surface.
6 Assumes average sediment density of 1.13 $t\ m^{-3}$ (Snyder et al. 2004).
7 Assumes coarse (>2 mm) –to-total ratio of 0.19 (Snyder et al. 2004).
8 All unit-area estimates based on regulated source area.

7.1.8.1.5 Sediment Supply from SFWPA Facilities

In the SFWPA Project area, field surveys indicated few erosion features directly related to Project facilities. Potential for future erosion is low, and accelerated erosion from roads and facilities is unlikely. Sediment produced in the vicinity of the facilities is small relative to the sediment transport capacity in the streams.

7.1.8.1.6 Large Woody Debris in Slate Creek and Slate Creek Reservoir

The upper study site in the Slate Creek Diversion Dam Reach is located approximately 0.8 mi downstream of Slate Creek Diversion Dam at an elevation of 3,379 feet and has a drainage area of approximately 132 square kilometers. The 403-meter-long study site exhibited forced pool-

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riffle morphology with predominantly cobble-gravel and gravel-cobble bed material. The site was characterized by a large, laterally continuous point bar deposit on the right bank and bedrock control at the downstream end. Average water surface slope was 0.0139, and average bankfull width was 19 meters. Mean large woody debris (LWD) frequency and volume were 1.0 piece/100 meters and 1 cubic meter/hectare, respectively. LWD frequency was 89 percent lower and volume was 97 percent lower than reported by Ruediger and Ward (1996) for channels in young timber stands (50 to 90 years old) in the Stanislaus National Forest. All LWD fell into the two smallest length and diameter classes. There were no key LWD pieces and no pieces influenced channel morphology or sediment storage.

The lower study site in the Slate Creek Diversion Dam Reach is located approximately 7.5 miles downstream of Slate Creek Diversion Dam at an elevation of 2,067 feet with a drainage area of approximately 157 square kilometers. The 430-meter-long study site exhibited forced pool-riffle morphology with predominantly cobble-boulder and boulder-cobble bed material and local bedrock control. Large point bar deposits occurred on the right bank at the upstream end and on the left bank at the downstream end. Average water surface slope was 0.0211, and average bankfull width was 19 meters. Mean LWD frequency and volume were 2.6 pieces/100 meters and 12 cubic meters/hectare, respectively. LWD frequency was 71 percent lower and volume was 77 percent lower than reported by Ruediger and Ward (1996) for channels in young timber stands (50 to 90 years old) in the Stanislaus National Forest. All of the LWD at the site fell in the three smallest length and diameter classes. LWD was found as solitary pieces oriented parallel to flow near the bankfull channel margin. There were no key LWD pieces and no pieces influenced channel morphology or sediment storage.

Slate Creek Diversion Dam Impoundment is a small impoundment at elevation 3,552 feet with a drainage area of 128 square kilometers. The impoundment capacity, however, has been significantly reduced by sedimentation and the current impoundment only extends about 100 feet upstream of the dam during low flows. Mean LWD frequency and volume were 1.4 pieces/100 meters and 32 cubic meters/hectare, respectively. All LWD fell in the three smallest length classes and two smallest diameter classes. Most of the LWD was found as solitary pieces and small accumulations on gravel bars at the upstream end of the impoundment area. LWD passes over Slate Creek Diversion Dam during high flows. The Licensee removes LWD from the upstream side of the dam and the trash rack at the diversion intake during high flows by closing the tunnel intake gates and allowing the flows to pass the LWD over the dam. During low flow periods, LWD that accumulates against the posts surrounding the “glory hole” in front of the trash rack must be mechanically removed. No records are available for the frequency of removal, volume of LWD removed, or its size distribution (K. Petersen, SFWPA, pers. comm., 2004). Current transport of LWD through Slate Creek Diversion Dam impoundment and over the dam to downstream reaches during high flows, combined with the relatively large downstream source area capable of supplying LWD to the channel as well as the similar LWD size distributions in the reservoir and downstream study sites, suggests that continued operation of Slate Creek Diversion Dam will not result in fewer key LWD pieces, lower LWD loading, or less LWD influence on channel morphology in the downstream reach.

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7.1.8.2 In the Project Area

In addition to the information used to broadly describe geology and soil conditions in Sections 7.1.1 through 7.1.7, Licensee found five source documents regarding geology and soils conditions in the Project Area. Each of these is described here:

7.1.8.2.1 Slope Stability Downstream of New Bullards Bar Dam

In general, New Bullards Bar Dam is founded on typically hard and strong metavolcanic rock. Much of the rock on the downstream right abutment is fairly massive, and given its typically hard and strong condition it is often only slightly weathered on outcrop surfaces. However, rock within intensely fractured and sheared zones can be weak and highly weathered (Christensen Associates Inc. 2007).

In early 2006, a rockslide occurred on the slope downstream from the right abutment of New Bullards Bar Dam. The rockslide was initiated as a shallow wedge failure in the steep slope that had been undercut by excavation for the Burma Road. The initial failure occurred during or immediately following several days of intense rainfall. It blocked and damaged the road but did not directly affect Project facilities. Failure by progressive toppling and upslope migration of the developing headscarp and north sidescarp continued through the remainder of the 2005-2006 rainy season into April 2006, then ceased entirely. At road level, the slide is 120 feet wide at present and the hazardous area is considered to include the additional 160 feet long, vertical and overhanging road cut section of the road on the north. Block toppling and slope raveling may continue to enlarge the slide. A complete report on the geologic conditions contributing to the slide, the mechanisms of failure, the extent and effects of the slide, results of monitoring, and recommendations was filed with FERC.

7.1.8.2.2 Sediment Removal in Our House Diversion Dam Impoundment

Sediment has been removed from Our House Diversion Dam on four occasions:

- 1986 – Sediments had been accumulating in the impoundment for 18 years since construction of the diversion dam in 1968. The floods of February 1986 were believed to have contributed the bulk of the sediments. Phase I dredging began sediment removal on August 1, 1986; an unquantified amount was removed. On August 20, 1986, between 7,333 and 15,000 cubic yards was estimated to have been passed downstream through the release valve due to erosion of material in the reservoir, along with an additional unknown amount about a month later. YCWA discontinued removal in the fall of 1986, though an additional 15,000 cubic yards remained to be removed. An interim technical report provided alternatives for additional removal (EBASCO and Envirospere 1986).
- 1992 – Dredging removed 27,595 cubic yards of sediment between August 3 and September 5, 1992. Sediments were disposed of at a site at the Sierra Mountain Mills approximately 8 miles away (PG&E 1992).
- 1997 – Dredging removed 67,894 cubic yards of sediment between September 10 and October 30, 1997. Prior to removal, sediments were tested for mercury and found to be at

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natural background levels. Sediments were sent to a dredging disposal site on Forest Service property approximately eighteen miles west of Our House Reservoir (PG&E 1997).

- 2006 – On December 31, 2005, an intense storm event carried sediments from the upstream reaches of the Middle Yuba River that partially blocked the low level outlet, tunnel intake structure, and fish water release outlet. Dredging removed 80,000 cubic yards of sediment between August 10 and September 15, 2006. Sediments were disposed of in an old quarry site on Marysville Road on Forest Service land approximately 1 mile south of Bullards Bar Dam (YCWA 2006).

Licensee is in the process of obtaining approval from the appropriate agencies for a sediment pass-through program at Our House Diversion Dam to avoid similar incidents in the future.

7.1.8.2.3 Sediment Removal in Log Cabin Diversion Dam Impoundment

Licensee is in the process of obtaining approval from the appropriate agencies for a sediment pass-through program at Log Cabin Diversion Dam.

7.1.8.2.4 Erosion Along Reservoir/Impoundment Shorelines

Licensee is unaware of any erosion areas along Project reservoir/impoundments that are not typical of similar reservoirs/impoundments in the Sierra Nevada.

7.1.8.2.5 Initial Channel Classification and Habitat Mapping upstream of USACE's Englebright Reservoir

An initial channel characterization of the Project reaches was recently developed by the Licensee in 2009, using available topographic information,[6] geologic maps (Saucedo and Wagner 1992), and ESRI/National Agriculture Imagery Program (NAIP) one-meter pixel color aerial imagery orthophotos from 2005.[7] The results of this desktop exercise approximate a Level 1 Rosgen classification (Rosgen 1996), but this exercise is not considered to be such a classification because there has been no field checking; this initial effort used only remote-sensing data. (Montgomery and Buffington 1993a, 1997; WFPB 1995) classes were used to hypothesize channel form and process, as presented in Table 7.1.8-2. Channels with the same gradient, confinement, and parent material are expected to behave similarly to changes in hydrology and in the wood and sediment delivered to the channel. For example, how a channel looks, where sediment and wood are stored, and when sediment moves are expected to be the similar within reaches of the same gradient, confinement, valley shape, and similar geologic parent material. This information was used as preparation for habitat mapping and study plan development. A habitat mapping report Attachment 3.9A of *Draft Study 3-09 Instream Flow Upstream of USACE's Englebright Reservoir Study*.

In addition to the 2009 habitat mapping, Licensee also collected some supplemental habitat and channel form data below Our House Dam (YCWA unpublished data). The data collected below

[6] Derived from Terrain Navigator Pro V.7 available from Maptech, Inc.©
[7] http://casil.ucdavis.edu/casil/imageryBaseMapsLandCover/imagery/naip_2005/county_mosaics/

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Our House Dam has been used in the Habitat Mapping Report (referred to in, Attachment 3.9A of *Draft Study 3-09 Instream Flow Upstream of USACE's Englebright Reservoir Study*).

A summary of the methods used for this preliminary channel classification system appears here:

- Stream Longitudinal Profile: Stream longitudinal profiles were measured using maps available from Terrain Navigator Pro© (V. 7) software. Distance between contour lines was measured and a longitudinal profile was created. Map-based gradient, while an estimate, is often a good indicator of stream energy and process.
- Geology: Geology was determined using the geologic map of the Chico quadrangle (Saucedo and Wagner 1992). Geologic parent material is often important in sediment supply, substrate type, and channel form control.
- Confinement, Sinuosity, and Valley Shape: These variables were estimated using streaming imagery from ESRI using the program ArcGIS Desktop. These variables are useful in hypothesizing riparian condition and process, and long-term sediment history.

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Table 7.1.8-2. Parameters relevant to channel types expected within gradient and confinement classes, separated by channel type.

	Braided	Regime	Pool-Riffle	Plane-Bed	Step-Pool	Cascade	Bedrock	Colluvial
Typical Bed Material	Variable	Sand	Gravel	Gravel, cobble	Cobble, boulder	Boulder	N/A	Variable
Bedform Pattern	Laterally oscillary	Multi-layered	Laterally oscillary	None	Vertically oscillary	None	--	Variable
Reach Type	Response	Response	Response	Response	Transport	Transport	Transport	Source
Dominant Roughness Elements	Bedforms (bars, pools)	Sinuosity, bedforms (dunes, ripples, bars) banks	Bedforms (bars, pools), grains, LWD, sinuosity, banks	Grains, banks	Bedforms (steps, pools), grains, LWD, banks	Grains, banks	Boundaries (bed & banks)	Grains, LWD
Dominant Sediment Sources	Fluvial, bank failure, debris flow	Fluvial, bank failure, inactive channel	Fluvial, bank failure, inactive channel, debris flow	Fluvial, bank failure, debris flow	Fluvial, hillslope, debris flow	Fluvial, hillslope, debris flow	Fluvial, hillslope, debris flow	Hillslope, debris flow
Sediment Storage Elements	Overbank, bedforms	Overbank, bedforms, inactive channel	Overbank, bedforms, inactive channel	Overbank, inactive channel	Bedforms	Lee & stoss sides of flow obstructions	--	Bed
Typical Slope (m/m)	S < 0.03	S < 0.001	0.001 < S and S < 0.02	0.01 < S and S < 0.03	0.03 < S and S < 0.08	0.08 < S and S < 0.30	Variable	S < 0.20
Typical Confinement	Unconfined	Unconfined	Unconfined	Variable	Confined	Confined	Confined	Confined
Pool Spacing (Channel Widths)	Variable	5 to 7	5 to 7	None	1 to 4	< 1	Variable	Variable

Source: Montgomery and Buffington (1993b)
Note: N/A Not applicable

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Results - Preliminary Classification of Project Reach Channel Types

Generally, the Project reaches evaluated appear to be confined within resistant parent material. Gradients are generally greater than 1 percent. Table 7.1.8-3 summarizes the major characteristics of the Project reaches, based on this desktop exercise. Rosgen "Aa+," "A," and "B" types are believed to be found within the Project reaches, though some field checking is necessary to confirm this. The applicable Rosgen classes are typified as follows:

- Rosgen "Aa+": very steep (>10% gradient), deeply entrenched, debris transport, torrent streams. Very high relief. Erosional, bedrock, or depositional features; debris flow potential. Vertical steps with deep scour or plunge pools and waterfalls.
- Rosgen "A": steep (4-10% gradient), entrenched, cascading step/pool morphology. High energy/debris transport streams with stable plan and profile when bedrock or boulder dominated. Generally exhibit high transport potential and relatively low in-channel sediment storage.
- Rosgen "B": moderately steep to gently-sloped (2-4% gradient), moderately entrenched, riffle-dominated channel with infrequently spaced pools. Very stable plan and profile with stable banks.
- Rosgen "C": low-gradient (less than 2%), slightly entrenched, relatively sinuous with pools/riffle morphology, and well-developed floodplains and characteristic point bars. Channel plan and profile stability are dependent upon streambank stability and upstream watershed conditions and sediment regime.

Table 7.1.8-3. Project reach summary.

Project Reach	Length (mi)	Gradient (range)	Confinement	Rosgen
Middle Yuba	12.2	1.2% (1.0-2.9%)	confined	"B"
Oregon Creek	4.0	2.3% (0.9-7.4%)	confined	"A" and "B"
North Yuba	2.3	2.0% (0.9-5.5%)	confined	"A" and "B"
Yuba above New Colgate	6.0	1.7% (0.3-8.0%)	confined	"B"
Yuba below New Colgate	1.4	<1%	confined	"C" nearest approx.

Middle Yuba River – 1-3 percent gradient, confined, Rosgen "B"

The Middle Yuba River flows through a variety of parent materials, most notably resistant granitic rocks, and is bisected by the Big Bend-Wolf Creek fault within one mile of the junction with the North Yuba. The steepest section, at just below three percent, is located near the bottom of the reach, just below Klensedorf Point (Figure 7.1.8-1). There are numerous lower gradient sections, many of which are upstream of sharp bends that form "knickpoints." However, in any of these lower gradient sections where it appears that there is floodplain and side-channel development, sinuosity never exceeds 1.1 (i.e., valley length and channel length through the valley are approximately equal). Channels may be incised into cobble or boulder bars and

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resistant to movement across the valley, similar to a confined channel, and the floodplains are rarely accessed and have become terraces. Freemans Crossing is within a valley that is likely a long-term depositional area and has gradients of about one percent. It may be highly modified by human settlement, and channel location may be defined and maintained by artificial means such as dikes, berms, and hardened or reinforced stream banks. A multi-thread channel splits around an area known as "Emory Island" (~RM 6.5), though sinuosity is still fairly low at 1.1, and gradient is about one percent. Fieldwork would be necessary to further define these areas. Based on the gradient and confinement, expected dominant channel conditions are as follows:

- Overall channel form: plane-bed
- Typical bed material: gravel, cobble
- Bedform pattern: none (lacks 3-dimensional heterogeneity)
- Reach type: response with short sections of transport
- Dominant roughness: substrate, banks
- Dominant sediment sources: fluvial (from upstream), bank failures
- Sediment storage elements: overbank, inactive channel
- Typical slope: between 1 and 3 percent
- Typical confinement: variable

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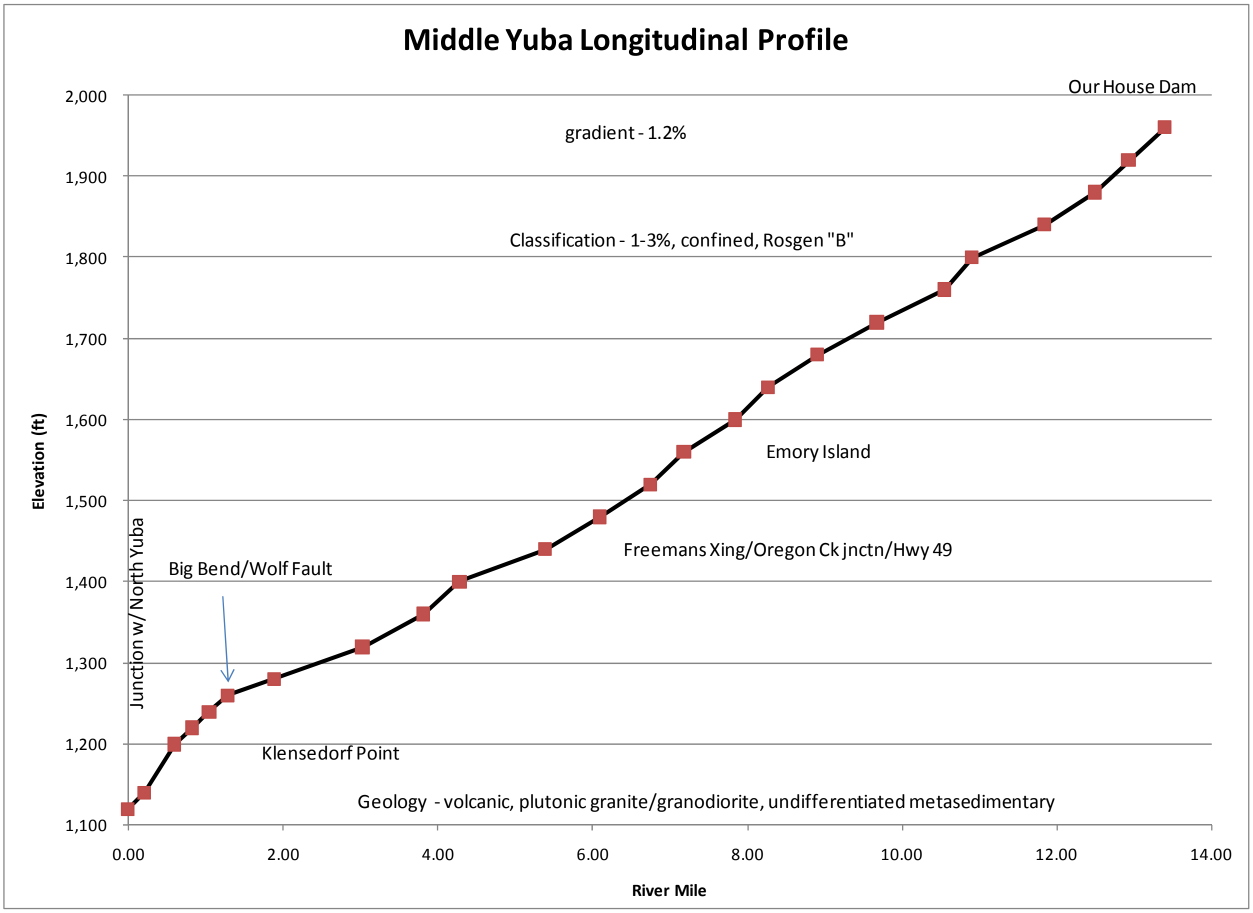

Figure 7.1.8-1. Longitudinal profile of Middle Yuba River between Our House Diversion Dam and the North Yuba River.

Oregon Creek – variable gradient, confined, Rosgen "A," and "B" types

There are three breaks within Oregon Creek, between which fluvial processes may vary (Figure 7.1.8-2). Oregon Creek flows mostly through resistant plutonic granitic material, though there is a short, steep section near the top that is composed of competent metasedimentary material. There is a short 4-8 percent gradient section just above the junction with the Middle Yuba River and another one above Celestial Valley. Celestial Valley appears to be a long-term depositional area and has gradients of about one percent. It may have been highly modified by human settlement and channel location may be defined and maintained by artificial means such as dikes, berms, and hardened or reinforced stream banks. Table 7.1.8-4 summarizes likely dominant channel conditions for the two types of channels within the reach (i.e., Rosgen A and B).

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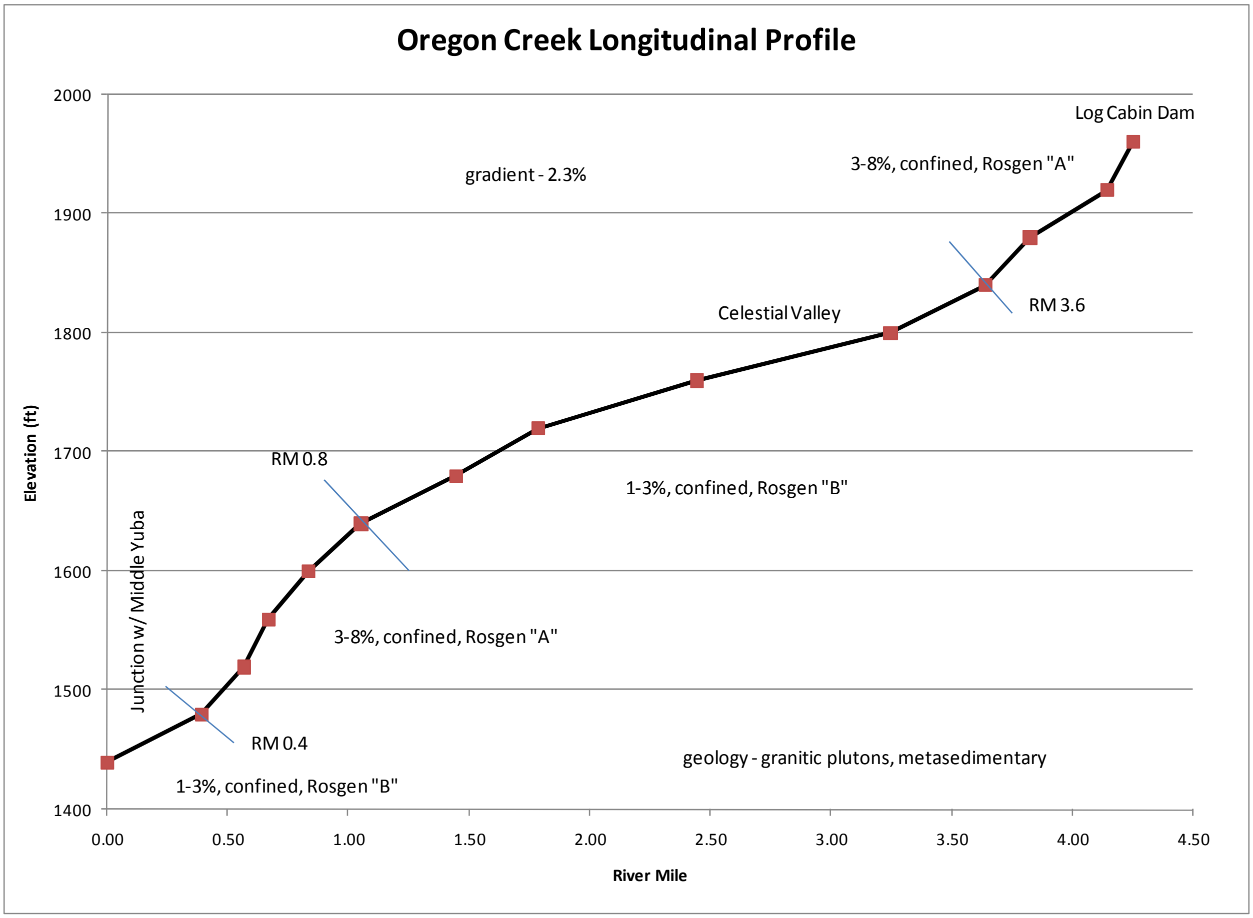

Figure 7.1.8-2. Longitudinal profile and channel classification of Oregon Creek.

Table 7.1.8-4. Oregon Creek and North Yuba River below Bullards Bar - hypothesized dominant channel condition based on gradient and confinement.

Variable	3-8%, confined, Rosgen “A”	1-3%, confined, Rosgen “B”
Overall channel form	step-pool	plane-bed
Typical bed material	cobble, boulder	gravel, cobble
Bedform pattern	vertically oscillary	none-low 3D heterogeneity
Reach type	transport	response, w/ some transport
Dominant roughness	bedforms (steps, pools), substrate, LWD, banks	substrate, banks
Dominant sediment source	fluvial, hillslope, debris flow	fluvial, bank failure, debris flow
Sediment storage elements	bedforms	overbank, inactive channel
Typical slope	between 3 and 8%	between 1 and 3%
Typical confinement	confined	variable

<u>North Yuba River below New Bullards Bar Dam – 1-3 percent gradient, confined, Rosgen “A” and “B”</u>

While channel is dominated by gradients below three percent (average gradient of 2%), there are short sections where the gradient is more than three percent, and one short section that is above

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five percent (Rosgen "A") located at approximately mid reach (Figure 7.1.7-3). Just above the steepest section, the gradient flattens to less than one percent. In viewing the NAIP orthophotos, it appears that the channel has been mostly scoured to bedrock (composed of Mesozoic volcanic rocks of the Smartville Complex), though there are some small inset bars (cobble and smaller) on the inside of some bends. The channel is not sinuous, and it appears that the active scour zone encompasses the entire valley floor (e.g., there is no apparent floodplain or terrace development). Refer to Table 7.1.7-4 for dominant hypothesized channel conditions within the two channel types of this reach.

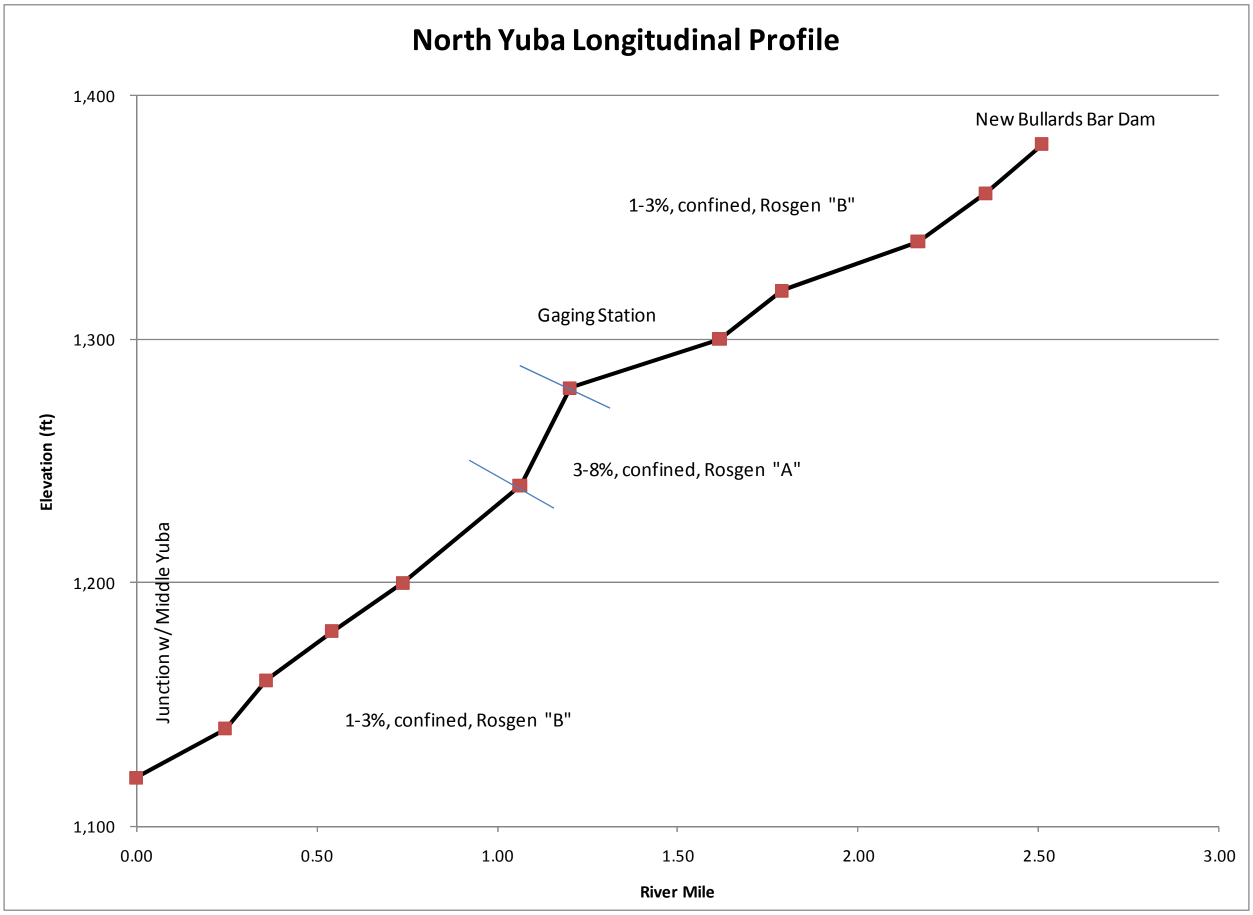

Figure 7.1.8-3. Longitudinal profile and initial channel classification of North Yuba between the junction with Middle Yuba and New Bullards Bar Dam.

<u>Yuba River above New Colgate Powerhouse – 1-3 percent gradient, confined, Rosgen "B"</u>

Channel is dominantly bedrock-controlled, with only very short boulder/cobble sections. Plan and profile are resistant to change. Sinuosity is very low as there are no plan and profile sections strongly influenced by alluvial processes. Most of the channel gradient is less than four percent with the exception of the contact between the Pleasant Valley pluton gabbroic rocks and the volcanic rocks of Smartville Complex, which results in a short, steep (8 percent gradient) section (Figure 7.1.8-4). A few other short, approximately five percent gradient sections occur as the

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stream bends sharply around resistant bedrock knobs. While the channel has been classified as "1-3 percent, confined, Rosgen B," the dominance of bedrock controls influences flow hydraulics and sediment movement. Conventional hydraulic geometry does not really apply in these highly variable channels (Tinker and Wohl 1998). Pools appear to be long, deep trench pools through the bedrock notches, and are short, shallow and perhaps more run-like in the broader boulder/cobble dominated sections. Sediment is sparse and transport is efficient, (i.e., sediment transport capability far exceeds sediment availability).

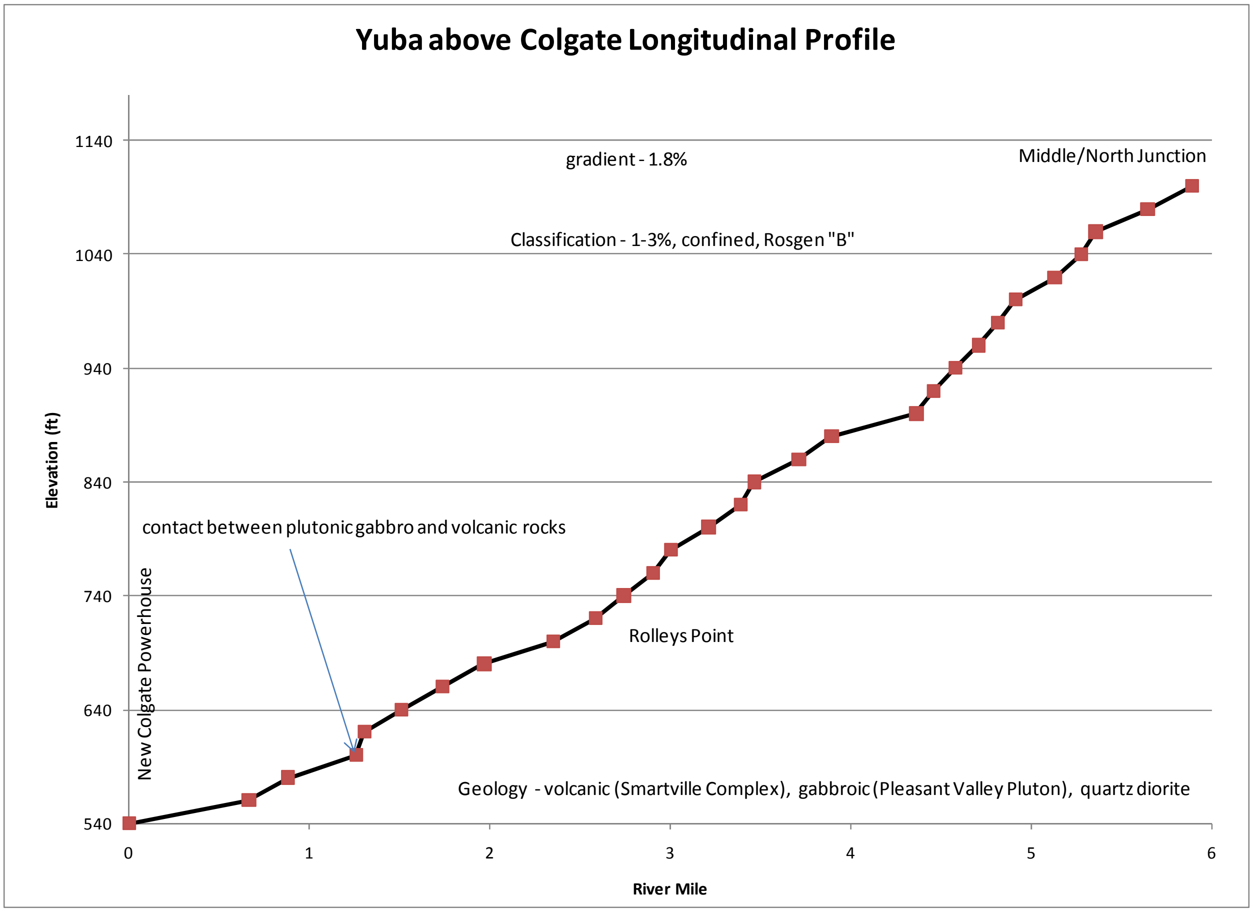

Figure 7.1.8-4. Longitudinal profile and initial channel classification of Yuba River between the New Colgate Powerhouse and the Middle/North Yuba junction.

Yuba River below New Colgate Powerhouse – <1 percent gradient, confined

This reach extends from the normal maximum water surface elevation from USACE's Englebright Reservoir (RM 32.2), defined as occurring at Rice Crossing, to the New Colgate Powerhouse (RM 33.6). Although the maximum water surface elevation from the lake occurs at Rice Crossing, the effects of the base level control from the lake level extend upstream, probably to the powerhouse. There are large sand and gravel bar deposits up to and including French Bar about 0.8 miles upstream (RM 33.0). These deposits, and the lack of deposition upstream, indicate that most of the fine-grained (gravel and smaller) sediment supplied from upstream is depositing within this short reach and into USACE's Englebright Reservoir. There are small point and lateral sand/gravel bars upstream of French Bar but mid-channel roughness (probably boulders) shows that the channel is gradually becoming more coarse in the upstream direction. There are no topographic lines that cross the channel, so gradient and longitudinal profile cannot be measured. It is assumed that the gradient is less than one percent and the channel is approaching a "regime" channel, though it is still confined within resistant valley walls. A Rosgen "C" type channel is the best approximation, but those channels have better defined floodplains and pool/riffle sequences than is likely in this backwater-influenced zone. Some hypothesized channel parameters (based on Table 7.1.8-2) are:

- Overall channel form: Regime (balance between sedimentation and deposition over time)
- Typical bed material: sand
- Bedform pattern: multi-layered
- Reach type: Response with transport sections increasing in the upstream direction
- Dominant roughness: sinuosity, bedforms (dunes, ripples, bars), banks
- Dominant sediment sources: fluvial (from upstream), bank failures, inactive channel
- Sediment storage elements: overbank, bedforms, inactive channel
- Typical slope: <1 percent
- Typical confinement: unconfined

7.1.8.3 Downstream of the Project Area

The Yuba River downstream of Englebright Dam is one of the more thoroughly studied rivers in the Central Valley of California. Information is available from both previously conducted studies dating back to the early 1900s through current information gathering efforts from ongoing data collection, monitoring, and evaluation activities. Considerable information relating to the impacts of hydraulic mining and the operation of the Yuba River as an element of the state flood control system have been developed. Additionally, extensive information regarding geomorphic drivers, landforms and boundary conditions, hydrogeomorphic dynamics, physical habitat and ecological dynamics, and river management actions have been developed through time.

The Yuba River downstream of Englebright Dam was tremendously impacted by mining debris influx between 1850 and 1940. Between 1852 and 1906, an estimated 366,500,000 cubic yards (yd^3) of hydraulic mining debris moved downstream from the upland mining areas of the greater Yuba River watershed and was deposited in the lower Yuba River, causing aggradation on the order of 26-85 feet (Alder 1980). Changing regulations eventually curtailed hydraulic mining in California, but several decades passed before the most immediate impacts of hydraulic mining abated.

Adler (1980) states that by 1906, the supply of hydraulic mining debris flowing from upland areas to the lower Yuba had peaked and degradation became the dominant process along the

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lower Yuba River. Based upon historical channel cross-section data collected along the lower Yuba River during the late 1800s and early 1900s and updated in 1979, Adler concluded that the lower Yuba River channel below USACE's Englebright Dam had attained equilibrium by 1940 to a channel morphology similar to its pre-1849 channel configuration (i.e., a single stable channel with similar channel elevation), except the stream channel is now bordered by large cobble training walls that constrain the channel width in many sections. The study further concludes that, since 1940, almost 90 percent of the hydraulic mining debris deposited in the lower Yuba River remains today as quasi-permanent deposits in the floodplains. The cobble training walls, along with the massive deposits of hydraulic mining debris behind the training walls, are now a stable, generally immobile part of the Lower Yuba River system.

In general the hydraulic mining sediment balance in the Yuba River below Englebright appears stable in the decadal time frame. Sediment budget and digital elevation model (DEM) differencing analysis by Pasternack and the Yuba Accord River Management Team (RMT) indicate that while there is a shortage of gravel and bed load at the uppermost end of the reach (just below Englebright Dam), and a net sediment outflow from the Timbuctoo reach (RM 19 – RM 21), the overall sediment balance between Englebright Dam and the Feather River confluence is stable.

CDWR and USACE (2003) analyzed the incipient motion conditions for flows of 4,000, 40,000, 65,000, 121, 000, and 161, 000 cfs using HEC-RAS hydraulic output and a sediment transport tool known as the Shields Diagram that relates. For each flow they determined the maximum particle size moved by the flow. This approach assumes that the entire mixture of sediment is this size and does not account for the effects of a heterogeneous bed.

Additional studies of localized reaches (Sawyer et al. 2010 and Pasternack 2008) have shown that each morphological unit experienced the "full transport" (Shields Stress t* values of > 0.06) sediment transport regime over a unique range of flows. Thus, a single incipient motion threshold for the river is not appropriate as a metric for evaluating lower Yuba River sediment transport conditions and fluvial geomorphology.

The Yuba River downstream of Englebright Dam remains the focus of research efforts originating at University of California at Davis and the Yuba Accord River Management Team, as well as other efforts. A summary list of recent information currently available includes, but is not limited to:

- Topographic and geologic maps, including a digital elevation model (DEM) of the Yuba River downstream of USACE's Englebright Dam (M&E Program 2010)8
- Hydrologic modeling and statistics for the Yuba River (YCWA 2007)
- Operations procedures for Project facilities (YCWA 2009)

[8] M&E Program documents and work products are located at the River Management Team (RMT) web site, www.yubaaccordrmt.com.

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- PHABSIM habitat modeling of the Yuba River conducted by Beak Consultants for the California Department of Fish and Game (Beak 1989)
- Two-dimensional hydrodynamic habitat modeling (River2D) of the Yuba River conducted by the U.S. Fish and Wildlife Service (Gard 2007; 2008)
- Two-dimensional hydrodynamic modeling (SRH-2D) of the Yuba River by U.C. Davis for the River Management Team (M&E Program 2010)
- Low-altitude aerial video of the Yuba River (YCWA 2009)

Licensee found that significant source documents regarding geology and soils downstream of the Project have been synthesized by EDAW (2006) for the Feather/Yuba Rivers Levee Repair Draft Environmental Impact Report EIR.

Specific groundwater and other characteristics within the Feather River are presented therein. A geomorphic study was performed for the Third Phase of the Sacramento River Bank Protection Project to develop a geomorphically based framework for bank protection evaluation and strategies (WE&T 1991). A studied section of the Yuba River extends from Marysville (RM 0) to USACE's Daguerre Point Dam (RM 11.4). This section of river is presently a severely aggraded system that has incised into the mining-derived sediment. A total of 3,500 linear feet of bank protection was mapped as "damaged" in this section, but the priority for rehabilitation is low relative to sites on the lower Sacramento River and sloughs.

In 2008, the SWRCB approved petitions to change YCWA's water-right permits to implement the Yuba River Accord ("Yuba Accord"), a consensus-based, comprehensive program to protect and enhance 24 miles of aquatic habitat in the lower Yuba River, extending from USACE's Englebright Dam downstream to the river's confluence with the Feather River near Marysville (RMT 2009). The Yuba Accord consists of a Fisheries Agreement and several other elements. As part of the Yuba Accord, assessments of physical habitat conditions are being conducted to describe flow and fluvial geomorphological interactions, and to serve as the basis for physical habitat (e.g., reach, mesohabitat unit, flow and temperature) relationships with fish population parameters. To date, morphological units have been mapped on the Timbuctoo Bend on the lower Yuba River using field-based reconnaissance and GIS-based analysis of existing data layers (Pasternak and Eilers 2009; Pasternack 2008). In addition, at this same location digital elevation model differencing was used to quantify flood-induced morphodynamic change (Sawyer et al. 2009 in press). As part of this study, pre- and post-May 2005 flood topography mapping was done, cross-sections and velocity data were collected along three transects to validate a two dimensional hydrodymic model, and sedimentary characteristics were visually assessed and mapped (Moir and Pasternack 2008).

Information from ongoing data collection, monitoring, and evaluation activities, particularly from the Yuba Accord M&E Program (M&E Program) addressing geomophological conditions and physical habitat conditions in the Yuba River downstream of Englebright Dam that will be available for the conduct of this study includes, but is not limited to:

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- Hydrologic water balance/operations model of the Yuba River (Relicensing Study Proposal 2.2)
- Substrate and cover classification maps of the Yuba River downstream of USACE's Englebright Dam to characterize microhabitat and mesohabitat conditions (M&E Program).
- Mesohabitat classification map of the Yuba River (M&E Program)

Airplane-based photography of the lower Yuba River occurred in 1937, 1947, 1952, 1958, 1984, 1986, 1991, 1995, 1996, 1997, 1999, 2002, and annually since 2004. Historical imagery has largely not been geo-rectified. Most imagery since 1999 is geo-rectified. The National Agricultural Imagery Program has 1-m resolution imagery from 2009 that represents the highest quality geo-rectified imagery available for the present condition.

A combination of boat-based, ground-based, and LIDAR (Light Detection and Ranging) mapping has been used to create a much higher spatial resolution than the 1999 map. Point spacing on the floodplain was finer than 1 point every 2 feet. In the channel, the spacing was more variable, but still on the order of 1 point every 5-20'. The EDR ("Englebright Dam Reach", the Yuba River from Englebright Dam to Deer Creek) was mapped too, but the Narrows is still not mapped as of spring 2010. No sizable data gaps exist downstream of the Narrows - all islands, backwaters, and side channels were mapped. A report explaining the data collection and map production procedures is available from the RMT.

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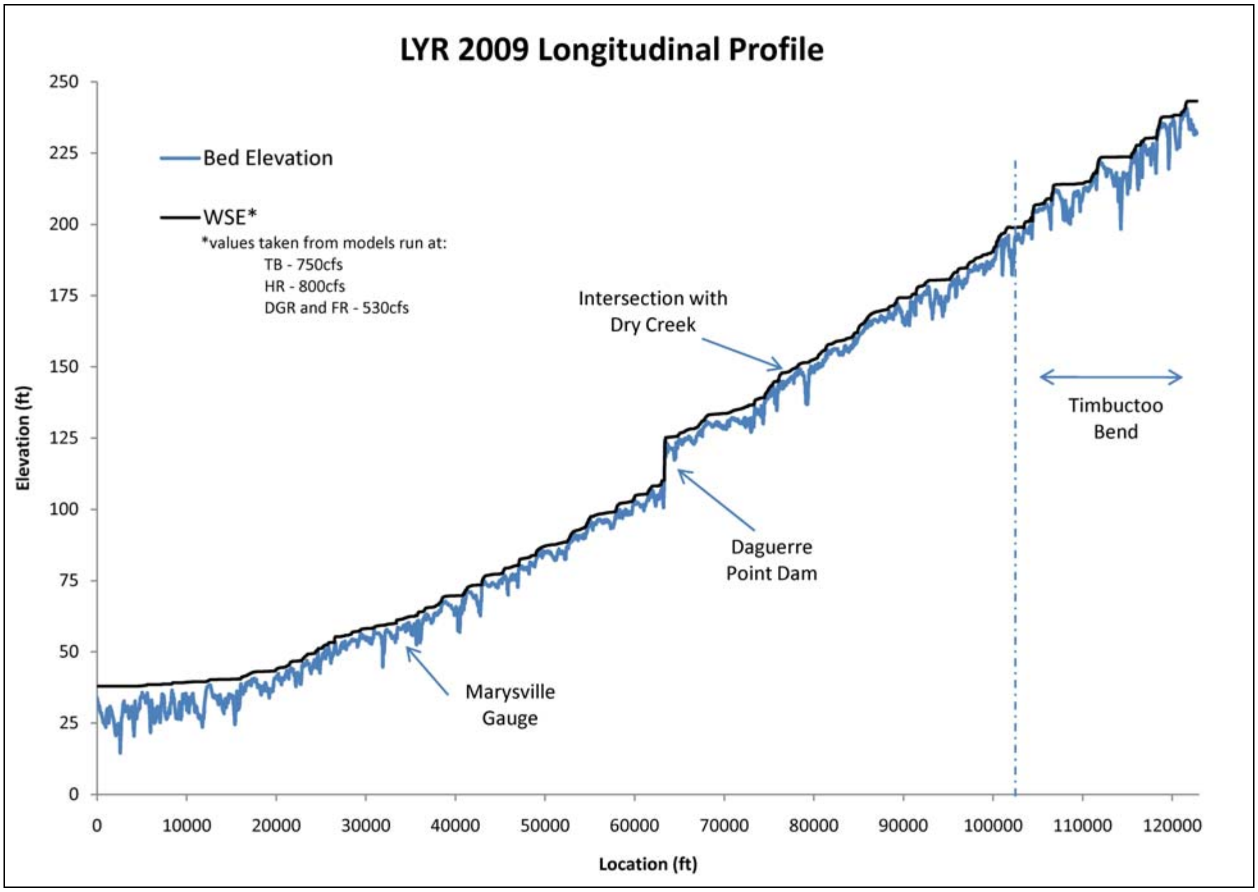

Figure 7.1.8-5. Longitudinal profile of Yuba River below Timbuctoo Bend.

In spring 2010, the RMT approved a protocol for mapping the substrate and cover for the entire lower Yuba River systematically. The approach uses a visual classification system for substrate with size divisions that are determined by properties of the statistical distribution of particle sizes in a gravel-bed river. Prior to initiating the survey, field crews were tested twice on the method using 17 samples with various size mixtures of sediment taken from the lower Yuba River (and subsequently returned there). Beginning in July 2010, crews have been using real-time differential GPS units to field-map polygons of the surficial bed material down to polygon sizes greater than 10 m^2. The coverage is for the wetted area of about 5,000 cfs, as predicted using the 2009 topographic map and the associated SRH models for the whole river. The mapping effort will be complete by December 2010.

Several different hydrodynamic models have been used to study lower Yuba River hydraulics. Beak Consultants, Inc (1989) used the IFG4 method to characterize the hydraulics of the lower Yuba River. They designated 31 transects with at least 20 points to represent the proportional occurrence of habitat types in each reach. USACE (2002) made HEC-RAS and FLO-2D hydraulic models of the channel and floodplain with coarse 400 ft by 400 ft cells (i.e. 400 ft internodal spacing) for use in studying terrestrial flooding during large floods. The U.S. Fish and Wildlife Service Instream Flow Branch (Gard, 2007, 2008) performed 2D hydraulic modeling of 18 sites for flows of 400-4500 cfs (the full range of controllable flows).

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Professor Greg Pasternack of the University of California at Davis was sponsored by the USFWS to perform 2D hydrodynamic modeling of two different sites on the lower Yuba River over a range of discharges with FESWMS. One site was the Timbuctoo Bend Apex Riffle (TBAR) whose topography was independently mapped in 2004 and 2005 (before and after the May 2005 flood peak of 42930 cfs). The 2004 TBAR topography was modeled at flows of 400, 622, 827, 1200, 135, 1800, 2250, 2700, 4500, 5620, 11600, and 42930 cfs. The other site that FESWMS was used to model was the Englebright Dam Site (EDS) in the narrow canyon just below Englebright Dam. This site included the Narrows II Pool just downstream of Englebright Dam, a run, and then another pool upstream of Narrows I. This site was mapped in 2005 and FESWMS was used to model discharges of 800, 1190, 8809, 9580, 25100, 31800, and 91400 cfs.

The RMT sponsored an extension of the modeling effort for the lower Yuba River. In 2010, the RMT prepared computational meshes for the entire lower Yuba River downstream of the highway 20 bridge to go with the pre-existing ones for upstream of the bridge. The model reaches now include the EDR (Englebright Dam Reach), Timbuctoo Bend, the Hammon Reach (Highway 20 bridge to DPD), the Daguerre reach (DPD to USGS Marysville gaging station), and the Feather Reach (USGS gaging station to confluence with the Feather River). Extensive observational data was collected 2008-2010 to test the models, including water surface elevation points, LIDAR points collected on the water surface to create a continuous water surface elevation map for the flow on the day of that flight, a dataset of water depths was collected at cross-sections in December 2009, and over 6000 observations of velocity between December 2009 to August 2010. 1-m resolution SRH models of the lower Yuba River were run from 500 cfs to 5000 cfs.

Detailed map and model information are available on the RMT public web site, www.yubaaccordrmt.com.

7.1.9 List of Attachments

None

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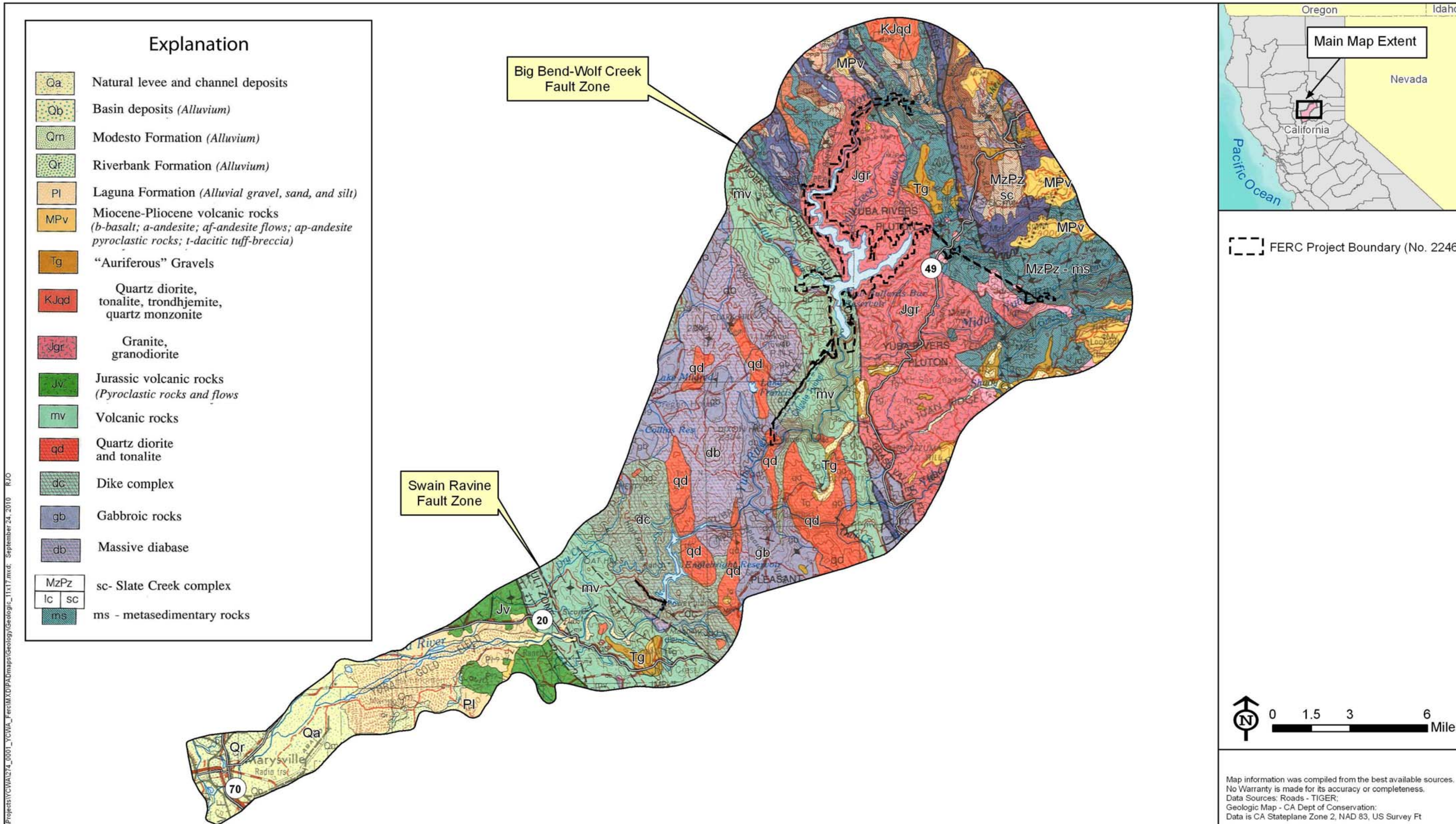

Figure 7.1.2-1. Geologic map of the Project Vicinity.

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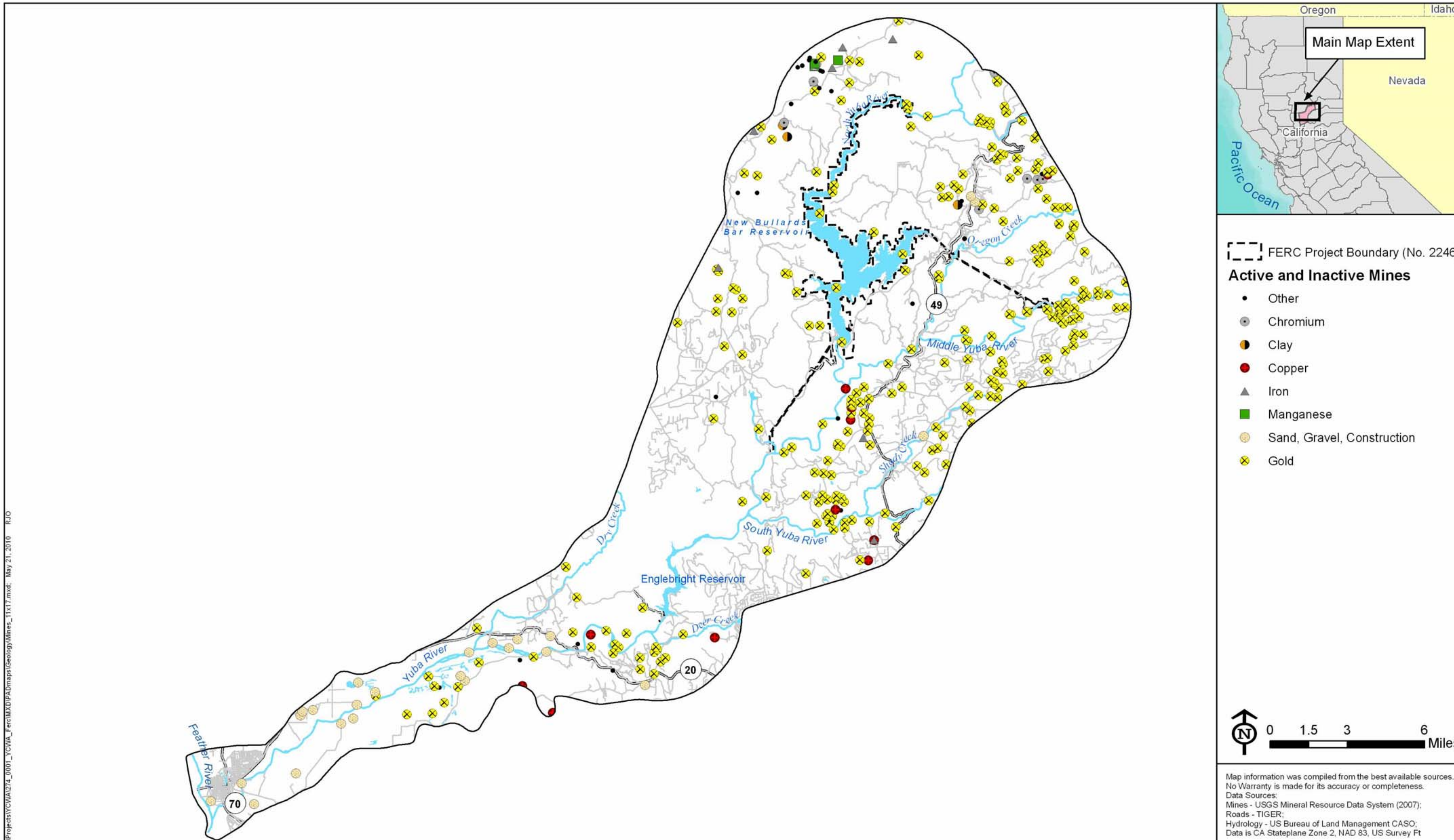

Figure 7.1.4-1. Active and inactive mines in the Project Vicinity.

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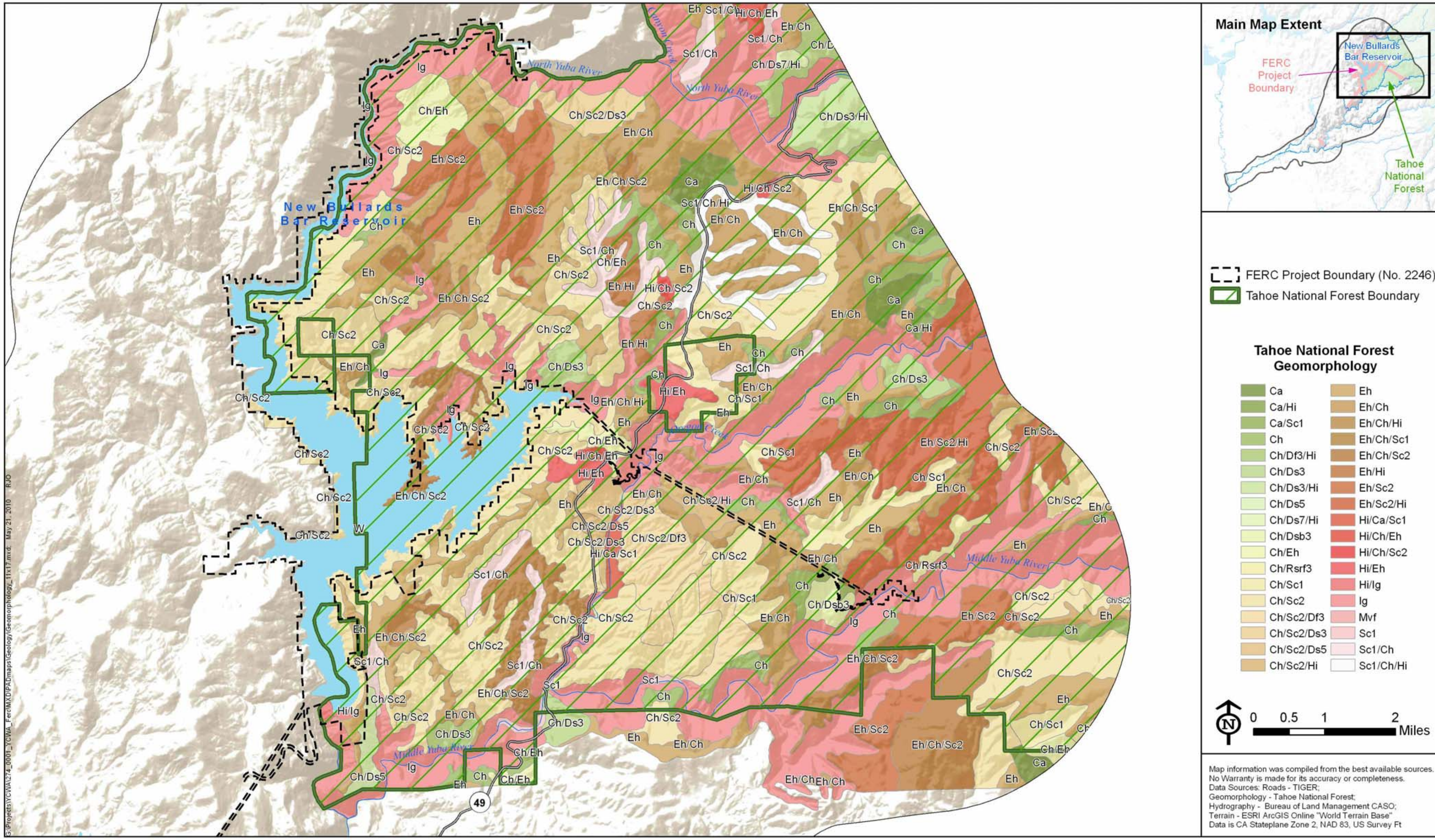

Figure 7.1.5-1. Geomorphology of the Tahoe National Forest within the Project Vicinity.

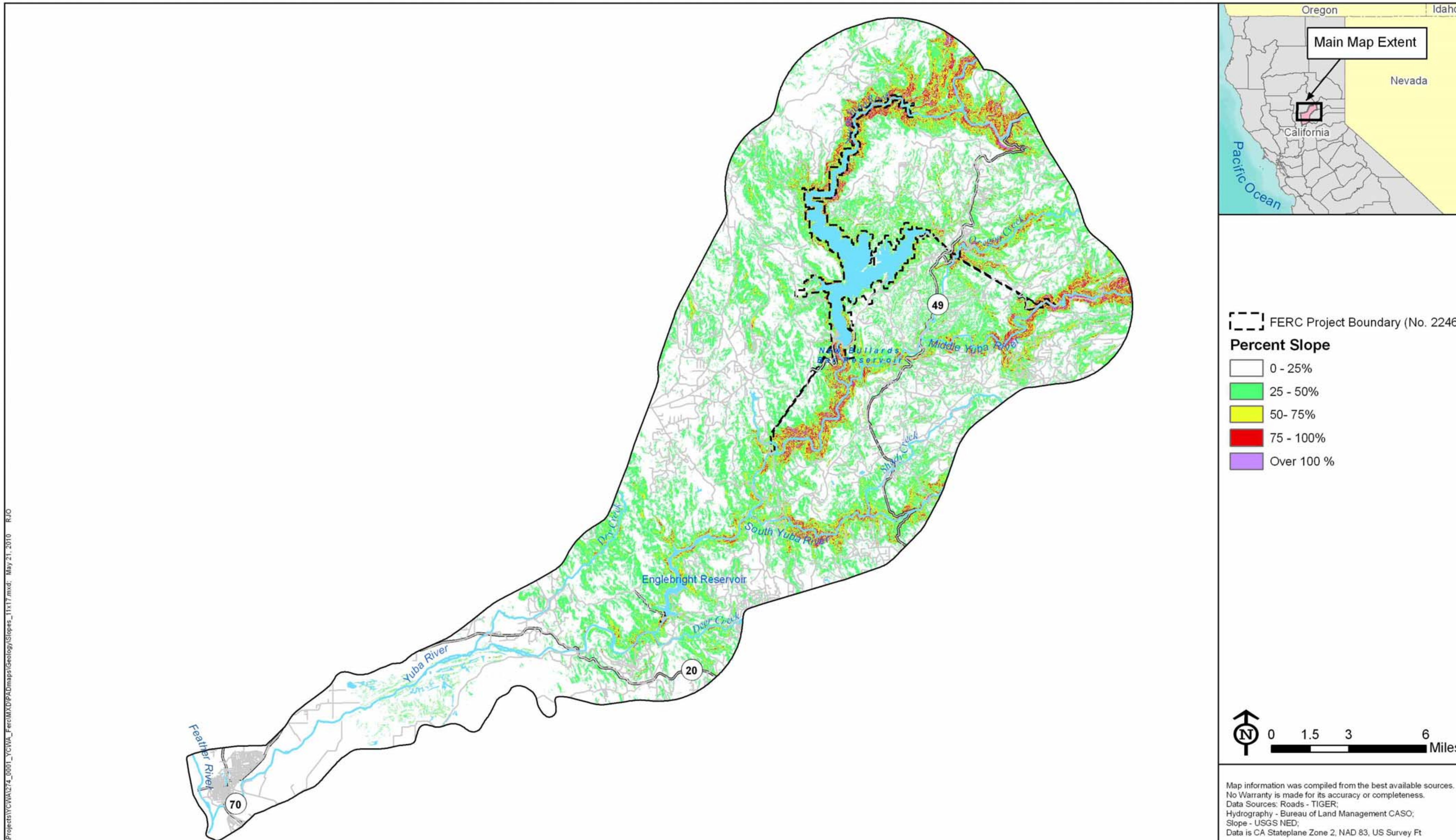

Figure 7.1.6-1. Slopes in the Project Vicinity.

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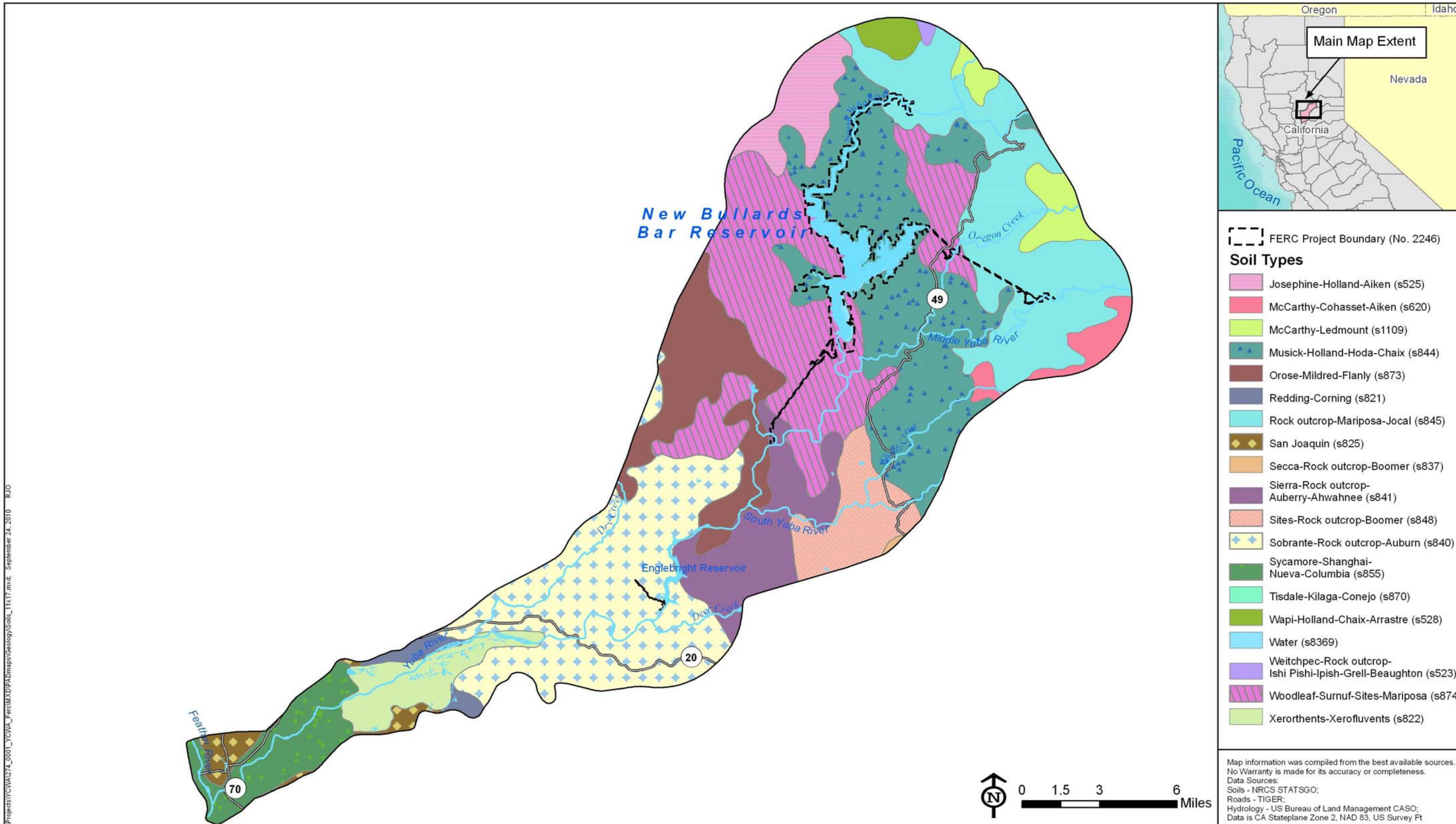

Figure 7.1.7-1. Soil associations in the Project Vicinity.

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7.2 Water Resources

7.2.1 Overview

This section discusses water resources in the vicinity of Yuba County Water Agency's (YCWA or Licensee) Yuba River Development Project (Project).[1] This section is divided into nine subsections, including this overview (Section 7.2.1). Section 7.2.2 provides drainage area information for the Yuba River sub-basins and at major Project facilities. Section 7.2.3 provides information such as length and gradient of stream reaches potentially affected by the Project. Section 7.2.4 provides morphometric information regarding Project reservoirs. Section 7.2.5 describes the hydrology in the Project Vicinity. Sections 7.2.6 and 7.2.7 list the existing instream flow designated beneficial uses and applicable water quality standards, respectively, for stream reaches and reservoirs potentially affected by the Project. Section 7.2.8 provides the existing and proposed water rights potentially affected by the Project. Section 7.2.9 describes existing, relevant, and reasonably available water quality information upstream, within, and downstream of the Project, including water temperature, water chemistry, and mercury in fish.

7.2.2 Drainage Areas of Yuba River Sub-basins

Section 3.1.1 provided an overview of the seven major drainages in the Yuba River basin, and included a map (Figure 3.1-1) showing each sub-basin. The total drainage area of each sub-basin, including the portion of the drainage area upstream and downstream of the Project, is provided in Table 7.2.2-1.

Table 7.2.2-1. Drainage areas of Yuba River sub-basins.

Sub-Basin	Most Upstream Project Facility or Feature	Drainage Area			
		Upstream of Project Facilities	Downstream of Project Facilities		Total
		(square miles)	(square miles)	% of Total	(square miles)
North Yuba River	New Bullards Bar Reservoir Normal Maximum Water Surface Elevation	419.6	71.1	14	490.7
Middle Yuba River	Our House Diversion Dam[1]	144.5	30.4	17%	174.9
Oregon Creek[2]	Log Cabin Diversion Dam[1]	29.1	6.1	17	35.2
South Yuba River	None	351.6	0	0%	351.6
Deer Creek	None	89.4	0	0%	89.4
Dry Creek	None	108.0	0	0%	108
Yuba River[3,4]	New Colgate Powerhouse	14.6	80.1	85%	94.7
	Total	**1,156.8**	**187.7**	**14%**	**1,344.5**

1 Since the impoundments formed by Our House and Log Cabin diversion dams are so minor, the drainage area is given at the dam rather than at the normal maximum water surface elevation formed by the dam.
2 Oregon Creek, on which the Project's Log Cabin Diversion Dam is located, is a tributary to the Middle Yuba River. For the purpose of the above table, Oregon Creek is considered a separate sub-basin and its drainage area is not included in the Middle Yuba River drainage area.
3 While New Colgate Powerhouse is the most upstream Project facility on the Yuba River, the Yuba River originates at the confluence of the North and Middle Yuba rivers. Project facilities on the North and Middle Yuba rivers result in the entire drainage area of the Yuba River being affected by the Project.
4 Ninety-nine percent of the drainage area in the Yuba River is located upstream of United States Army Corps of Engineers' (USACE) Daguerre Point Dam, and the remaining 1 percent is downstream of the dam.

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1 For the purpose of the Relicensing, the Project Vicinity is defined as the area surrounding the Project on the order of a United States Geological Survey (USGS) 1:24,000 topographic quadrangle.

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7.2.3 Stream Reaches Affected by the Project

The eight stream reaches directly, indirectly, and cumulatively affected by the Project were described in Section 3.2. A summary description of each reach is provided in Table 7.2.3-1.

Table 7.2.3-1. Stream reaches affected by the Project by sub-basin.[1]

Reach Name	Upstream Terminus	Downstream Terminus	Length (mi)	Gradient (%)
NORTH YUBA RIVER				
New Bullards Bar Dam Reach	Base of New Bullards Bar Dam (RM 2.3, Elev 1,320 ft)	North Yuba River Confluence with Middle Yuba River (RM 0.0, Elev 1,124 ft)	2.3	2.2
OREGON CREEK, A TRIBUTARY TO THE MIDDLE YUBA RIVER				
Log Cabin Diversion Dam Reach	Base of Log Cabin Diversion Dam (RM 4.1, Elev 1,965 ft)	Oregon Creek Confluence with Middle Yuba River (RM 0.0, Elev 1,442 ft)	4.1	2.5
MIDDLE YUBA RIVER				
Our House Diversion Dam Reach	Base of Our House Diversion Dam (RM 12.0, Elev 1,970 ft)	Middle Yuba River Confluence with Oregon Creek (RM 4.5, Elev 1,442 ft)	7.5	1.4
Oregon Creek Reach	Middle Yuba River Confluence with Oregon Creek (RM 4.5, Elev 1,442 ft)	Middle Yuba River Confluence with North Yuba River (RM 0.0, Elev 1,124 ft)	4.5	1.3
YUBA RIVER				
Middle/North Yuba River Reach	Confluence of North and Middle Yuba rivers (RM 39.7, Elev 1,124 ft)	New Colgate Powerhouse (RM 33.9, Elev 543 ft)	5.8	1.9
New Colgate Powerhouse Reach	New Colgate Powerhouse (RM 33.9, Elev 543 ft)	USACE's[2] Englebright Reservoir Normal Maximum (RM 32.2, Elev 542 ft)	1.7	0.1
Narrows 2 Powerhouse Reach	Narrows 2 Powerhouse (RM 24.0, Elev 307 ft)	USACE's[2] Daguerre Point Dam Normal Maximum (RM 11.5, Elev 124 ft)	12.5	0.3
USACE's[2] Daguerre Point Dam Reach	USACE's[2] Daguerre Point Dam (RM 11.4, Elev 124 ft)	Yuba River Confluence with the Feather River (RM 0.0, Elev 48 ft)	11.4	0.1

Note: Elevation datum: NAVD 88
[1] Stream reaches impounded by Project and non-Project dams are not included in this table. See Section 3.2.2.
[2] USACE: United States Army Corps of Engineers

7.2.4 Morphometric Data for Existing Project Reservoirs

Table 7.2.4-1 summarizes relevant data related to New Bullards Bar Reservoir, the Project's only storage reservoir, including water surface elevation, gross storage, usable storage, surface area, volume, estimated maximum depths, and shoreline length.

Table 7.2.4-1. Morphometric information regarding Project reservoirs.

Project Reservoir	Upstream Drainage Area (sq mi)	Usable Storage Capacity (ac-ft)	Normal Maximum WSEL[1] (ft)	Surface Area (ac)	Shoreline Length (mi)	Maximum Length (mi)	Estimated Maximum Depth (ft)
New Bullards Bar Reservoir	488.6	966,103	1,956	4,790	71.9	8.5	645

WSEL = Water Surface Elevation

The average hydraulic retention time of usable storage within New Bullards Bar Reservoir is approximately 6 months, based on long-term averages of storage and flow through the reservoir.

Figure 7.2.4-1 shows the storage-area-elevation curves for New Bullards Bar Reservoir from United States Army Corps of Engineers' (USACE) 1972 New Bullards Bar Reservoir Regulation for Flood Control Manual.

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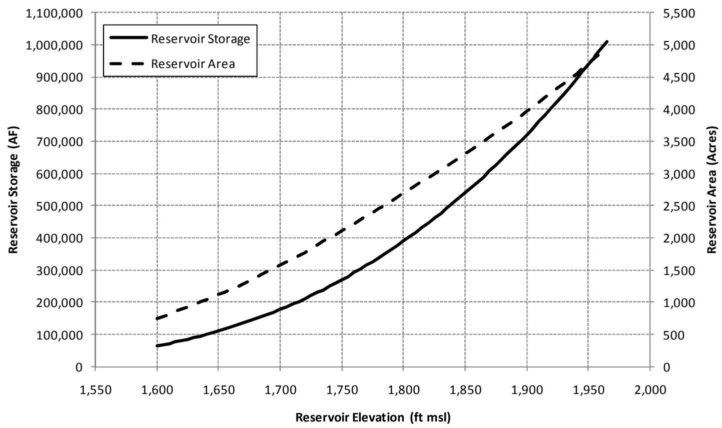

Figure 7.2.4-1. New Bullards Bar Reservoir storage-area-elevation curves.

7.2.5 Streamflow, Gage Data, and Flow Statistics

For the purpose of this Pre-Application Document (PAD), Licensee's hydrologic period of record extends from water year (WY) 1970 through WY 2008. This period includes both the driest and wettest periods for the Project Vicinity. Further, for the purpose of this PAD, "regulated" hydrology refers to hydrologic conditions with both Project and non-Project facilities in the watershed, "unimpaired" hydrology refers to flows that would have occurred in the basin during the period of record if no Project or non-Project facilities were present, and "non-Project" hydrology refers to flows that would have occurred if the Project had not been developed, but all non-Project facilities were present.

All regulated, unimpaired, and non-Project hydrology (mean daily values) as well as Licensee's methods used to estimate each flow condition are provided in Appendix F. Regulated hydrology was synthesized by Licensee from measured reservoir elevations and stream flows and is reported by the United States Department of Interior (USDOI) United States Geological Survey (USGS) in annual reports, while unimpaired and non-Project hydrology were calculated using area-weighted flow, mass balance, and statistical regression methodologies. Appendix F also includes flow exceedance charts for all gage locations discussed in this section.

7.2.5.1 Streamflow and Other Gages in the Project Vicinity

Flow and reservoir elevation/storage data for the Project Vicinity comes from USGS and Licensee-maintained gages within the Yuba River Basin. Table 7.2.5-1 identifies the main gages that provide either flow or reservoir level data.

Table 7.2.5-1. Streamflow gages and Project tunnel, powerhouse, and reservoir gages.

USGS Gage Number	Name	Elevation (ft msl)	Drainage (sq mi)	Period of Record	
				Start	End
STREAMFLOW GAGES					
11408850	Middle Yuba River Near Camptonville	NA[1]	136	8/1/1967	9/30/1989
11408880[2]	Middle Yuba River Below Our House Diversion Dam, Near Camptonville	1,957.51	145	10/1/1968	Present
11409300	Oregon Creek At Camptonville	2,230	23	10/1/1967	9/30/2000

Table 7.2.5-1. Streamflow gages and Project tunnel, powerhouse, and reservoir gages.

USGS Gage Number	Name	Elevation (ft msl)	Drainage (sq mi)	Period of Record	
				Start	End
11409400[2]	Oregon Creek below Log Cabin Diversion Dam, Near Camptonville	1,912.73	29.1	9/1 1968	Present
11413000	North Yuba River below Goodyears Bar	2,453	250	10/1/1930	Present
11413300	Slate Creek Below Diversion Dam, Near Strawberry Valley	3,570	49.4	10/1/1960	Present
11413520[1]	North Yuba River Below New Bullards Bar Dam, Near North San Juan	1,350	490	8/13/1966	9/30/2004
11417500	South Yuba River At Jones Bar, Near Grass Valley	1,060	308	10/1/1940	Present
11418000[1]	Yuba River Below USACE's Englebright Dam, Near Smartville	278.68	1,108	10/1/1941	Present
11418500	Deer Creek Near Smartville	630	84.6	10/1/1935	Present
11421000[1]	Yuba River Near Marysville	-2.95	1,339	10/1/1943	Present
11420700	Dry Creek near Browns Valley	NA	87	8/1/1964	10/03/1980
TUNNEL FLOW GAGES					
11408870	Lohman Ridge Diversion Tunnel At Intake, Near Camptonville	2,014.77	NA	10/1/1988	Present
11409350	Camptonville Diversion Tunnel At Intake, Near Camptonville	1,952.00	NA	10/1/1988	Present
POWERHOUSE FLOW GAGES					
11417980	Narrows Powerhouse No. 2 Below USACE's Englebright Dam	NA	NA	10/1/1970	9/30/2006
11413510	New Colgate Powerplant Near French Corral	NA	NA	10/1/1966	Present
11413517[1]	North Yuba River Low Flow Release Below New Bullards Bar Dam	NA	NA	10/1/2003	Present
11417970	Narrows No. 1 Powerhouse at USACE's Englebright Dam (PG&E)	NA	NA	10/01/1974	9/30/2006
RESERVOIR STORAGE GAGES					
11413515	New Bullards Bar Reservoir Near North San Juan	1,965	489	1/1/1969	Present

Notes: Elevation per NGVD 1929. Elevation and drainage per USGS records.
NA: Not available
msl: mean sea level

[1] These gages are used by Licensee to document compliance with the minimum flow requirements in the existing Federal Energy Regulatory Commission (FERC) license.

Figure 7.2.5-1 provides a schematic view of Project facilities and gages in the Project Vicinity.

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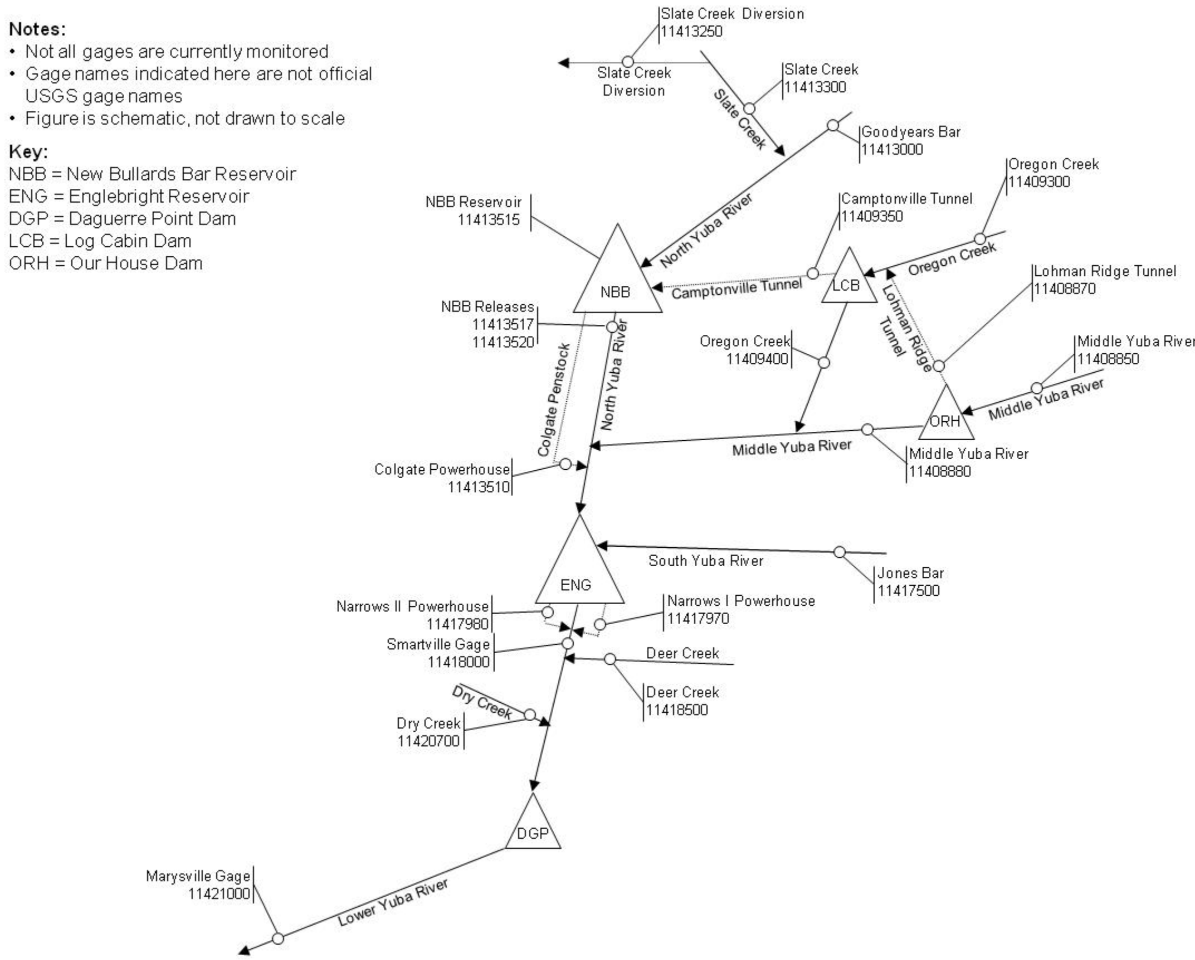

Figure 7.2.5-1. Schematic of the Project Vicinity, including USGS gage identification numbers.

7.2.5.2 Regulated Hydrology Data for Project Facilities and Potentially Affected Sections of the Yuba River and Tributaries

This section summarizes hydrology data available for sections of the Yuba River and its tributaries that provide inflow to the Project Area[2], the area immediately downstream of Project facilities, powerhouses, and other points of interest, (e.g., USGS gage locations). Data are generally presented by sub-basin as outlined in Section 7.2.2 above, and in an upstream-to-downstream order. Licensee’s synthesized flow data for these points of interest are included with the complete hydrology data for both regulated and unimpaired flows in Appendix F.

Flow data shown in this section include average monthly gage flows, historical mean daily

[2] For the purposes of this document, the Project Area is defined as the area within the Federal Energy Regulatory Commission (FERC) Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within about 0.25-mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature or structure.

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streamflows per year, and flow exceedance curves by tributary or facility within the Project Vicinity. Most of the figures are based on an analysis of regulated USGS gage flow data for the period of record (i.e., WY 1970 through 2008). There are some exceptions due to new or discontinued gages, in which case the data were either synthesized based on a combination of data from several gages or a limited data set was used for analysis. Average monthly streamflows are shown as bar charts with end-point bars to represent minimum and maximum monthly flow values. Regulated mean daily flow figures help characterize daily trends and flow variability throughout the year. The flow exceedance curves represent the percentage of time a specified flow is equaled or exceeded throughout the period of record. See Appendix F for more detailed flow exceedance curves by month. The combination of the three figures for each tributary or facility provides a general description of gaged flow behaviors of these features within the Project Area.

7.2.5.2.1 Historic Overview

Construction and operation of the Project have altered the flow regime of the lower Yuba River below USACE's Englebright Dam and flow regimes in the reaches below New Bullards Bar Dam, Log Cabin Diversion Dam and Our House Diversion Dam. Little streamflow information is available for pre-Project time periods for the reaches directly below the three Project dams, but two gaging stations located on the lower Yuba River have been operated since well before the Project was constructed. These gaging stations provide lower Yuba River hydrology for the pre-Project time period to compare to the Project hydrology. From 1903 through 1943, USGS Gage 11419000 measured flows on the Yuba River near Smartsville,[3] just below Deer Creek. Since 1943, both the Smartville Gage, USGS Gage Number 11418000, located at river mile 23 and the Marysville Gage, USGS Gage Number 11421000, at river mile 5.6, have been in operation.

Pre-Project hydrology can be compared with Project hydrology on a long term basis by comparing the exceedance probabilities of mean daily flows for various time periods. Three periods of interest are used for the comparison. The period of 1903 to 1941 is used for pre-project-condition hydrology at the Smartville Gage. This period was before the construction of USACE's Englebright Dam. The period of 1944 to 1969 is used for pre-project-condition flows with USACE's Englebright Dam and Pacific Gas and Electric Company (PG&E's) Narrows I Powerhouse in place, and the period of 1969 to 2008 is used for the Project-condition period of record flows.

7.2.5.2.2 Time Period Setting

During the pre-Project time period of 1903 to 1941, no Project facilities were in place, USACE's Englebright Dam was not in place, although it was under construction for the last few years of this period, and development of the upper Yuba River watershed was taking place. Most of the dams and diversions that were used primarily for gold mining were already in place during this period, but they were being re-built, replaced or removed. Debris dams were also in place, being

[3] In 2008, the people of this community petitioned to have the name changed to Smartsville, with an 's" in the middle of the name. However, the USGS gage refers to the former spelling of the community name. Therefore in this document, the community is referred to as such

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re-built or being added at several locations throughout the middle to lower elevations of the watershed. During the 1903 to 1941 time period, three notable dams were constructed. The original Bullards Bar Dam (several brush, timber, and rock structures were constructed at Bullards Bar in the mid to late 1800s), a 175-foot-high dam creating 31,500 acre-ft of storage capacity, was constructed in the early 1920s at a location 2 miles upstream of the location of New Bullards Bar Dam. USACE's Englebright Dam was constructed by the California Debris Commission, a unit of USACE, in the late 1930s and early 1940s and is now owned by USACE. Lastly, USACE's Daguerre Point Dam was constructed in 1906 by the California Debris Commission and has been rebuilt several times in the same general vicinity since then.

For the lower Yuba River, the pre-Project time period of 1944 to 1969 is characterized by the construction and operation of USACE's Englebright Dam and the Narrows 1 Powerhouse. The Narrows 1 Powerhouse has a maximum rated release capacity of 730 cubic feet per second (cfs). USACE's Englebright Dam has an uncontrolled spillway crest; inflows to USACE's Englebright Reservoir at rates greater than the Narrows 1 Powerhouse release capacity, and that lasted for any significant duration, resulted in uncontrolled spilling at the dam. Upper Yuba River watershed development on the Middle and South Yuba rivers was mostly in place during this time period with the major South Yuba River dam, Spaulding Dam, having been constructed in 1913.

The Project time period of 1970 to 2008 includes the operation of New Bullards Bar Dam and the New Colgate and Narrows 2 powerhouses. During this time period, there were a range of operational procedures and constraints on the project affecting downstream hydrology. These procedures and constraints are detailed in Section 6.0. During the Project time period, three sets of instream flow requirements governed Project operations and resulted in varied hydrologies. Also during the Project time period, the use of Yuba River water, primarily through diversions at USACE's Daguerre Point Dam, increased with the expansion of irrigation systems within Yuba County.

7.2.5.2.3 Comparison of Hydrologies

Figures 7.2.5-2 and 7.2.5-3 below show exceedance probabilities of mean daily flow in January for the two gaged locations, Marysville and Smartsville, respectively. The Marysville gage figure includes two time periods for comparison, the pre-Project time period of 1944 through 1969, and the Project time period of 1970 through 2008. The Smartville gage figures include three time periods for comparison, the pre-Project and Pre-Englebright Dam time period of 1904 through 1941, the pre-Project time period of 1944 through 1969, and the Project time period of 1970 through 2008. Exceedance probability figures show the percentage of occurrences, in this case the percentage of days that a flow occurred, at or above a specific level. For example, in the figure for the Marysville gage mean daily flow exceedance for the month of January, the mean daily flows were at or above 2,000 cfs 40 percent of days for the pre-Project time period and 50 percent of days for the Project time period. Several of the exceedance charts are shown in the following pages. The full set of exceedance charts is in Appendix F – Hydrology CD.

The charts for both Marysville and Smartville gages show little difference in pre-Project and Project flow exceedance percentages for the months gages of January. The Yuba River runoff volume is substantially greater than the storage of Project facilities or USACE's Englebright Reservoir. Even though New Bullards Bar Reservoir is typically filling during these months, the effect of filling may not significantly affect the frequency and volume of flow in the lower Yuba River on a long term basis.

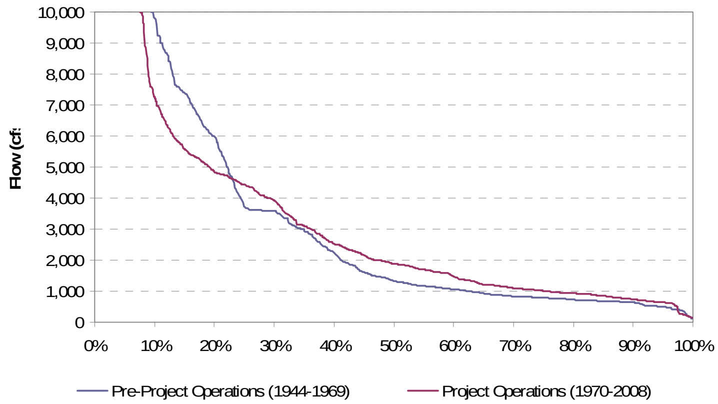

Figure 7.2.5-2. Flow exceedance of historical mean daily streamflow at Marysville gage for January.

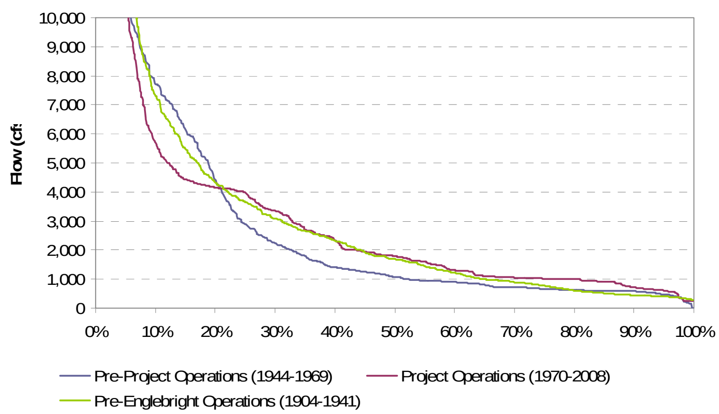

Figure 7.2.5-3. Flow exceedance of historical mean daily streamflow at Smartville gage for January.

As examples of flow conditions during the snowmelt period, figures 7.2.5-4 and 7.2.5-5 show the exceedance probabilities of mean daily flows for Marysville and Smartville gages for the month of April, respectively. These figures show that the Project period flows in April are consistently lower than flows during either the Pre-Englebright period or the Pre-Project period. The lower flows of the Project period are due to New Bullards Bar Reservoir capturing much of the snowmelt runoff. The months of March and May also show this trend, although with reduced differences in mean daily flow exceedances.

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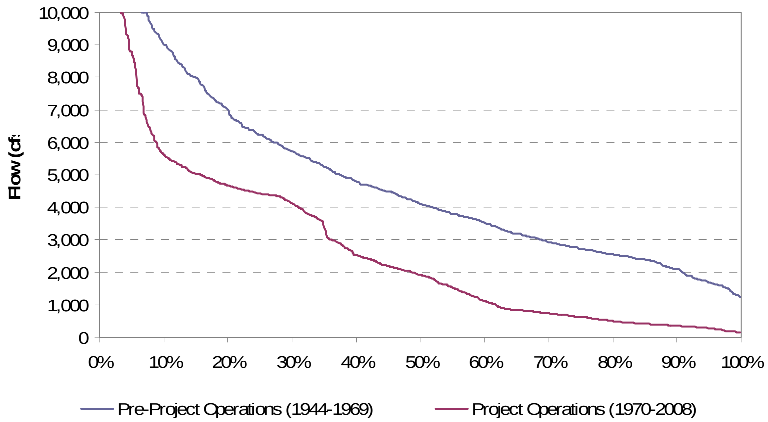

Figure 7.2.5-4. Flow exceedance of historical mean daily streamflow at Marysville gage for April.

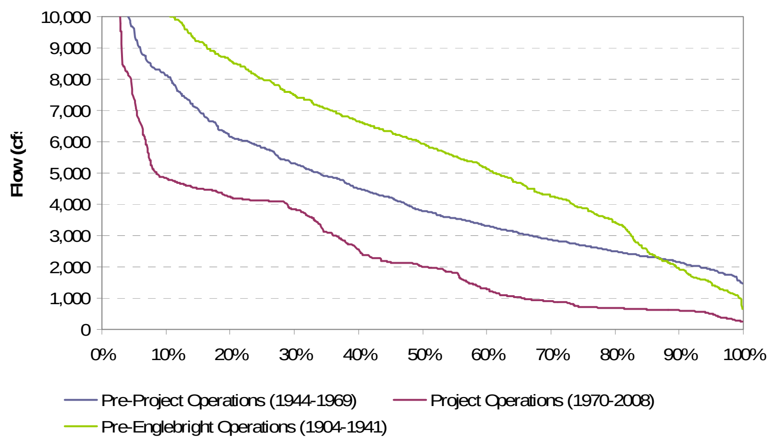

Figure 7.2.5-5. Flow exceedance of historical mean daily streamflow at Smartville gage for April.

Differences in mean daily flow exceedances are not solely related to Project operations; some of the differences in mean daily flow exceedances for March through May between the Project and pre-Project periods are due to hydrologic differences for the two periods. Unimpaired flow in the driest third of years averaged 400,000 acre-feet (ac-ft) less in the Project period than in the pre-Project period.

Comparisons of the pre-Project and Project flows for the months of July through November show substantially higher flows during the Project time period as compared to the pre-Englebright and pre-Project periods at both locations for all five months. Figures 7.2.5-6 and 7.2.5-7 show exceedance probabilities for the Marysville and Smartville gages for the month of October, respectively. The Marysville gage figure indicates 90 percent of the mean daily flow for the Project period is at least 400 cfs while the flow for the same month during the pre-Project period is only 44 cfs. Figure 7.2.5-7 shows mean daily flows at the Smartville gage are at least 600 cfs for 90 percent of days during the Project period, while flows in both the pre-Project and pre-Englebright periods exceed 195 cfs 90 percent of days. Other months of the July to November period have even greater differences between the Project and pre-Project flow exceedance probabilities (see Appendix F).

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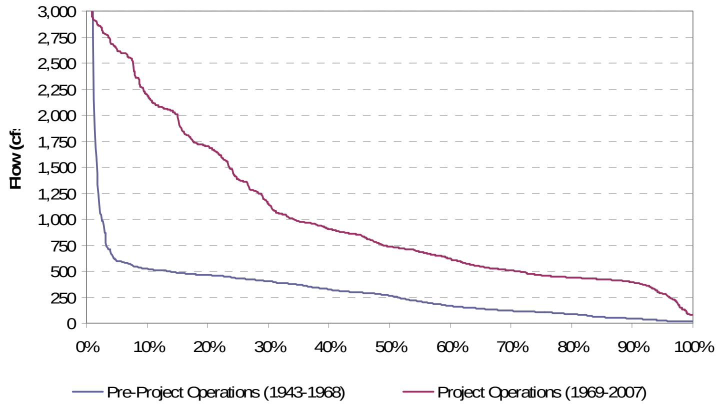

Figure 7.2.5-6. Flow exceedance of historical mean daily streamflow at Marysville gage for October.

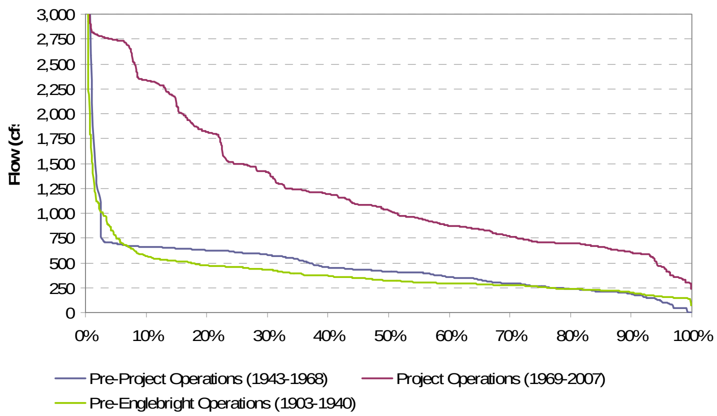

Figure 7.2.5-7. Flow exceedance of historical mean daily streamflow at Smartville gage for October.

While the exceedance probability figures provide a good reference for recurrence of flow, they do not provide any context to flow variability or how these flows occur. The mean daily pre-Project flows are characterized by low (as low as 20 cfs) flows at Marysville for July through November in many years irrespective of hydrology, and similarly low fall flows at Smartville with highly varied flows from day to day. For example, Figure 7.2.5-8 is a chart of mean daily flows for the months of July through November of 1951. As water was released from the Narrows 1 Powerhouse, mean daily flows at Smartville for the pre-Project period varied from 700 cfs to 150 cfs with a mid-week power generation peaking schedule for most of this period. Mean daily flows in September and parts of October averaged around 700 cfs on weekdays and dropped to about 150 cfs on weekends. Figure 7.2.5-9 shows mean daily flows for the years 1959 through 1961. For this pre-Project time period, flows at Marysville ranged from 15 cfs to 50 cfs for most of the summer, increased in the early fall for about a week or two to 150 cfs or more, and then dropped back to around 50 cfs for October and into November. For the Yuba Accord, summer flows are required to be above 400 cfs at Marysville gage for 95 percent of all years and would be above 350 cfs for the remaining percentage of years, except years classified as conference years, which is the one percent chance driest year.

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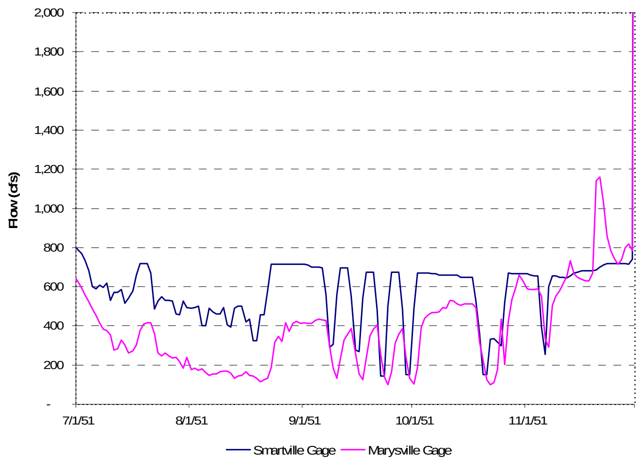

Figure 7.2.5-8. Mean daily streamflow on the lower Yuba River for July through November of 1951.

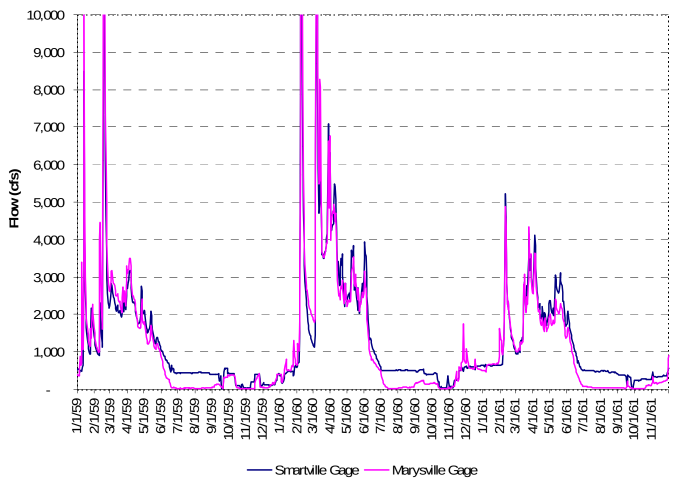

Figure 7.2.5-9. Mean daily streamflow on the lower Yuba River for 1959 through 1961.

7.2.5.2.3 Project Conditions

This section describes flow conditions at various facilities, beginning upstream of the Project and continuing through the Project and downstream to Marysville.

North Yuba River

The three primary tributaries of the North Yuba River are Canyon Creek, Slate Creek, and Deadwood Creek. There are no major projects on the mainstem of the North Yuba River upstream of New Bullards Bar that significantly affect the flow of the river. On its tributaries, however, there are two developments of note: one is the Deadwood Creek Power Plant, which is a small hydropower plant on Deadwood Creek; the other is the Slate Creek Diversion Dam on Slate Creek, operated by South Feather Water and Power Agency (SFWPA), which diverts water into the Feather River basin.

North Yuba River Upstream of New Bullards Bar Reservoir

The hydrology of the North Yuba River is predominantly snowmelt driven, with rain and snowmelt peak flows occurring from March through May. The record of daily data from the primary gage in the watershed upstream of the Project, North Yuba River below Goodyears Bar (USGS 11413000), has a period of record from October 1930 through the present. The Goodyears Bar gage is located at an elevation of approximately 2,453 feet, and includes a watershed area of approximately 250 square miles. Figure 7.2.5-10 shows average monthly streamflow for the North Yuba River at Goodyears Bar. During most months, the maximum monthly flows are significantly higher than the monthly average, representing significant precipitation events or outliers. The maximum average monthly streamflow of 4,526 cfs and daily maximum streamflow of 29,600 cfs were recorded during the height of an extreme flood in January 1997.

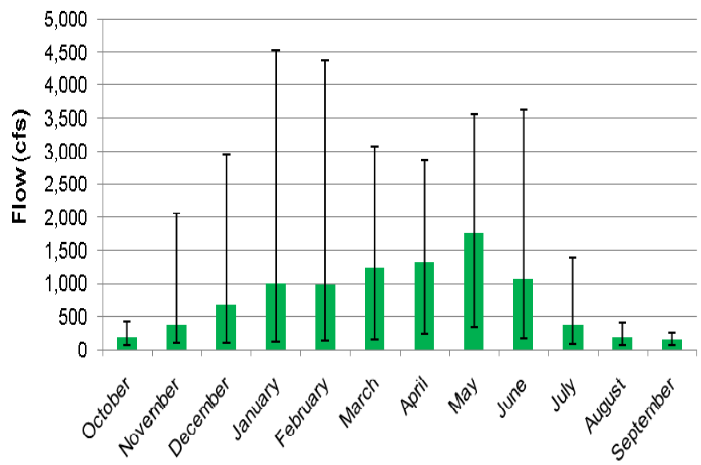

Figure 7.2.5-10. Average monthly streamflow for the North Yuba River below Goodyears Bar gage (USGS 11413000) from WY 1970 through WY 2008.

Historical mean daily streamflows per year in the North Yuba River are shown in Figure 7.2.5-11.

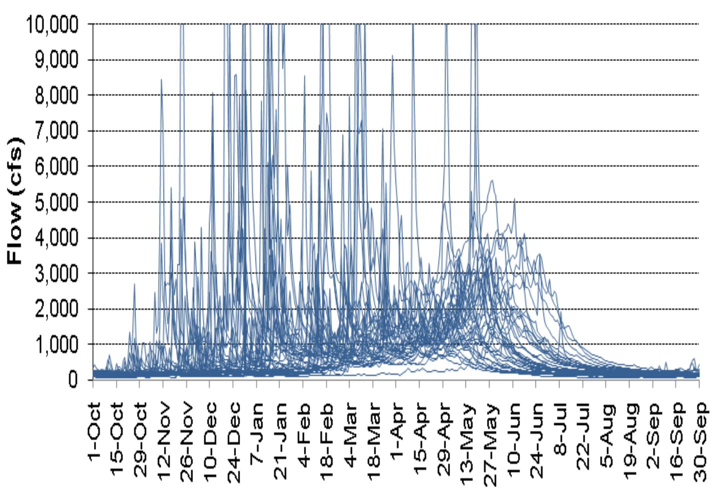

Figure 7.2.5-11. Historical mean daily streamflow each year for the North Yuba River below Goodyears Bar gage (USGS Gage 11413000) from WY 1970 through WY 2008.

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A flow exceedance curve of historical mean daily average flow on the North Yuba River at Goodyears Bar gage is shown in Figure 7.2.5-12. Only 10 percent of daily average flows during the period of record exceed 2,000 cfs. Fifty percent of daily average flows exceed 360 cfs, and 90 percent of daily average flows exceed 140 cfs.

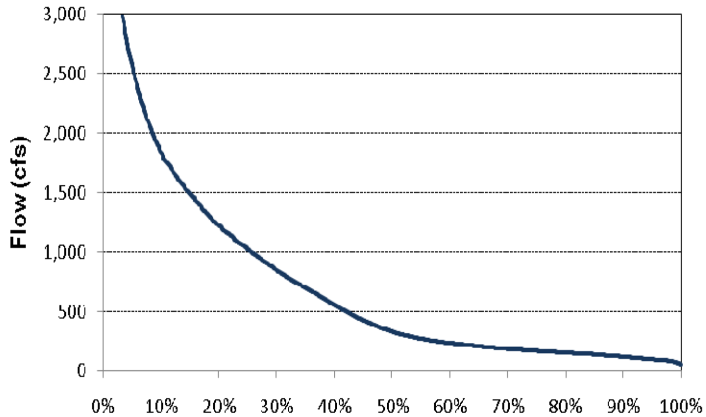

Figure 7.2.5-12. Flow exceedance of historical mean daily streamflow for the North Yuba River below Goodyears Bar gage (USGS Gage 11413000) from WY 1970 through WY 2008.

<u>Slate Creek, Tributary to North Yuba River Upstream of New Bullards Bar Reservoir</u>

Slate Creek is one of the larger tributaries to the North Yuba River upstream of New Bullards Bar Reservoir. It originates near the town of La Porte in the northern portion of the Yuba River watershed and joins the North Yuba River approximately 0.5 mile upstream of the upper reaches of New Bullards Bar Reservoir at an elevation of approximately 1,980 feet. The Slate Creek watershed is approximately 61 square miles.

SFWPA diverts water from Slate Creek into the Feather River basin near Strawberry Valley via the Slate Creek Tunnel at approximately 3,500 feet, nearly 9 miles above Slate Creek's confluence with the North Yuba River. For a discussion of these diversions, refer to Section 7.2.8.1. Approximately 49 square miles of the Slate Creek watershed are upstream of the Slate Creek Diversion Dam; the other 12 square miles of the watershed are below the diversion dam. The average gradient of Slate Creek below the Slate Creek Diversion Dam is 3.3 percent.

Slate Creek inflows to the North Yuba River have been continuously gaged below the Slate Creek Tunnel by USGS Gage 11413300 since October 1960. Figure 7.2.5-13 shows average monthly streamflow for Slate Creek below the Slate Creek Diversion Dam. The maximum daily average streamflow of approximately 12,200 cfs was recorded during the height of the extreme flood in January 1997.

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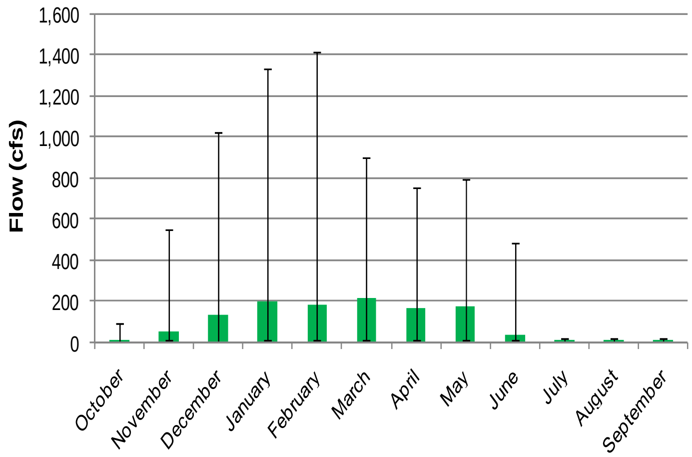

Figure 7.2.5-13. Average monthly streamflow for Slate Creek below SFWPA's Slate Creek Diversion Dam (USGS Gage 11413300) from WY 1970 through WY 2008.

Historical mean daily streamflows per year in Slate Creek below the Slate Creek Diversion Dam are shown in Figure 7.2.5-14.

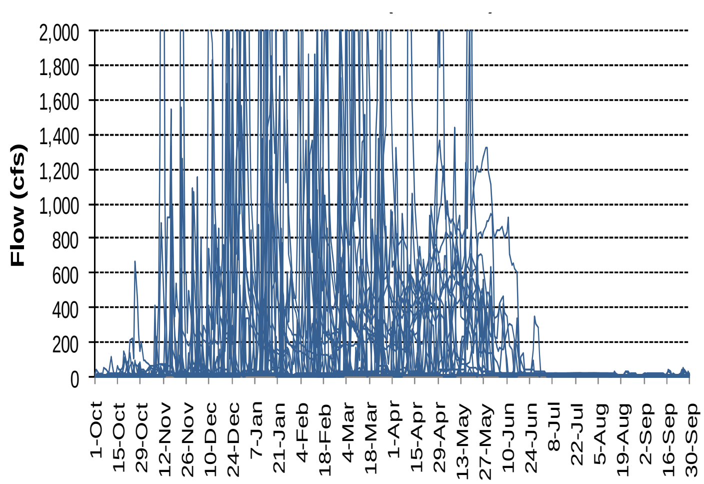

Figure 7.2.5-14. Historical mean daily streamflow each year for Slate Creek below SFWPA's Slate Creek Diversion Dam (USGS Gage 11413300) from WY 1970 through WY 2008.

A flow exceedance curve for Slate Creek below SFWPA's Slate Creek Diversion Dam is shown in Figure 7.2.5-15. Only 10 percent of mean daily flows during the period of record exceed 300 cfs. Fifty percent of mean daily flows exceed 13 cfs, and 90 percent of mean daily flows exceed 2 cfs.

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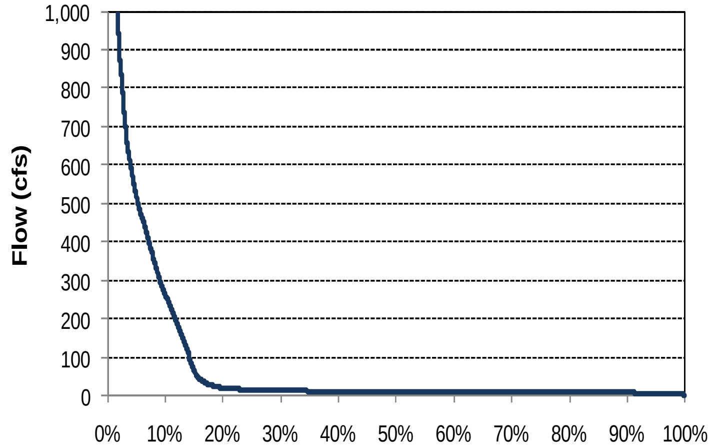

Figure 7.2.5-15. Flow exceedance of historical mean daily streamflow for Slate Creek below SFWPA's Slate Creek Diversion Dam (USGS Gage 11413300) from WY 1970 through WY 2008.

New Bullards Bar Reservoir

New Bullards Bar Reservoir has an estimated useable storage capacity of 966,103 ac-ft at gross pool and has been measured daily at USGS Gage 11413515 from October 1969 to the present. Figure 7.2.5-16 shows average monthly storage for the New Bullards Bar Reservoir. The maximum average monthly storage volume of approximately 960,000 ac-ft was recorded in June of 1996.

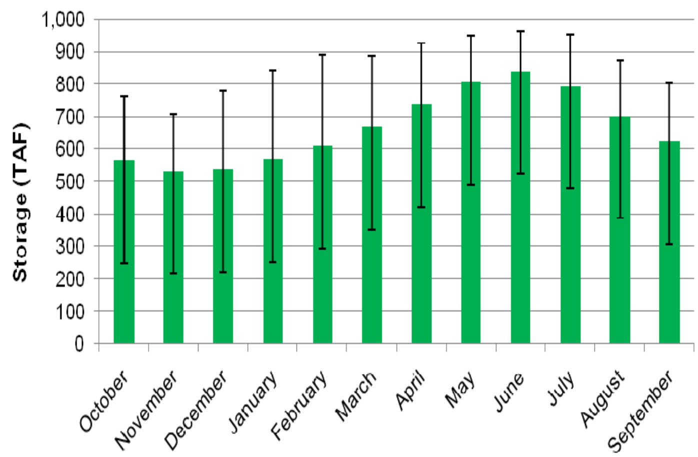

Figure 7.2.5-16. Average monthly storage for New Bullards Bar Reservoir (USGS Gage 11413515) from WY 1970 through WY 2008.

Historical daily storage for the reservoir is shown per year in Figure 7.2.5-17. The reservoir storage is typically at its highest in May and June, and at its lowest in December and January. The lowest storage since the reservoir first filled, 178,230 ac-ft, occurred on December 29, 1981. The lowest maximum daily storage for the May and June time period, 289,454 ac-ft, occurred on May 2, 1977.

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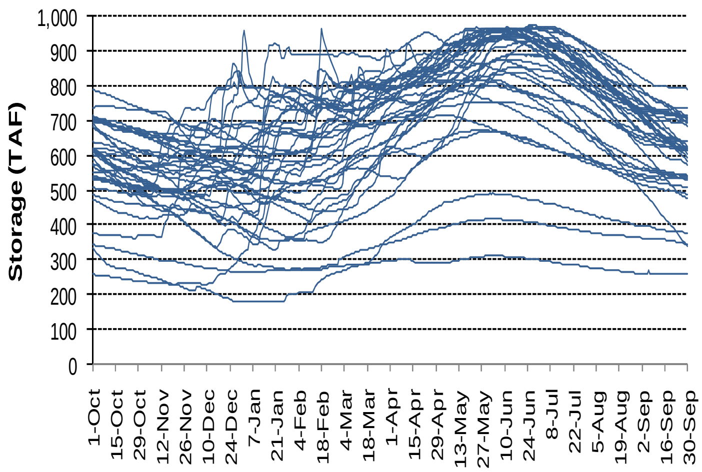

Figure 7.2.5-17. Historical daily storage each year for New Bullards Bar Reservoir (USGS Gage 11413515) from WY 1970 through WY 2008. WY 1977 represents the lowest peak storage during the period of record.

A storage exceedance curve for daily New Bullards Bar Reservoir storage is shown in Figure 7.2.5-18. Daily storage exceeds 895,000 ac-ft 10 percent of the time during the period of record. Daily storage exceeds 675,000 ac-ft 50 percent of the time and exceeds 415,000 ac-ft 90 percent of the time.

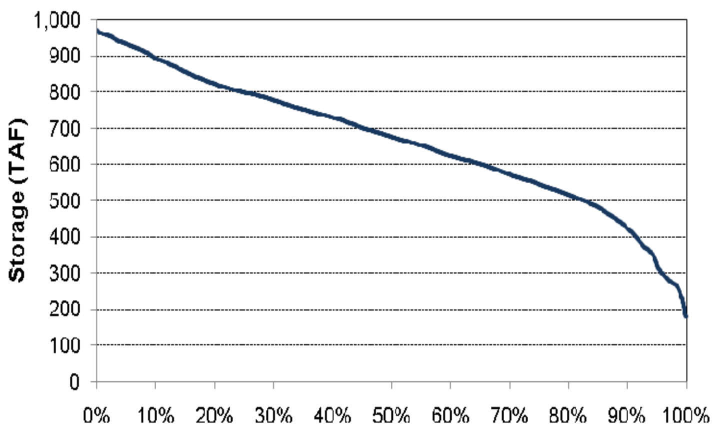

Figure 7.2.5-18. Storage exceedance of historical daily storage for New Bullards Bar Reservoir (USGS Gage 11413515) from WY 1970 through WY 2008.

<u>New Colgate Power Tunnel and Powerhouse - Diversion from North Yuba River to Yuba River</u>

The New Colgate Powerhouse Power Tunnel and Penstock, with a capacity of 3,500 cfs, conveys water from New Bullards Bar Reservoir on the North Yuba River to the New Colgate Powerhouse on the Yuba River. The power tunnel and penstock include 5.2 miles of tunnel and 2,809 feet of a 14.5-ft diameter steel pipe. The New Colgate Powerhouse is an above-ground, steel-reinforced concrete powerhouse that houses two Voith Siemens Pelton-type turbines with a combined capacity of 340 megawatts (MW) under a design head of 1,306 feet and a maximum release rate of 3,430 cfs.

Flows in the power tunnel are measured by USGS Gage 11413510 at the New Colgate Powerhouse. This gage has measured flows since the New Colgate Powerhouse became active in 1969. Figure 7.2.5-19 shows the monthly average New Colgate Powerhouse Tunnel flow; the

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maximum monthly average flow at full release capacity has occurred several times, always during very wet periods when the powerhouse was run at full capacity for the entire month. While the reported flows have exceeded 3,500 cfs on occasion, this is likely due to gage error.

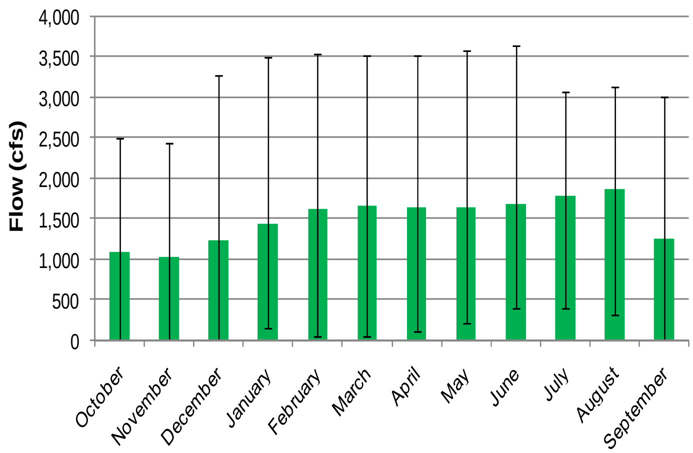

Figure 7.2.5-19. Historical monthly average flow through the New Colgate Powerhouse Tunnel (USGS Gage 11413510) from WY 1970 through WY 2008.

Figure 7.2.5-20 shows the historical mean daily flow through the New Colgate Powerhouse Tunnel. Since the New Colgate Powerhouse Tunnel nearly always has access to water due to the large amount of storage in New Bullards Bar Reservoir, releases do not generally follow a typical hydrological pattern of high releases during the winter and low releases in the summer and fall. For most of the year, New Colgate Powerhouse is operated as a peaking facility, or to provide ancillary services such as spinning reserves or regulation. Under peaking operations, releases through the powerhouse are concentrated to hours of the day when power is most valuable or when power is needed most (such as weekdays from mid-morning through early evening, largely corresponding to warmer times of the day and/or peak workday hours). Under ancillary services operations, the generating station may be ramped upwards or downwards quickly, to respond to power system load changes on a near-real-time basis. Under ancillary services operations, generating station output and flows may vary substantially minute-to-minute. The New Colgate Powerhouse also often operates under a combined peaking/ancillary service protocol, with one unit operating in peaking mode and the other unit responding to ancillary service requirements. During some of the late 1990s and early 2000s, New Colgate Powerhouse operations were focused on weekday peak generation. More recently, power generation has shifted to a schedule driven by a balance of peak period generation and providing ancillary services to the region.

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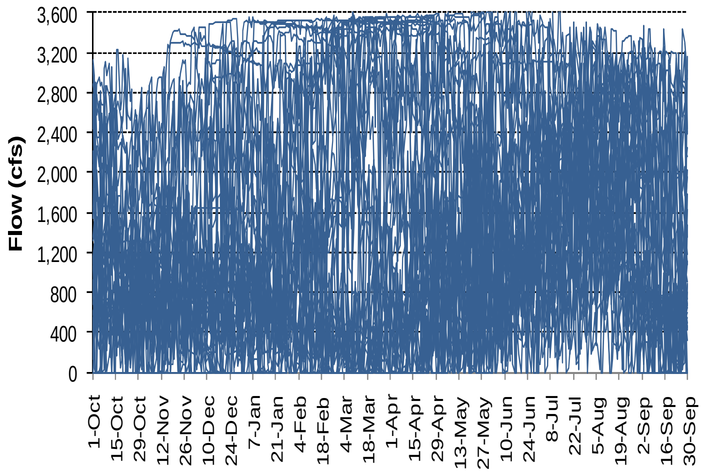

Figure 7.2.5-20. Historical mean daily flow each year for the New Colgate Powerhouse Tunnel (USGS Gage 11413510) from WY 1970 through WY 2008.

The exceedance chart in Figure 7.2.5-21 shows the range and relative recurrence of mean daily flows throughout the period of record. This figure indicates the mean daily flows exceeded 3,200 cfs approximately 10 percent of the time, 1,200 cfs 50 percent of the time, and 200 cfs 90 percent of the time.

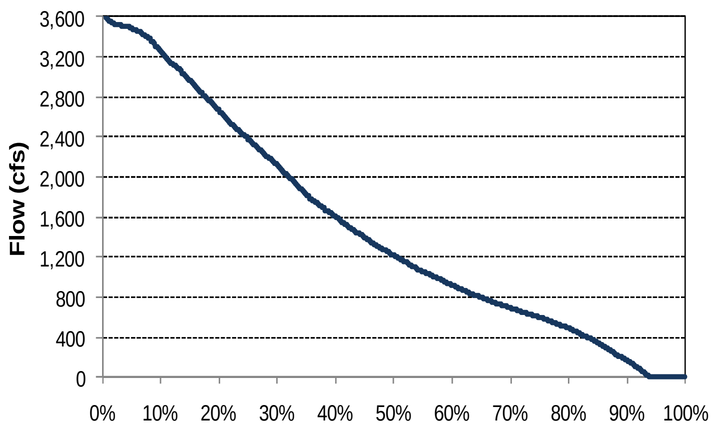

Figure 7.2.5-21. Flow exceedances of historical mean daily flows in the New Colgate Powerhouse Tunnel (USGS Gage 11413510) from WY 1970 through WY 2008.

<u>North Yuba River Downstream of New Bullards Bar Dam</u>

In the 2-mile-long reach of the North Yuba River below New Bullards Bar Dam, flow can come from one of three sources: releases from the New Bullards Bar Minimum Flow Powerhouse, releases from the New Bullards Bar Hollow Jet Valve, or spills from New Bullards Bar Dam spillway. The New Bullards Bar Minimum Flow Powerhouse constantly releases at about 6 cfs to meet the required 5 cfs minimum flow below New Bullards Bar Dam. The Hollow Jet Valve is used infrequently, generally when outages preclude releases to the New Colgate Powerhouse. Spills, while relatively infrequent, are a notable contributor to flows in the North Yuba River below New Bullards Bar Dam when they occur. Data for historical mean daily flows below New Bullards Bar Dam are from historical Licensee records and USGS gages 11413517 and 11413520, and are provided as Figures 7.2.5-22 through 7.2.5-24. While these figures do not

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show any flows in July, August, or September, North Yuba River flows below New Bullards Bar Dam have historically been maintained at or above the minimum required flow throughout the period of record. The scale of the figures obscures the low flows generally occurring in those months.

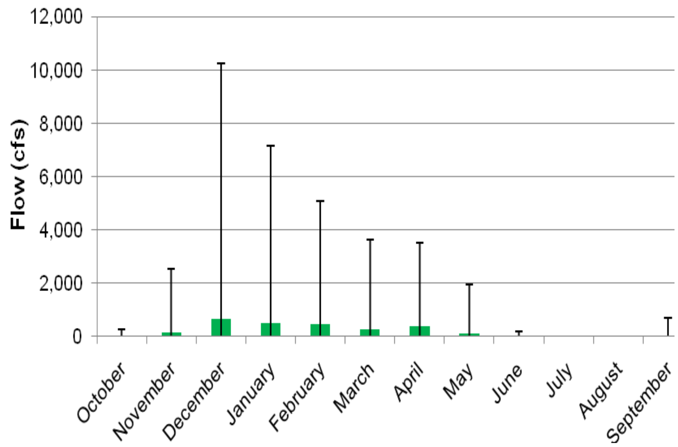

Figure 7.2.5-22. Historical monthly average releases from New Bullards Bar Reservoir from WY 1970 through WY 2008.

Spills from New Bullards Bar Dam typically occur between December and May, with some rare spills in June. Historically, the largest spills have occurred in late-December through mid-February, with the greatest mean daily spill of 53,633 cfs occurring on January 2, 1997.

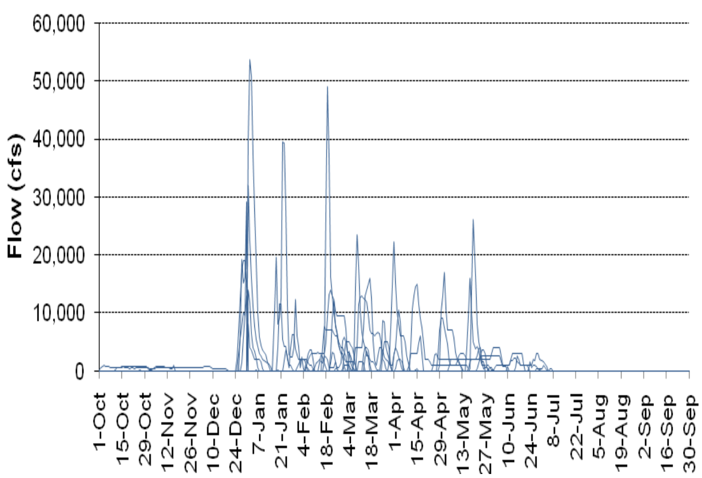

Figure 7.2.5-23. Historical mean daily average releases from New Bullards Bar Reservoir from WY 1970 through WY 2008.

As shown in Figure 7.2.5-24, New Bullards Bar Dam spills have occurred on approximately 5 percent of days within the period of record. Spills of over 10,000 cfs have occurred on approximately 1 percent of days within the record.

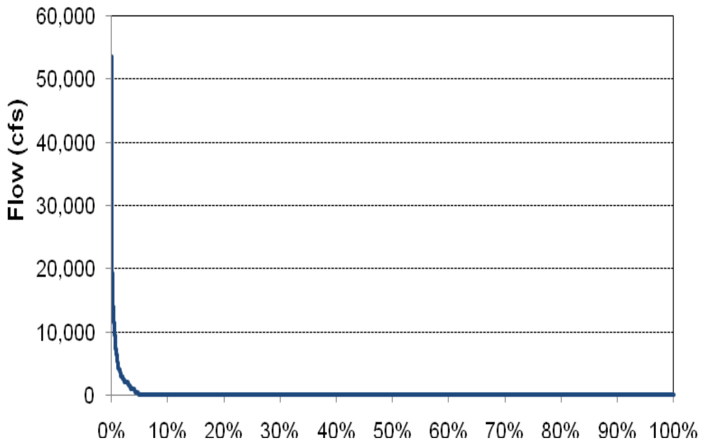

Figure 7.2.5-24. Flow exceedance of historical mean daily New Bullards Bar Dam releases from WY 1970 through WY 2008.

Middle Yuba River

The Middle Yuba River Sub-basin covers approximately 210 square miles. This includes the area of the Oregon Creek watershed, which is discussed separately below. River flows vary greatly throughout the year due to the narrow, steep canyons along the banks of the river. Flows in the Middle Yuba River primarily originate from snow runoff and rainwater gathered at Jackson Meadows Reservoir in Sierra County. Other inflows to the Project-affected basin are provided by two tributaries: Oregon Creek and Grizzly Creek.

<u>Middle Yuba River Upstream of Our House Diversion Dam</u>
Nevada Irrigation District (NID) affects flow upstream of Our House Diversion Dam by storing water in Jackson Meadows Reservoir and diverting water to the South Yuba River at the Milton Diversion Dam. For a discussion of these storages and diversions, refer to Section 7.2.8.1.

Inflows to Our House Diversion Dam from the Middle Yuba River have been determined from three gages. Prior to 1989, USGS Gage 11408850 recorded Middle Yuba River flows near Camptonville. Since 1989, Middle Yuba River inflows to the Our House Diversion Dam are computed by adding the flow below Our House Diversion Dam, as measured at USGS Gage number 11408880 and flows in the Lohman Ridge Diversion Tunnel, as measured at USGS Gage 11408870. Figure 7.2.5-25 shows average monthly streamflow for Middle Yuba River based on the synthesized flows described above. The maximum monthly average streamflow, approximately 3,000 cfs, and maximum daily average stream flow of approximately 21,000 cfs, were recorded during the height of the extreme flood in January 1997.

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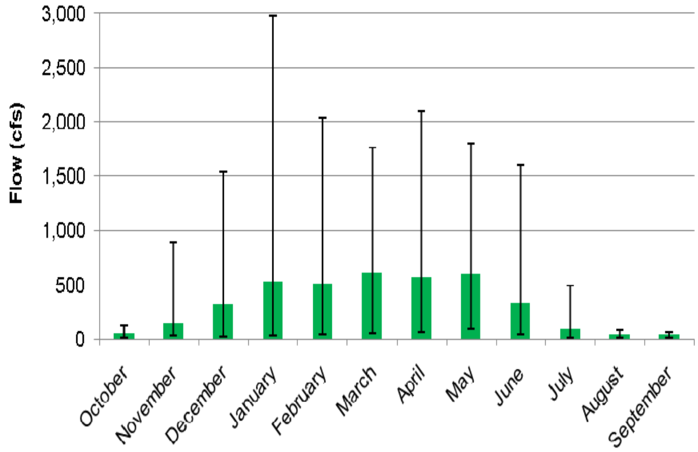

Figure 7.2.5-25. Average monthly Middle Yuba River inflow to Our House Diversion Dam from WY 1970 through WY 2008.

Historical mean daily streamflows per year in the Middle Yuba River are shown in Figure 7.2.5-26.

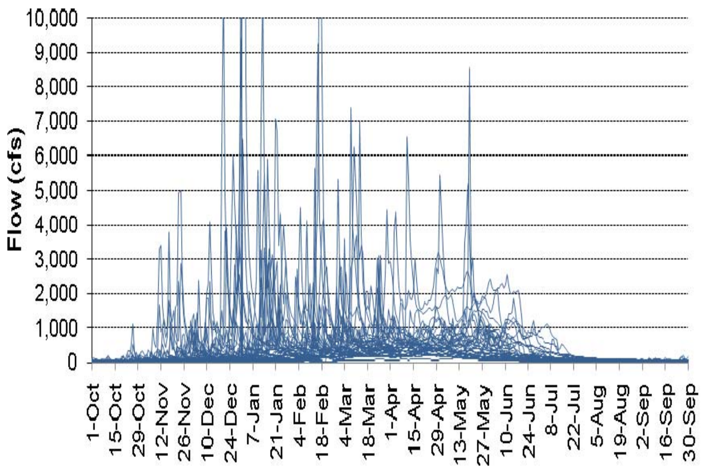

Figure 7.2.5-26. Historical mean daily Middle Yuba River inflow to Our House Diversion Dam from WY 1970 through WY 2008.

A flow exceedance curve for mean daily flows on the Middle Yuba River into Our House Diversion Dam is shown in Figure 7.2.5-27. Only 10 percent of mean daily flows during the period of record exceed 800 cfs. Fifty percent of mean daily flows exceed 115 cfs and 90 percent of mean daily flows exceed 30 cfs. These results indicate that the Middle Yuba River has generally lower flows than the North Yuba River.

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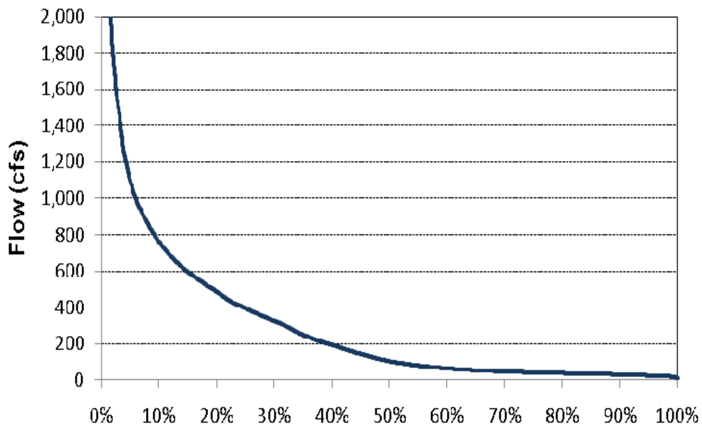

Figure 7.2.5-27. Flow exceedance of historical mean daily Middle Yuba River inflow to Our House Diversion Dam from WY 1970 through WY 2008.

Our House Diversion Dam Impoundment

Our House Diversion Dam is a 130-ft radius double curvature concrete arch dam located on the Middle Yuba River 12 miles upstream of its confluence with the North Yuba River, and has a drainage area of 144.8 square miles. The dam is 70 feet high with a crest length of 368 feet, a crest elevation of 2,049 feet, and has a maximum spillway capacity of 60,000 cfs. While there is no storage behind Our House Dam, the dam creates a headwater for diversion to the Project's Lohman Ridge Tunnel and for releases to the Middle Yuba River.

Lohman Ridge Diversion Tunnel – Diversion from Middle Yuba River to Oregon Creek

The Lohman Ridge Diversion Tunnel diverts flow from the Middle Yuba River at the Our House Diversion Dam impoundment to Oregon Creek. Tunnel flows have been measured at USGS Gage 11408870 since October 1988. The Lohman Ridge Diversion Tunnel is 12.5 feet high by 12.5 feet wide and diverts a maximum flow of 860 cfs through its 19,410- foot (90% unlined and 10% lined) length to Oregon Creek, approximately 1,000 feet upstream of Log Cabin Diversion Dam. Figure 7.2.5-28 shows average monthly flow for Lohman Ridge Diversion Tunnel diversions. The maximum monthly average flow, approximately 700 cfs, was recorded in May of 1996, a wet year.

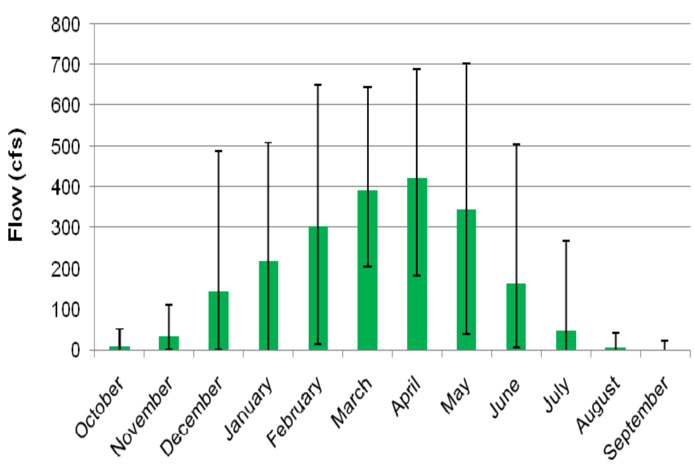

Figure 7.2.5-28. Average monthly flow for the Lohman Ridge Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

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Historical mean daily flows per year for the Lohman Ridge Diversion Tunnel are shown in Figure 7.2.5-29.

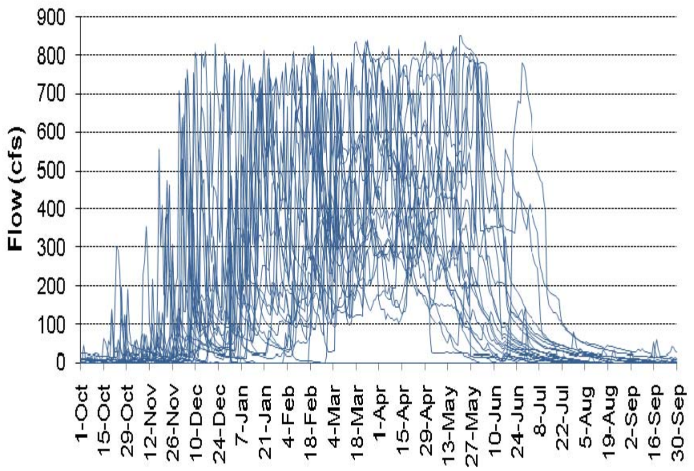

Figure 7.2.5-29. Historical mean daily flow each year for the Lohman Ridge Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

A flow exceedance curve for mean daily flows in the Lohman Ridge Diversion Tunnel is shown in Figure 7.2.5-30. Only 10 percent of mean daily flows during the period of record (WY 1989-2008) exceed 525 cfs. Fifty percent of mean daily flows exceed 52 cfs; mean daily flows exceed 0 cfs 90 percent of days.

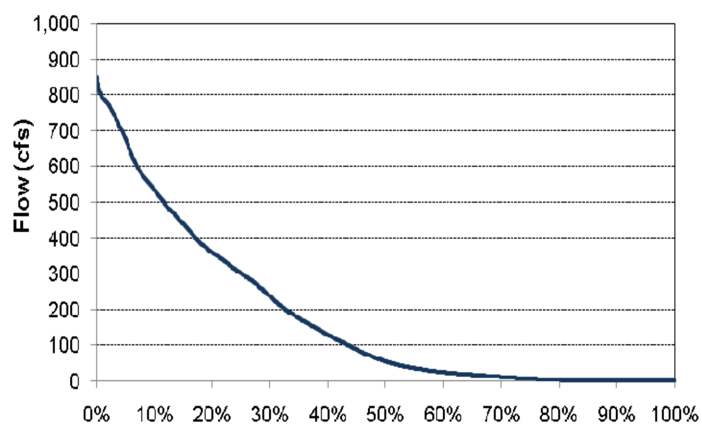

Figure 7.2.5-30. Flow exceedance of historical mean daily flow for the Lohman Ridge Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

Middle Yuba River Downstream of Our House Diversion Dam

Our House Diversion Dam has two outlets: a 5-ft diameter steel pipe controlled by a slide gate on the upstream face of the dam diverts flows into the Lohman Ridge Diversion Tunnel, and a 24-inch pipe for releases to the Middle Yuba River. The outlet centerline of the 5-ft diameter steel pipe is at an elevation of 1,990 feet, and has a maximum capacity of 800 cfs. Flow to the 24-inch pipe is controlled by a hand-operated downstream gate valve and has a maximum capacity of 60 cfs.

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Flows on the Middle Yuba River below Our House Diversion Dam have been measured since 1970 by the USGS gage 11408880. Figure 7.2.5-31 shows average monthly flow in the Middle Yuba River below Our House Diversion Dam for water year 1970 through water year 2008. The maximum monthly average Middle Yuba River flow below Our House Dam of 2,973 cfs and the maximum mean daily flow of 21,000 cfs were both recorded during the height of the extreme flood in January 1997.

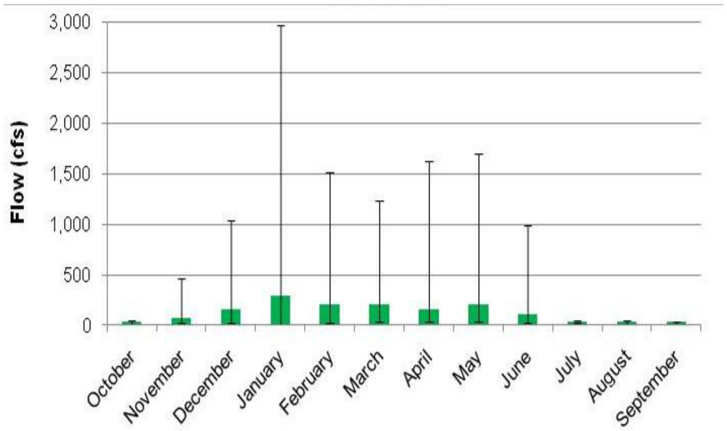

Figure 7.2.5-31. Average monthly Middle Yuba River flow below Our House Dam from WY 1970 through WY 2008.

Historical mean daily flows in the Middle Yuba River below Our House Dam are shown in Figure 7.2.5-32.

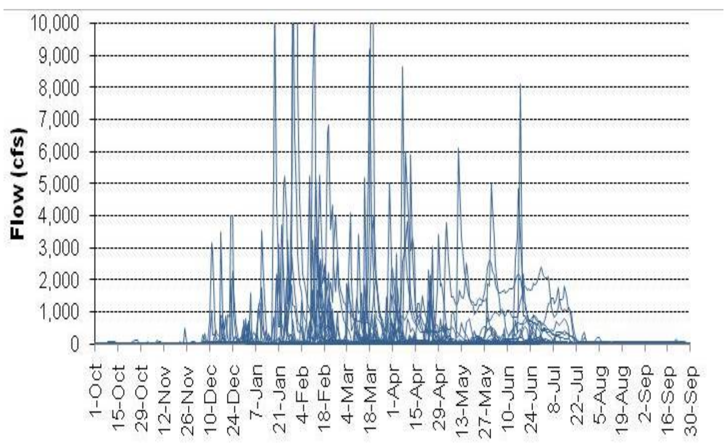

Figure 7.2.5-32. Historical mean daily Middle Yuba River flow below Our House Dam from WY 1970 through WY 2008.

An exceedance curve of mean daily flows in the Middle Yuba River below Our House Dam is shown in Figure 7.2.5-33. Only 10 percent of mean daily flows during the period of record (1969-2008) exceed 102 cfs. Fifty percent of mean daily flows exceed 36 cfs, and mean daily flows exceed 27 cfs on 90 percent of days.

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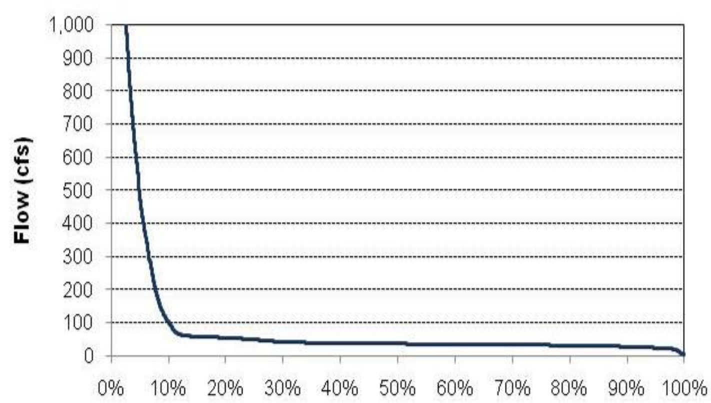

Figure 7.2.5-33. Flow exceedance of historical mean daily Middle Yuba River flow below Our House Dam from WY 1970 through WY 2008.

Oregon Creek, Tributary to the Middle Yuba River, Upstream of the Project

Oregon Creek is entirely contained within the Middle Yuba River watershed and originates near an elevation of approximately 4,455 feet. Oregon Creek flow above Log Cabin Diversion Dam is a combination of flow from the Lohman Ridge Diversion Tunnel, originating at Our House Diversion Dam on the Middle Yuba River, and Oregon Creek flows. Above the outfall of the Lohman Ridge Diversion Tunnel, Oregon Creek is free of development. Approximately 6 square miles of the 35-square mile Oregon Creek watershed lie below Log Cabin Diversion Dam.

Between October 1968 and September 2000, Oregon Creek flows to Log Cabin Diversion Dam were gaged by the USGS Gage 11409300 at Camptonville. Since then, inflows to Log Cabin Diversion Dam can be calculated by combining flows below Log Cabin Diversion Dam, as measured by USGS Gage 11409400, with flows in the Camptonville Diversion Tunnel, as measured by USGS Gage 11409350, and subtracting flows from the Lohman Ridge Diversion Tunnel, as measured at USGS Gage 11408870. Figure 7.2.5-34 shows average monthly streamflow for Oregon Creek based on a combination of historical and synthesized flows, as described above. The maximum monthly average streamflow, approximately 664 cfs, was recorded during a flood event in February of 1986, and the maximum daily average stream flow of approximately 3,730 cfs, was recorded during the height of the extreme flood in January 1997.

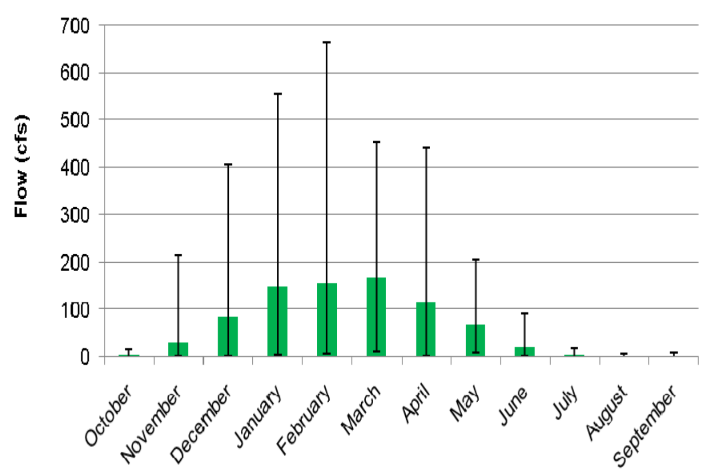

Figure 7.2.5-34. Average monthly Oregon Creek flow above the Lohman Ridge Tunnel outfall from WY 1970 through WY 2008.

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Historical mean daily streamflows per year in Oregon Creek are shown in Figure 7.2.5-35.

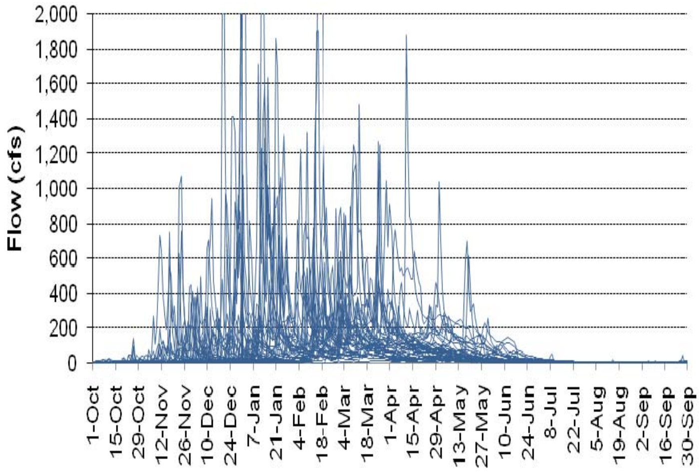

Figure 7.2.5-35 Historical mean daily Oregon Creek flow above the Lohman Ridge Tunnel outfall from WY 1970 through WY 2008.

A flow exceedance curve of mean daily flows to Oregon Creek is shown in Figure 7.2.5-36. Only 10 percent of mean daily flows during the period of record exceed 140 cfs. Fifty percent of mean daily flows exceed 15 cfs, and mean daily flows exceed 2 cfs on 90 percent of days.

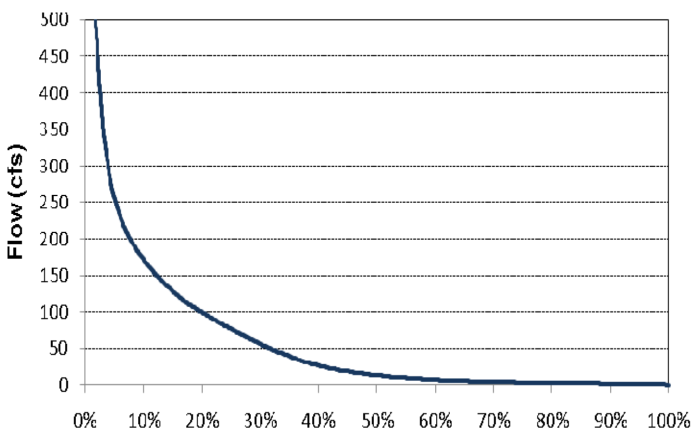

Figure 7.2.5-36. Flow exceedance of historical mean daily Oregon Creek flow above the Lohman Ridge Tunnel outfall from WY 1970 through WY 2008.

Log Cabin Diversion Dam Impoundment

The 55-ft high Log Cabin Diversion Dam diverts flows from Oregon Creek to New Bullards Bar Reservoir via the Camptonville Diversion Tunnel. Log Cabin Diversion Dam is approximately 4 miles upstream of Oregon Creek's confluence with the Middle Yuba River. Similar to Our House Diversion Dam, Log Cabin Diversion Dam does not have any storage; the dam creates a headwater for diversions into the Project's Camptonville Tunnel and for releases to Oregon Creek.

Camptonville Diversion Tunnel – Diversions from Oregon Creek to North Yuba River

Flow to the Camptonville Diversion Tunnel is controlled by a slide gate just upstream of the dam. The outlet centerline is at an elevation of 1,938 feet and the pipe's maximum capacity is

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1,100 cfs. Releases to Oregon Creek are made through an 18-inch diameter steel pipe controlled by a hand-operated gate valve downstream. The pipe's maximum capacity is 13 cfs.

The Camptonville Diversion Tunnel is 6,107 feet long and has the capacity to convey 1,100 cfs to New Bullards Bar Reservoir on the North Yuba River. The first 4,275 feet of the conduit is an unlined horseshoe shaped tunnel 14.5 feet wide by 14.5 feet high, and the remaining 1,832 feet of the tunnel is a lined horseshoe shaped tunnel 11 feet 7 inches wide by 13 feet high.

The Camptonville Diversion Tunnel has the capacity to divert up to 1,100 cfs to New Bullards Bar Reservoir. The tunnel has been measured at USGS Gage 11408870 from October 1988 to the present. Figure 7.2.5-37 shows average monthly flow for Camptonville Diversion Tunnel diversions. The maximum average monthly flow, approximately 870 cfs, was recorded in April 1995, a wet year.

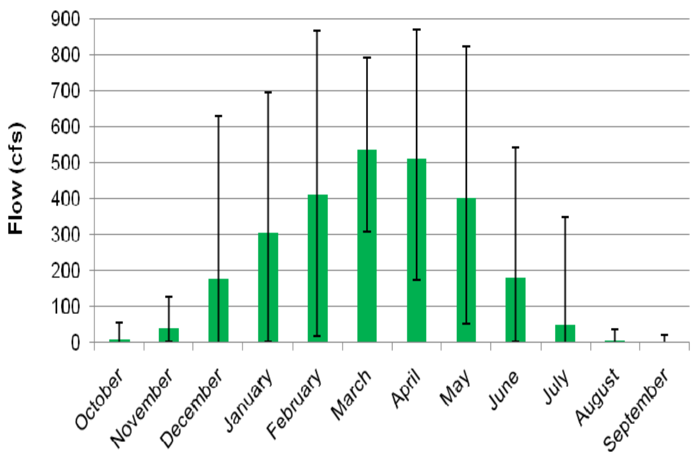

Figure 7.2.5-37. Average monthly streamflow in the Camptonville Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

Historical mean daily flows for the Camptonville Diversion Tunnel are shown in Figure 7.2.5-38.

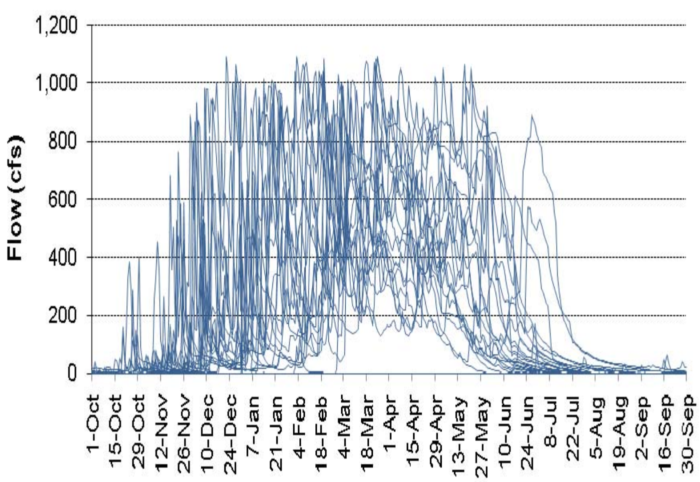

Figure 7.2.5-38. Historical mean daily streamflow each year in the Camptonville Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

A flow exceedance curve for the Camptonville Diversion Tunnel is shown in Figure 7.2.5-39. Only 10 percent of mean daily flows during the period of record exceed 670 cfs, indicating that the majority of flows are much lower. Fifty percent of mean daily flows exceed 63 cfs, and mean daily flows exceed 0 cfs 90 percent of days.

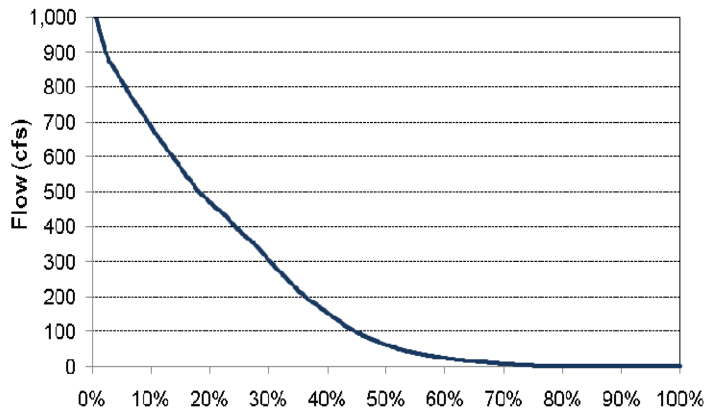

Figure 7.2.5-39. Flow exceedance of historical mean daily streamflow in the Camptonville Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

Oregon Creek Downstream of Log Cabin Diversion Dam

Flows in Oregon Creek below Log Cabin Diversion Dam have been monitored since 1970 by the USGS gage 11409400. Figure 7.2.5-40 shows average monthly flow in Oregon Creek below Log Cabin Diversion Dam for water year 1970 through water year 2008. The maximum monthly average flow in Oregon Creek below Log Cabin Diversion Dam of 617 cfs, and the maximum mean daily flow of 5,340 cfs, were recorded in February and March 1986, respectively.

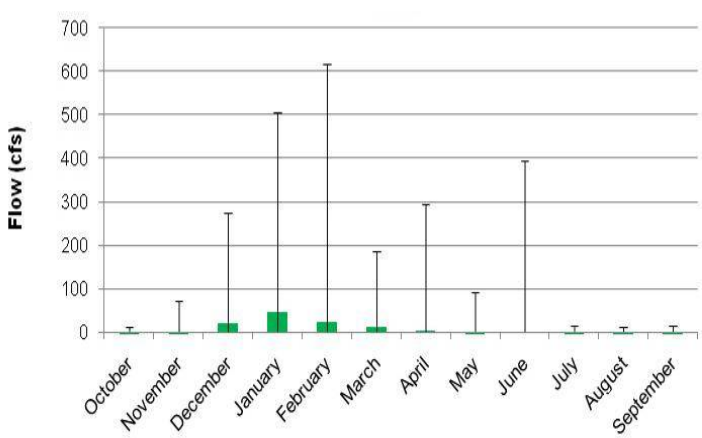

Figure 7.2.5-40. Average monthly Oregon Creek flow below Log Cabin Diversion Dam from WY 1970 through WY 2008.

Historical mean daily flows in Oregon Creek below the Log Cabin Diversion Dam are shown in Figure 7.2.5-41.

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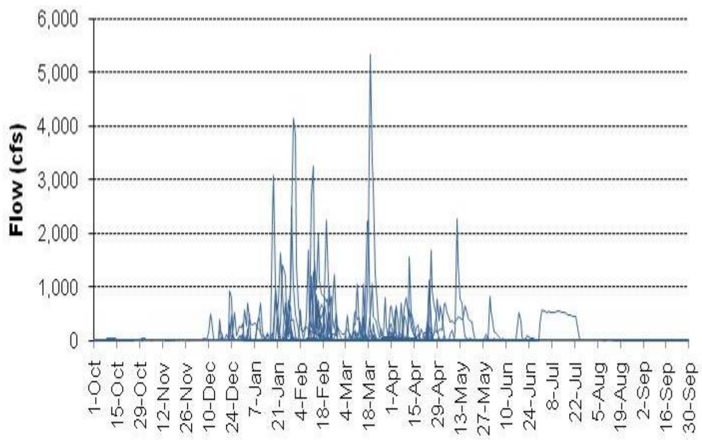

Figure 7.2.5-41. Historical mean daily Oregon Creek flow below Log Cabin Diversion Dam from WY 1970 through WY 2008.

A flow exceedance curve of mean daily flows in Oregon Creek below the Log Cabin Diversion Dam is shown in Figure 7.2.5-42. Only 10 percent of mean daily flows during the period of record exceed 17 cfs. Fifty percent of mean daily flows exceed 10 cfs, and mean daily flows exceed 3 cfs on 90 percent of days.

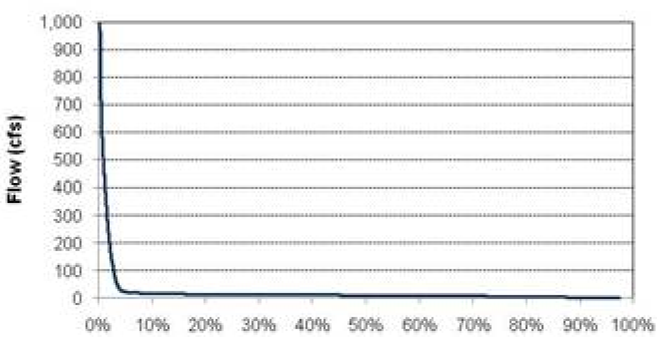

Figure 7.2.5-42. Flow exceedance of historical mean daily streamflow in Oregon Creek below the Log Cabin Diversion (USGS 11409400) from WY 1970 through WY 2008.

South Yuba River

The headwaters of the South Yuba River begin at an elevation of 9,000 feet in Placer County near Castle Peak and Donner Summit. The South Yuba River watershed covers approximately 352 square miles. The South Yuba River joins the Yuba River at USACE's Englebright Reservoir at an elevation of approximately 525 feet, after flowing for 42 miles with an average gradient of 2 percent.

South Yuba River Upstream of the Project

The upper portion of the South Yuba River watershed (above 5,000 ft elevation) is primarily snowmelt-runoff driven, while the lower portion is rainfall-runoff driven. Inflows to the basin are attributed to natural runoff in the basins.

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NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project affect runoff into the Project by storing water in upstream reservoirs and diverting water to the Bear River at Spaulding Dam. For a discussion of these storages and diversions, refer to Section 7.2.8.1.

Flows on the lower South Yuba River have been continuously measured at the Jones Bar gage (USGS 11417500), approximately 7 miles upstream of its confluence with the Yuba River, since April 1959. Figure 7.2.5-43 shows average monthly streamflow for the South Yuba River at the Jones Bar gage. As with the North and Middle Yuba rivers, maximum monthly flows in the South Yuba River are significantly higher than monthly averages because they typically represent significant precipitation events or outliers. The maximum monthly average streamflow, approximately 4,865 cfs, and the maximum daily average streamflow of approximately 30,300 cfs, were recorded during the height of the extreme flood in January 1997.

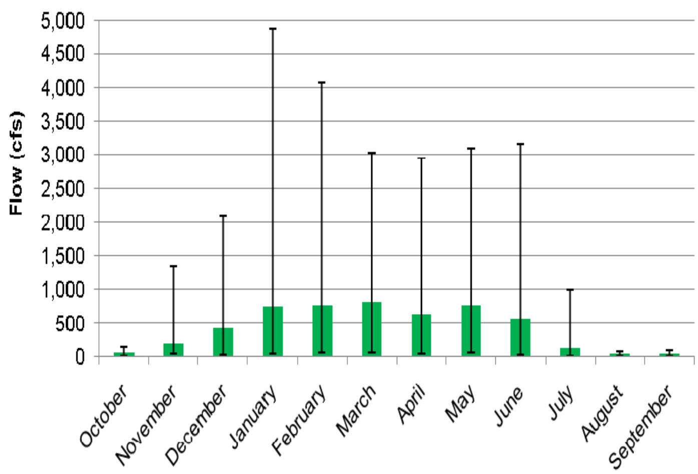

Figure 7.2.5-43. Average monthly streamflow for the South Yuba River near Jones Bar gage (USGS Gage 11417500) from WY 1970 through WY 2008.

Figure 7.2.5-44 shows the historical mean daily streamflows on the South Yuba River near Jones Bar.

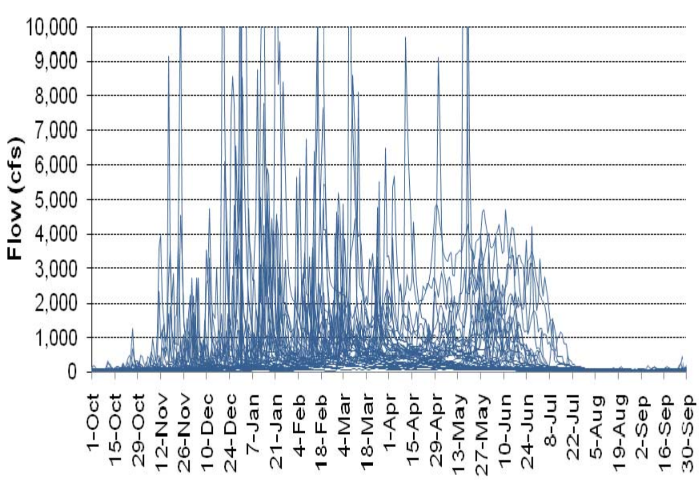

Figure 7.2.5-44. Historical mean daily streamflow each year for the South Yuba River near Jones Bar gage from WY 1970 through WY 2008.

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A flow exceedance curve for the South Yuba River is shown in Figure 7.2.5-45. Only 10 percent of mean daily flows during the period of record exceed 1,000 cfs, indicating that the majority of flows are much lower. Fifty percent of mean daily flows exceed 125 cfs, and 90 percent of mean daily flows exceed 40 cfs. Generally, these results indicate that the South Yuba River has mean daily flows similar to the mean flows in the Middle Yuba River.

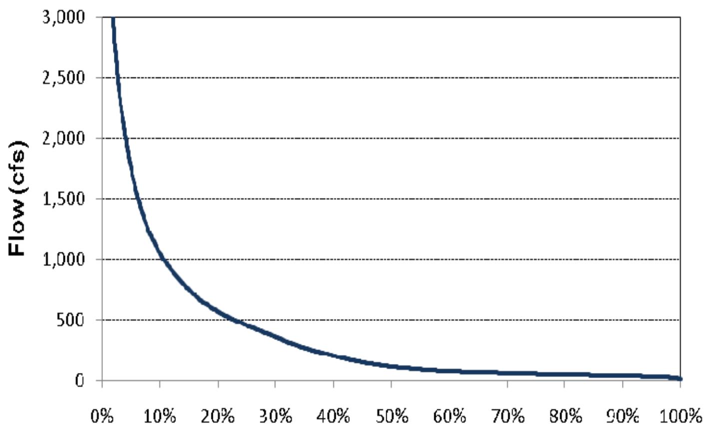

Figure 7.2.5-45. Flow exceedance of historical mean daily streamflow for the South Yuba River near Jones Bar gage from WY 1970 through WY 2008.

Yuba River

The Yuba River begins at the confluence of the North and Middle Yuba rivers, approximately 16 miles upstream of USACE's Englebright Dam, at an elevation of approximately 1,124 feet. The river then extends approximately 24 miles below USACE's Englebright Dam to the Feather River in Marysville for a combined total of 63 miles. The Yuba River sub-basin covers approximately 95 square miles.

The majority of the Yuba River sub-basin is rainwater driven since it is located at relatively low elevations. In addition to the North and Middle Yuba rivers, inflows to the basin are attributed to the South Yuba River, Deer Creek, and Dry Creek. There are several developments along the Yuba River between the confluence of the North and Middle Yuba rivers and its confluence with the Feather River. The two largest developments are USACE's Englebright and Daguerre Point dams as well as the Narrows 1 and 2 powerhouses. There is also a pumpline diversion located approximately 1 mile upstream from USACE's Daguerre Point Dam. The only Project facility along the lower Yuba River is the Narrows 2 Powerhouse.

Yuba River Upstream of New Colgate Powerhouse

Flow in the Yuba River at the confluence of the North and Middle Yuba rivers consists primarily of flows from the North Yuba River that are releases and spills from New Bullards Bar Dam plus accretion, releases and spills from Our House Dam on the Middle Yuba River plus accretion, and releases and spills from Log Cabin Dam on Oregon Creek plus accretions. No stream gage information is available for the upper reach of the Yuba River between the head of the Yuba River at the confluence of the North and Middle Yuba rivers and the New Colgate Powerhouse. Figures 7.2.5-24, 7.2.5-33, and 7.2.5-42, show flows in the North Yuba River below New Bullards Bar Dam, in the Middle Yuba River below Our House Dam, and in Oregon Creek

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below Log Cabin Dam, respectively. With the exception of periods of high flows resulting from reservoir spills, flows in this reach are primarily driven by releases to meet minimum flow requirements below each of the three dams.

Yuba River Downstream of New Colgate Powerhouse to USACE's Englebright Reservoir

While no stream gage information is available for this reach, Yuba River flows below the New Colgate Powerhouse above USACE's Englebright Reservoir are largely a reflection of releases from the New Colgate Powerhouse. As previously described, flows in the Yuba River above the New Colgate Powerhouse are generally composed of releases from New Bullards Bar Dam, Our House Dam, and Log Cabin Dam to meet minimum flow requirements below the respective dams. As described previously in this section, New Colgate Powerhouse releases are typically a function of power generation needs on an hour and daily timeframe and yearly hydrologic conditions and New Bullards Bar Reservoir storage on a seasonal and annual timeframe. As shown in figures 7.2.5-20 and 7.2.5-21, during most of the year, powerhouse releases are typically much greater than the combined flows from the three tributary dams. As a result, flows in the Yuba River downstream of New Colgate Powerhouse typically have large hourly and daily fluctuations in flow, reflecting power generation operations of the New Colgate Powerhouse.

USACE's Englebright Reservoir

USACE's Englebright Dam was constructed from 1938 to 1941 to capture sediment produced by upstream hydraulic mining activities. The reservoir is situated downstream of New Bullards Bar Dam at the confluence of the mainstem Yuba River and the South Yuba River. The average annual inflow to USACE's Englebright Reservoir, excluding releases from New Bullards Bar Reservoir, is approximately 400,000 ac-ft. USACE's Englebright Reservoir has a total storage capacity of approximately 70,000 ac-ft. However, only about the upper 10% of this storage is exercised. PG&E holds an appropriative water right license for the storage of up to 45,000 ac-ft in USACE's Englebright Reservoir. The reservoir storage capacity is used primarily to attenuate power peaking releases from New Colgate Powerhouse and to capture storm runoff from the upstream watershed. USACE's Englebright Reservoir is used extensively for recreation.

USACE's Englebright Dam has no low-level outlet; water from the reservoir is released for power generation at the PG&E Narrows 1 Powerhouse and the Narrows 2 Powerhouse or spills over the top of the dam during high flow conditions.

Yuba River Downstream of Narrows 2 Powerhouse

Controlled releases from USACE's Englebright Dam are made through the Narrows 1 and 2 powerhouses. The Narrows 1 Powerhouse, owned and operated by PG&E, has a 730-cfs capacity and diverts water from USACE's Englebright Reservoir on its southern shore, near the dam. The Narrows 1 Powerhouse is located approximately a quarter mile below USACE's Englebright Dam. The Narrows 2 Powerhouse is owned and operated by Licensee. The Narrows 2 Powerhouse diverts up to 3,400 cfs from USACE's Englebright Reservoir from its intake on the northern shore. The Narrows 2 Powerhouse is located on the northern bank of the Yuba River, about 600 feet below USACE's Englebright Dam. Data for historical Narrows 1 and 2 releases are from historical Licensee records. Figures 7.2.5-46 and 7.2.5-47 show the historical monthly average flows through each powerhouse.

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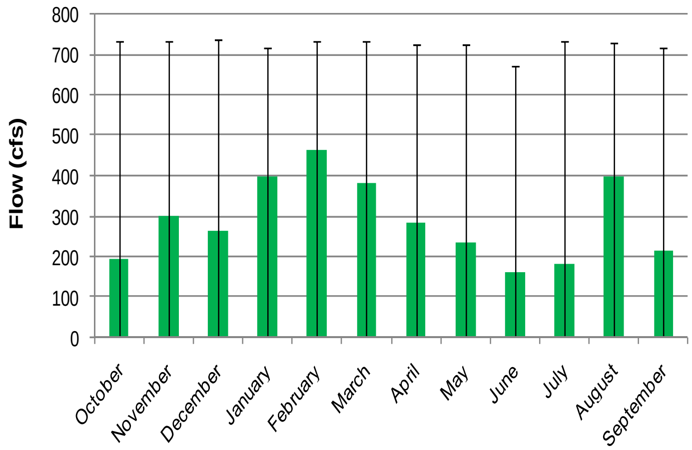

Figure 7.2.5-46. Average monthly flow for PG&E's Narrows 1 Powerhouse releases from WY 1970 through WY 2008.

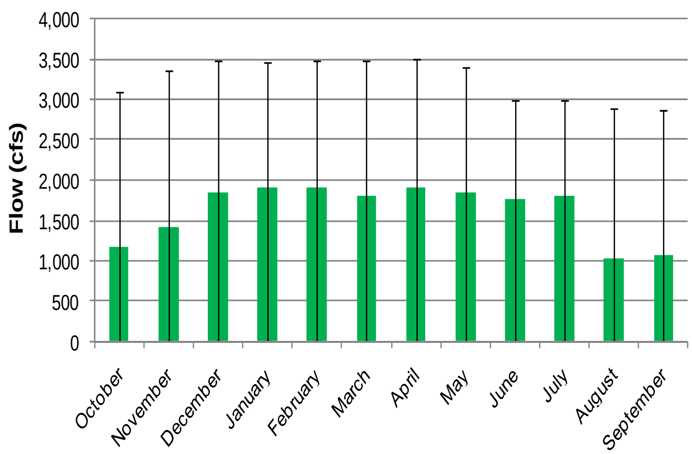

Figure 7.2.5-47. Average monthly flow for Narrows 2 Powerhouse releases from WY 1970 through WY 2008.

Figure 7.2.5-48 shows historical mean daily releases through the Narrows 1 Powerhouse. Occasional points exceeding 730 cfs are a reflection of a gaging error. Similarly, Figure 7.2.5-49 shows historical mean daily releases through the Narrows 2 Powerhouse. Releases range from 0 cfs to the maximum powerhouse capacity of 3,400 cfs.

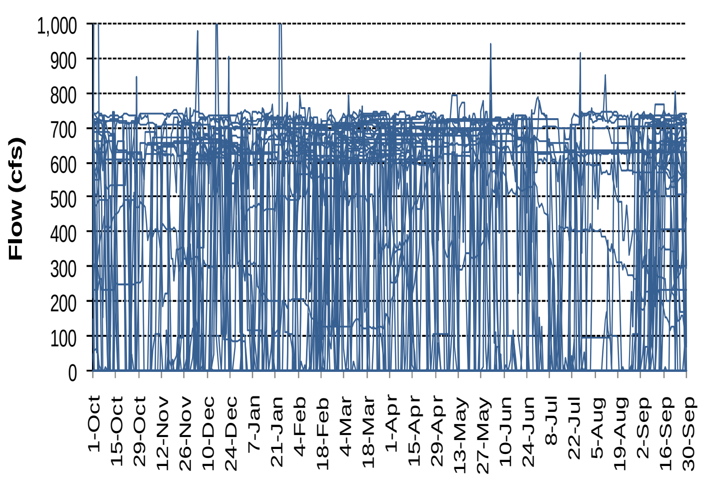

Figure 7.2.5-48. Historical mean daily releases each year for PG&E's Narrows I Powerhouse from WY 1970 through WY 2008.

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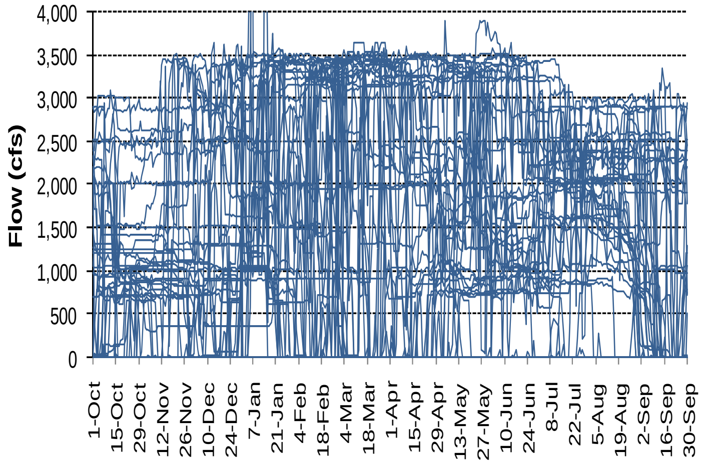

Figure 7.2.5-49. Historical mean daily outflows each year for the Narrows 2 Powerhouse from WY 1970 through WY 2008.

Figure 7.2.5-50 shows the exceedance probability of releases through the Narrows 1 and Narrows 2 powerhouses. Fifty percent of the time, there are no releases through the Narrows 1 Powerhouse; 10 percent of the time, releases through the Narrows 1 Powerhouse exceed 709 cfs. Narrows 2 Powerhouse releases exceed 0 cfs 90 percent of the time, exceed 1,514 cfs 50 percent of the time, and exceed 3,315 cfs 10 percent of the time.

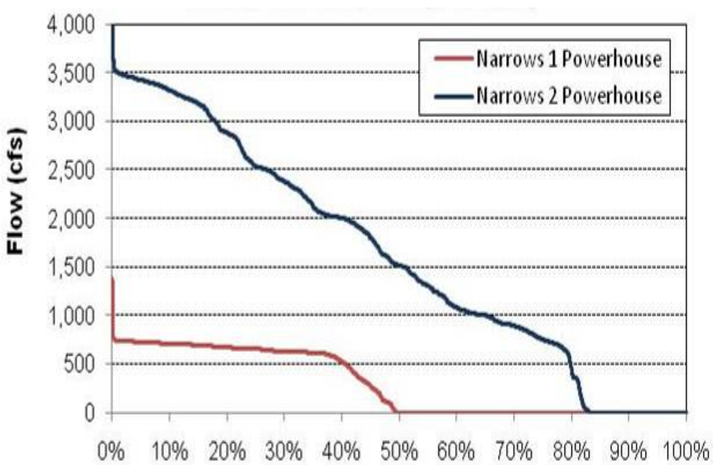

Figure 7.2.5-50. Flow exceedance of historical mean daily releases through the Narrows 1 and Narrows 2 powerhouses from WY 1970 through WY 2008.

<u>Yuba River at Smartville Gage</u>

Flows on the Yuba River below USACE's Englebright Dam are characterized by flows at two gaging stations. At the upper end of this reach, the Smartville gage (USGS 11418000) is located just below USACE's Englebright Dam, and reflects releases from Engelbright Reservoir through the Narrows 1 and 2 powerhouses and spills over USACE's Englebright Dam. The Smartville gage has been in active operation since October 1941. The Smartville gage is a compliance measurement point for license-required minimum streamflows and water-right streamflow compliance, as well as for Yuba Accord required minimum streamflows.

Figure 7.2.5-51 shows average monthly streamflow for the Yuba River at Smartville. The maximum monthly average streamflow, approximately 22,000 cfs, and the maximum daily

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average streamflow of approximately 134,000, were recorded during the height of the extreme flood in January 1997.

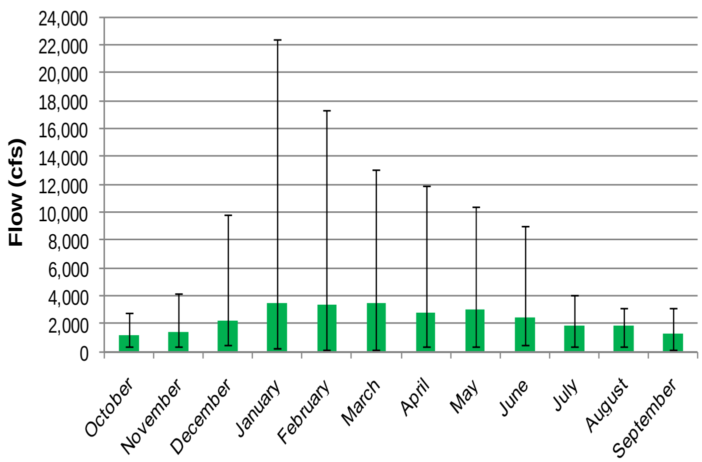

Figure 7.2.5-51. Average monthly Yuba River flow at the Smartville gage (USGS 11418000) from WY 1970 through WY 2008.

Historical mean daily streamflows per year in the Yuba River at Smartsville are shown in Figure 7.2.5-52.

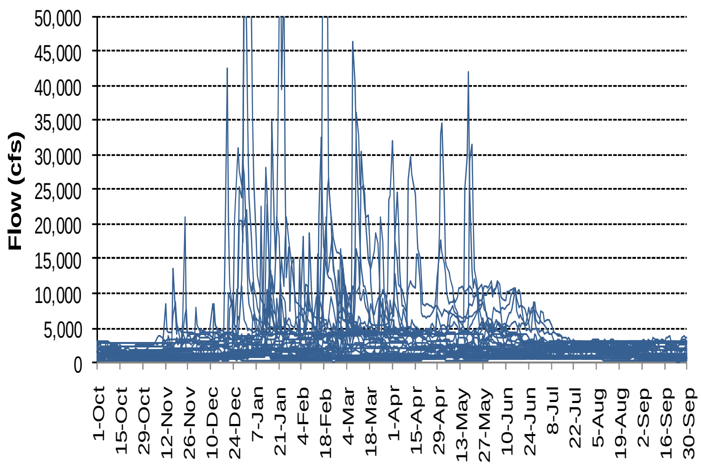

Figure 7.2.5-52. Historical mean daily streamflow each year for the Yuba River at Smartville (USGS 11418000) from WY 1970 through WY 2008.

A flow exceedance curve for the Yuba River at Smartsville is shown in Figure 7.2.5-53. Only 10 percent of mean daily flows during the period of record (WY 1970-2008) exceed 4,400 cfs. Fifty percent of mean daily flows exceed 1,500 cfs, and 90 percent of mean daily flows exceed 600 cfs.

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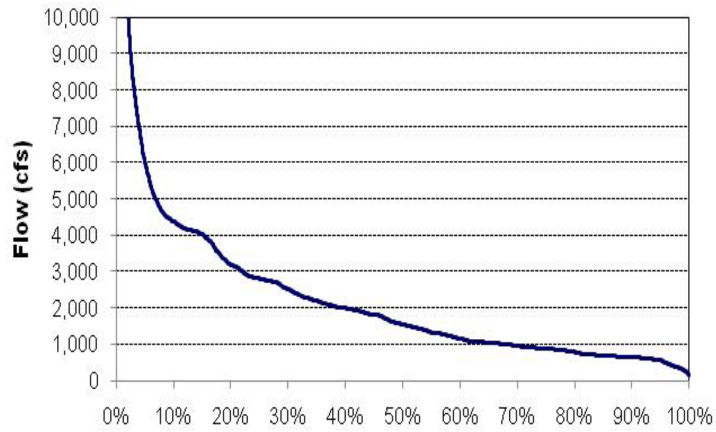

Figure 7.2.5-53. Flow exceedance of historical mean daily streamflow for the Yuba River at Smartville from WY 1970 through WY 2008.

<u>Dry Creek, Tributary to Yuba River</u>

Dry Creek, flowing near the western edge of Yuba County, has a watershed area of approximately 108 square miles, with its headwaters near the town of Challenge at an elevation of approximately 3,155 feet. Dry Creek flows generally southward and its flows are captured by Merle Collins Reservoir, a 57,000-ac-ft reservoir at an elevation of approximately 1,160 feet, owned and operated by Browns Valley Irrigation District (BVID). Flowing approximately 12 miles before meeting the Yuba River, Dry Creek releases from Merle Collins Reservoir are augmented by accretions from local runoff and agricultural return flows, reaching the Yuba River approximately 10 miles below USACE's Englebright Dam at an elevation of approximately 147 feet.

As shown in Table 7.2.2-1, Dry Creek is not affected by the Project because none of the facilities or diversion structures on Dry Creek are part of the Project; Dry Creek is a tributary to the Yuba River and flows into the Project Area.

Dry Creek flows near Browns Valley (below Merle Collins Reservoir) were measured by USGS Gage 11420700, approximately 5 miles upstream of Dry Creek's confluence with the Yuba River, from August 1964 through October 1980, but no records exist for flows after October 1980. Figure 7.2.5-54 shows average monthly streamflow for Dry Creek near Browns Valley. The maximum streamflow, approximately 760 cfs, was recorded in December of 1970, a wet year.

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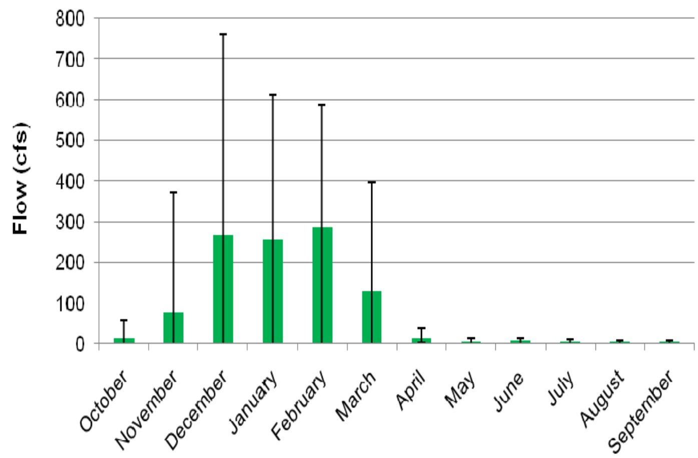

Figure 7.2.5-54. Average monthly streamflow for Dry Creek from WY 1964through WY 1980.

Historical mean daily streamflows per year in Dry Creek are shown in Figure 7.2.5-55.

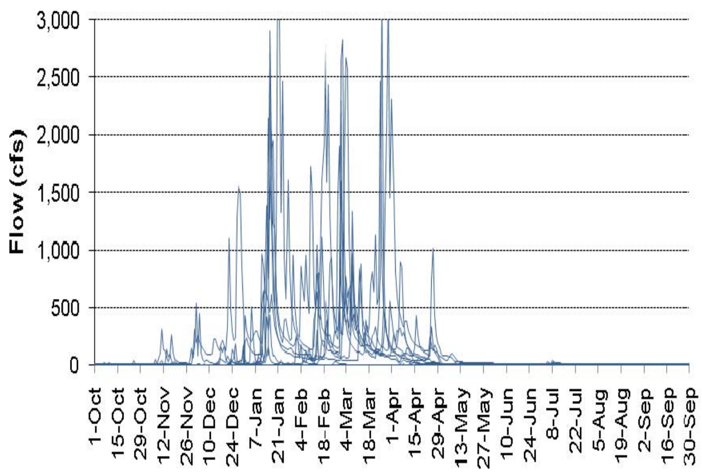

Figure 7.2.5-55. Historical mean daily streamflow each year for Dry Creek from WY 1964through WY 1980.

A flow exceedance curve for Dry Creek near Browns Valley is shown in Figure 7.2.5-56. Only 10 percent of mean daily flows during the period of record (1964-1980) exceed 170 cfs, fifty percent of mean daily flows exceed 8 cfs, and 90 percent of mean daily flows exceed 2 cfs.

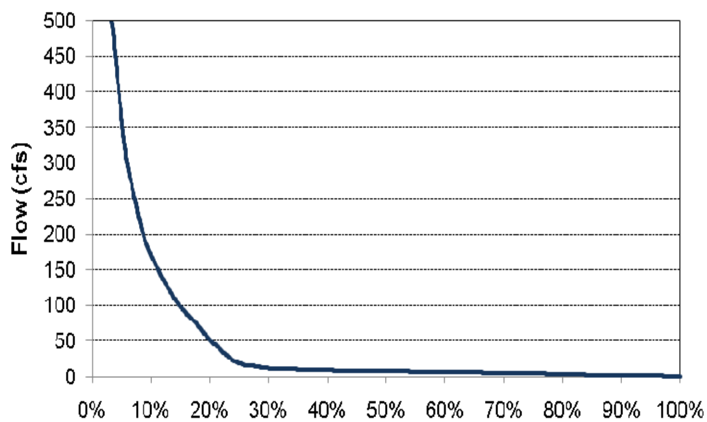

Figure 7.2.5-56. Flow exceedance of historical mean daily streamflow for Dry Creek from WY 1964 through WY 1980.

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Deer Creek, Tributary to Yuba River

Deer Creek originates in Nevada County and, in addition to its own natural runoff, receives water from the Middle and South Yuba River watersheds through PG&E's Drum-Spaulding Project (via the South Yuba Canal). The approximately 89-square mile Deer Creek watershed is primarily rainfall-runoff driven. Before it flows into the Yuba River near Smartsville below USACE's Englebright Reservoir, Deer Creek is subject to impoundment at NID's Scotts Flat Reservoir and in Lake Wildwood. Several canals divert water from Deer Creek into the Bear River watershed.

As shown in Table 7.2.2-1, Deer Creek is not affected by the Project because none of the facilities or diversion structures on Deer Creek are part of the Project; Deer Creek is a tributary to the Yuba River and flows into the Project Area.

Historical Deer Creek flows near Smartsville have been measured at the USGS Gage 11418500, approximately 1 mile upstream of Deer Creek's confluence with the Yuba River, since October 1935. The watershed contributing to Deer Creek flow below the Deer Creek gage is approximately 5 square miles. Figure 7.2.5-57 shows average monthly streamflow for Deer Creek near Smartville. The maximum streamflow, approximately 1,400 cfs, was recorded during the height of the extreme flood in January 1997.

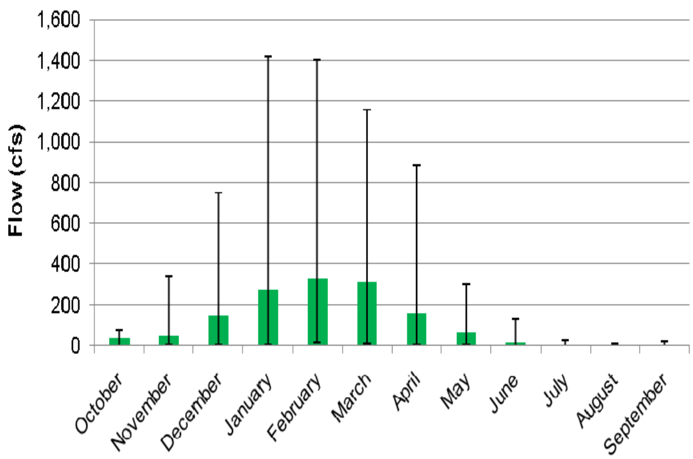

Figure 7.2.5-57. Average monthly streamflow for Deer Creek at Smartville (USGS Gage 11418500) from WY 1970 through WY 2008.

Historical mean daily streamflows per year in Deer Creek are shown in Figure 7.2.5-58.

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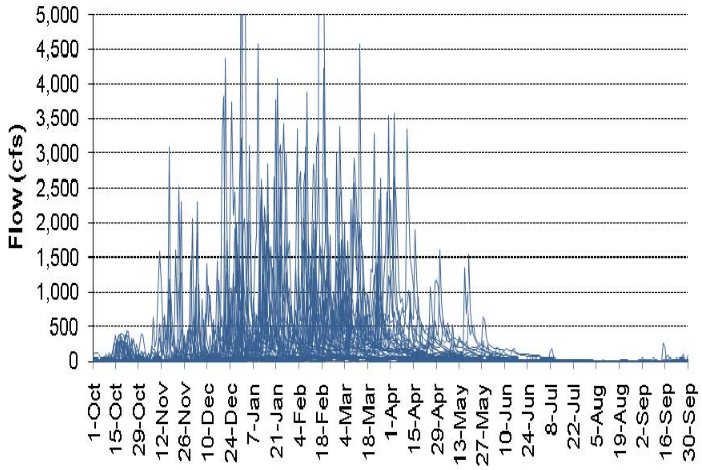

Figure 7.2.5-58. Historical mean daily streamflow each year for Deer Creek at Smartville (USGS Gage 11418500) from WY 1970 through WY 2008.

A flow exceedance curve of mean daily flows on Deer Creek at Smarstville is shown in Figure 7.2.5-59. Only 10 percent of mean daily flows during the period of analysis (1970-2008) exceed 305 cfs. Fifty percent of mean daily flows exceed 12 cfs, and 90 percent of mean daily flows exceed 3 cfs. In general, these results indicate that flows at 50 percent exceedance and above, or low flow trends, in Deer Creek are similar to those of Dry Creek.

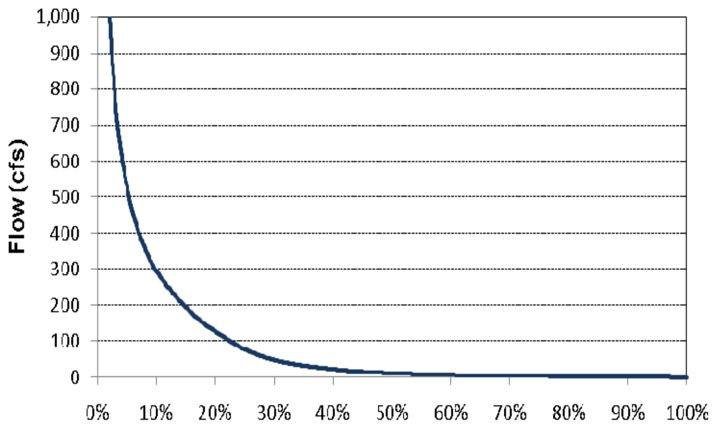

Figure 7.2.5-59. Flow exceedance of historical mean daily streamflow for Deer Creek at Smartville (USGS Gage 11418500) from WY 1970 through WY 2008.

USACE's Daguerre Point Dam

Similar to USACE's Englebright Dam, USACE's Daguerre Point Dam was constructed by the California Debris Commission to prevent hydraulic mining debris from the Yuba River watershed from flowing into the Feather and Sacramento rivers. The 30-foot high dam, which was constructed in 1906 and rebuilt in 1964 following damage from floods, has no appreciable storage capacity. USACE's Daguerre Point Dam has two fish ladders, one on the north bank and one on the south bank of the river, and two diversions, one on the north bank and one on the south bank. These two diversions provide water to YCWA's Member Units (a group of eight water users with water rights as explained in Section 7.2.8.3) for irrigation of farms within the Member Units. Some of the water diverted to the north is diverted under YCWA's water rights and some is diverted under Member Units' water rights. Water diverted to the south is all diverted under YCWA's water rights. Diversions and water deliveries from the lower Yuba

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River are discussed in more detail in Section 7.2.8.3. USACE's Daguerre Point Dam also creates important groundwater recharge to the North and South Yuba groundwater basins.

Yuba River Downstream of USACE's Daguerre Point Dam to the Feather River

At the lower end of the Yuba River, the Marysville Gage (USGS 11421000) has measured Yuba River flows approximately 6 miles upstream of its confluence with the Feather River since October 1943. Flows at Marysville reflect upstream (Smartville) flows, agricultural diversions at USACE's Daguerre Point Dam, inflows at Deer and Dry creeks, and accretions or depletions that occur along the lower Yuba River.

Figure 7.2.5-60 shows average monthly streamflow for the Yuba River at Marysville. The maximum monthly average streamflow, approximately 26,000 cfs, and the maximum daily average streamflow of approximately 140,000 cfs, were recorded during the height of the extreme flood in January 1997.

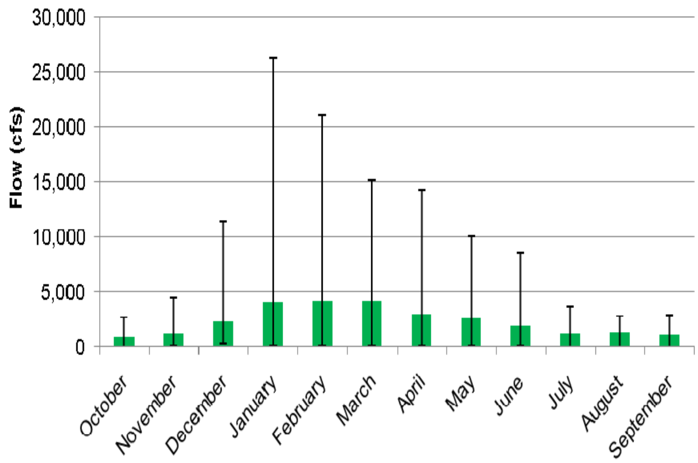

Figure 7.2.5-60. Average monthly streamflow for the Yuba River at Marysville (USGS Gage 11421000) from WY 1970 through WY 2008.

Historical mean daily streamflows per year in the Yuba River at Marysville are shown in Figure 7.2.5-61. The average daily flow variability between the minimum and maximum flows at the Marysville gage is 33,300 cfs, with the greatest monthly flow variability at both locations occurring in January and February.

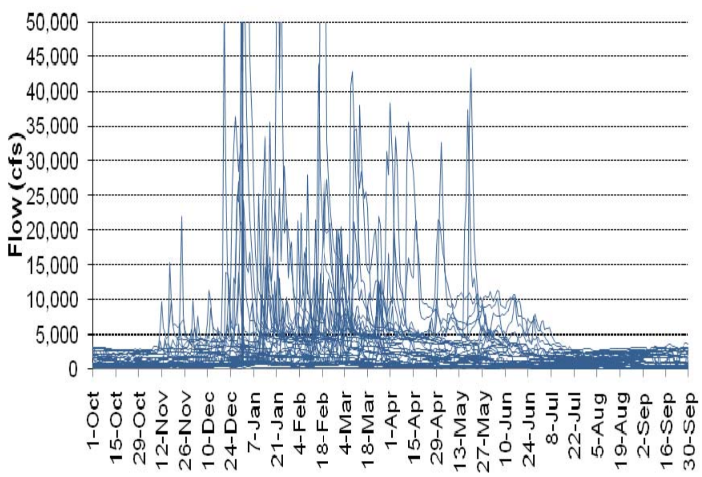

Figure 7.2.5-61. Historical mean daily streamflow each year for the Yuba River at Marysville (USGS Gage 11421000) from WY 1970 through WY 2008.

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A flow exceedance curve for the Yuba River at Marysville is shown in Figure 7.2.5-62. Only 10 percent of mean daily flows during the period of record exceed 5,000 cfs. Fifty percent of mean daily flows exceed 1,300 cfs, and 90 percent of mean daily flows exceed 400 cfs.

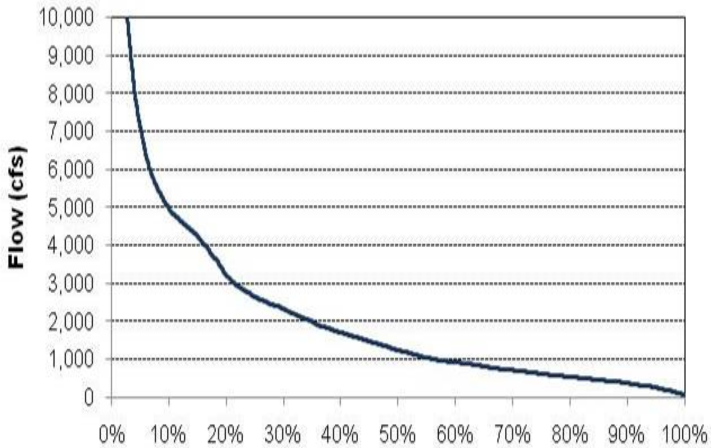

Figure 7.2.5-62. Flow exceedance of historical mean daily streamflow for the Yuba River at Marysville from WY 1970 through WY 2008.

7.2.6 Existing Instream Flow Designated Beneficial Uses

Section 4.1.9 described the designated beneficial uses of water in the Project Vicinity, as specified in the State Water Resources Control Board's (SWRCB) Basin Plan. These beneficial uses include: 1) municipal and domestic water supply; 2) agricultural water supply (irrigation); 3) industrial service supply (power generation); 4) water contact recreation; 5) non-water contact recreation; 6) warm freshwater habitat; 7) cold freshwater habitat; and 8) wildlife habitat. Refer to Table 4.1.9-1 for detailed description of the designated beneficial uses.

7.2.7 Applicable Water Quality Standards

As described in Section 4.1.9, water quality standards "*consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses*." [33 USC § 1313(C) (2) (A)]. Table 7.2.7-1, below, lists water quality objectives described in the Basin Plan related to the designated beneficial uses. This list is not exhaustive and can be modified by the SWRCB to reflect site-specific information.

Table 7.2.7-1. Water quality objectives to support designated beneficial uses in the Project Vicinity.

Water Quality Objective	Description
Bacteria	In terms of fecal coliform. Less than a geometric average of 200/100 ml on five samples collected in any 30-day period and less than 400/100 ml on ten percent of all samples taken in a 30-day period.
Biostimulatory Substances	Water shall not contain biostimulatory substances that promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses.

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Table 7.2.7-1. (continued)

Water Quality Objective	Description
Chemical Constituents	Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. Specific trace element levels are given for certain surface waters, none of which include the waters in the vicinity of the Project. Electrical conductivity (at 77 ºF) shall not exceed 150 micromhos (µmhos)/cm (90 percentile) in well-mixed waters of the Feather River from the Fish Barrier Dam at Oroville to Sacramento River. Other limits for organic, inorganic and trace metals are provided for surface waters that are designated for domestic or municipal water supply. In addition, waters designated for municipal or domestic use must comply with portions of Title 22 of the California Code of Regulations. For protection of aquatic life, surface water in California must also comply with the California Toxics Rule (40 CFR Part 131).
Color	Water shall be free of discoloration that causes a nuisance or adversely affects beneficial uses.
Dissolved Oxygen (DO)	Monthly median of the average daily dissolved oxygen concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percent concentration shall not fall below 75 percent of saturation. Minimum level of 7 mg/L. Specific DO water quality objectives below Oroville dam are 8.0 mg/L from September 1 to May 31, for Feather River from Fish Barrier Dam at Oroville to Honcut Creek (surface water body #40). When natural conditions lower dissolved oxygen below this level, the concentrations shall be maintained at or above 95 percent of saturation.
Floating Material	Water shall not contain floating material in amounts that cause a nuisance or adversely affect beneficial uses.
Oil & Grease	Water shall not contain oils, greases, waxes or other material in concentrations that cause a nuisance, result in visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.
PH	The pH of surface waters will remain between 6.5 and 8.5, and cause changes of less than 0.5 in receiving water bodies.
Pesticides	Waters shall not contain pesticides or a combination of pesticides in concentrations that adversely affect beneficial uses. Other limits established as well.
Radioactivity	Radionuclides shall not be present in concentrations that are harmful to human, plant, animal or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal or aquatic life.
Sediment	The suspended sediment load and suspended-sediment discharge rate of surface waters shall not be altered in such a manner as to cause a nuisance or adversely affect beneficial uses.
Settleable Material	Waters shall not contain substances in concentrations that result in the deposition of material that causes a nuisance or adversely affects beneficial uses.
Suspended Material	Waters shall not contain suspended material in concentrations that cause a nuisance or adversely affect beneficial uses.
Tastes and Odor	Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes and odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.
Temperature	The natural receiving water temperature of interstate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Quality Control Board that such alteration in temperature does not adversely affect beneficial uses. Increases in water temperatures must be less than 5 ºF above natural receiving-water temperature.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by analyses of indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests as specified by the Regional Water Quality Control Board.
Turbidity	In terms of changes in turbidity (NTU) in the receiving water body: where natural turbidity is 0 to 5 NTUs, increases shall not exceed 1 NTU; where 5 to 50 NTUs, increases shall not exceed 20 percent; where 50 to 100 NTUs, increases shall not exceed 10 NTUs; and where natural turbidity is greater than 100 NTUs, increase shall not exceed 10 percent.

Source: Central Valley Water Quality Control Board (CVRWQCB) 1998.

Section 303(d) of the Clean Water Act (CWA) requires that every two years each State submit to the United States Environmental Protection Agency (EPA) a list of rivers, lakes and reservoirs in the State for which pollution control or requirements have failed to provide for water quality. The Central Valley Regional Water Quality Control Board (CVRWQCB) and SWRCB work together to research and update the list for the Central Valley region of California. Based on a review of this list and its associated Total Maximum Daily Load (TMDL) Priority Schedule, in

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the Project Vicinity, USACE's Englebright Reservoir has been identified by the SWRCB as CWA §303(d) State Impaired for mercury; and Deer Creek, a tributary to the Yuba River, has been identified as impaired for pH (SWRCB 2006). However, there are currently no approved TMDL plans for the Yuba River.

In 2009, the CVRWQCB recommended including additional surface waters in the Project Area to the 303(d) list as impaired for mercury: New Bullards Bar Reservoir, the Middle Yuba River, the North Fork Yuba River from New Bullards Bar Dam to Englebright Reservoir, the South Yuba River from Lake Spaulding to USACE's Englebright Reservoir, and the Lower Yuba River from USACE's Englebright Reservoir to the Feather (CVRWQCB 2009). The CVRWQCB is also recommending that the lower Yuba River be added to the 303(d) list as impaired for iron (CVRWQCB 2009). These recommendations considered and adopted by the SWRCB at the August 3, 2010 Board meeting and were advanced forward for approval by the United States EPA at that time (Azimi-Gaylon, pers. comm., 2010).

7.2.8 Existing and Proposed Water Rights Potentially Affecting or Affected by the Project

Section 6.3.1.3 provides a list of water rights held by Licensee for power generation. Provided below is a description of other existing or proposed water rights potentially affecting or affected by the Project.

7.2.8.1 Water Rights Upstream of the Project Area That Affect the Project

Numerous water rights holders divert and store waters upstream of the Project Area. The upstream projects with significant impacts on inflows to the Project include SFWPA's South Feather Power Project, NID's Yuba-Bear Hydroelectric Project, and PG&E's Drum-Spaulding Project. Each of these project's diversions are summarized below.

7.2.8.1.1 South Feather Power Project

SFWPA diverts water from Slate Creek, a tributary to the North Yuba River upstream of New Bullards Bar Reservoir at the Slate Creek Diversion Dam. This diversion diverts up to a maximum flow of 848 cfs of water out of Slate Creek to Sly Creek Reservoir on Lost Creek, a tributary to the South Fork Feather River. SFWPA's water rights limit Slate Creek diversions to 600 cfs and at times diversions are physically limited to 500 cfs due to high water elevations in Sly Creek Reservoir.

Table 7.2.8-1 shows the average diversions in cfs and total annual diversions in ac-ft at the Slate Creek Diversion Dam as measured at USGS Gage 11413250, for three water years representative of dry, normal, and wet conditions.

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Table 7.2.8-1. North Yuba River sub-basin diversions by SFWPA South Feather Power Project - Slate Creek diversions for representative water year types.

Year Type	Representative Water Year	Average Diversion (cfs)	Annual Diversion (ac-ft)
Dry	2001	68	48,995
Normal	2003	141	102,108
Wet	1995	209	151,075

Source: USGS Gage 11413250, Slate C Tunnel Nr Strawberry Valley CA. http://waterdata.usgs.gov/nwis/dv/?referred_module=sw

7.2.8.1.2 Yuba-Bear Hydroelectric Project

NID diverts and regulates flows in the Middle and South Yuba river watersheds. On the Middle Yuba River, NID's Jackson Meadows Reservoir (RM 45.6) and Milton Diversion Dam (RM 43.4) affect flows entering the Yuba River Development Project. Jackson Meadows Reservoir can store 67,435 ac-ft of water and the Milton Diversion Dam, which has no associated storage, can divert up to 450 cfs from the Middle Yuba River to Bowman Lake on Canyon Creek, a tributary to the South Yuba River. Table 7.2.8-2 shows the average diversions in cfs and total annual diversions in ac-ft at the Milton Diversion Dam for water years representative of dry, normal, and wet conditions.

Table 7.2.8-2. Middle Yuba River sub-basin diversions by NID's Yuba-Bear Hydroelectric Project – Milton Diversion Dam diversions for representative water year types.

Year Type	Representative Water Year	Average Diversion (cfs)	Annual Diversion (ac-ft)
Dry	2001	40	28,682
Normal	2003	97	70,527
Wet	1995	87	62,991

Source: USGS Gage 11408000, Milton-Bowman Tunnel Outlet Nr Graniteville CA. http://waterdata.usgs.gov/nwis/dv/?referred_module=sw .
Note: These values should be considered estimates, as tunnel gage statistics do not take into account changes in upstream storage.

On the South Yuba River, NID's Canyon Creek reservoir system affects South Yuba River flows. The Canyon Creek reservoir system includes the French, Faucherie, Sawmill, Jackson Meadows and Bowman reservoirs with a combined gross storage of roughly 90,647 ac-ft. Bowman-Spaulding Diversion Dam can divert up to 300 cfs from Canyon Creek to PG&E's Lake Spaulding on the South Yuba River. Bowman-Spaulding Diversion Conduit also captures the majority of flows from several feeder streams, all tributary to the South Yuba River, between Bowman Lake and Lake Spaulding. These waters are then subsequently diverted out of South Yuba River basin into the Deer Creek and Bear River drainages by PG&E. Table 7.2.8-3 shows the average diversions in cfs and total annual diversions in ac-ft at NID diversion facilities tributary to the South Yuba River for water years representative of dry, normal, and wet conditions.

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Table 7.2.8-3. South Yuba River sub-basin diversions by NID's Yuba-Bear Hydroelectric Project – Bowman-Spaulding Diversion Dam and Conduit diversions for representative water year types.

Year Type	Representative Water Year	Average Diversion (cfs)	Annual Diversion (ac-ft)
Dry	2001	48	35,004
Normal	2003	102	73,934
Wet	1995	141	102,257

Source: USGS Gage 11417500 – South Yuba River at Jones Bar CA. http://waterdata.usgs.gov/nwis/dv/?referred_module=sw. Note: These values should be considered estimates, as tunnel gage statistics do not take into account changes in upstream storage.

7.2.8.1.3 Drum-Spaulding Project

PG&E diverts and regulates flows in the South Yuba River watershed. Several upstream storage reservoirs, including Spaulding and Fordyce, with a combined gross storage of 125,815 ac-ft, affect South Yuba River flows. Water is diverted at Spaulding Dam, where the Spaulding Tunnel can divert up to 1,200 cfs to the South Yuba and Drum canals. These canals transfer diverted flows into the Deer Creek and Bear River drainages, respectively. Table 7.2.8-4 shows the average diversions in cfs and total annual diversions in ac-ft at PG&E diversion facilities tributary to the South Yuba River for water years representative of dry, normal, and wet conditions.

Table 7.2.8-4. South Yuba River sub-basin diversions by PG&E's Drum-Spaulding Project – Spaulding Dam diversions for representative water year types.

Year Type	Representative Water Year	Average Diversion (cfs)	Annual Diversion (ac-ft)
Dry	2001	289	208,511
Normal	2003	525	378,140
Wet	1995	583	419,962

Source: USGS Gage 11417500 – South Yuba River at Jones Bar CA. http://waterdata.usgs.gov/nwis/dv/?referred_module=sw. Note: These values should be considered estimates, as tunnel gage statistics do not take into account changes in upstream storage.

Table 7.2.8-5 shows the cumulative annual average diversions in cfs and ac-ft from the South Yuba River upstream of the Project due to NID and PG&E's combined operations.

Table 7.2.8-5. Cumulative South Yuba River sub-basin diversions by PG&E's Drum-Spaulding Project and NID's Yuba-Bear Hydroelectric Project – diversions for representative water year types.

	Representative Water Year	Average Diversion (cfs)	Annual Diversion (ac-ft)
Dry	2001	337	243,514
Normal	2003	627	452,074
Wet	1995	724	522,219

Source: USGS Gage 11417500 – South Yuba River at Jones Bar CA. http://waterdata.usgs.gov/nwis/dv/?referred_module=sw. Note: These values should be considered estimates, as tunnel gage statistics do not take into account changes in upstream storage.

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7.2.8.2 Water Rights within the Project Area

YCWA pumps some water directly from New Bullards Bar Reservoir to supply water to the Cottage Creek Water Treatment Plant for domestic use associated with the recreation facilities adjacent to the reservoir. The amount of this pumping averages approximately 6 ac-ft per year.

7.2.8.3 Water Rights Downstream of the Project Area Affected by the Project

Downstream of the Project, water is diverted under consumptive-use water-right permits to eight water users, which are collectively referred to as the YCWA Member Units. YCWA also makes surface water available to the City of Marysville for the city's diversion to and use at Lake Ellis. The place of water delivery to YCWA's Member Units and the City of Marysville are listed in Table 7.2.8-6. The YCWA Member Unit service areas are shown in Figure 7.2.8-1.

Table 7.2.8-6. Yuba County Water Agency's annual contract amounts and place of delivery.

Member Unit	Base Contract (ac-ft)	Supplemental Contract (ac-ft)	Total Contract (ac-ft)	Member Unit Water Rights (ac-ft)	Total Contract and Water Rights (ac-ft)
BROWNS VALLEY IRRIGATION DISTRICT PUMPLINE DIVERSION FACILITY					
Browns Valley Irrigation District (BVID)[1]	9,500	--	9,500	24,462[1]	33,962
SOUTH CANAL[2]					
Brophy Water District (BWD)	43,470	32,177	75,647	--	75,647
South Yuba Water District (SYWD)	25,487	18,843	44,330	--	44,330
Dry Creek Mutual Water Company (DCMWC)[2]	13,682	3,061	16,743	--	16,743
Wheatland Water District (WWD) [3]	23,092	17,138	40,230	--	40,230
NORTH CANAL[4]					
Cordua Irrigation District (CID)	12,000	--	12,000	60,000	72,000
Hallwood Irrigation Company (HIC)	--	--	--	78,000	78,000
Ramirez Water District (RWD)	14,790	10,311	25,101	--	25,101
MARYSVILLE[5]					
City of Marysville	--	2,500	2,500	--	2,500
Total	**142,021**	**84,030**	**226,051**	**162,462**	**388,513**

1 BVID receives water at the Pumpline Diversion Facility, located 1 mile upstream from USACE's Daguerre Point Dam.
2 BWD, SYWD, DCMWC and WWD receive water from the South Yuba Canal (South Canal), which begins on the south side of the Yuba River slightly upstream of the south abutment of USACE's Daguerre Point Dam.
3 Includes both Phase 1 and Phase 2 of the Wheatland Project.
4 CID, HIC, and RWD receive water through the Hallwood-Cordua Canal (North Canal), located on the north abutment of USACE's Daguerre Point Dam.
5 The City of Marysville diverts water from the Yuba River near Marysville.

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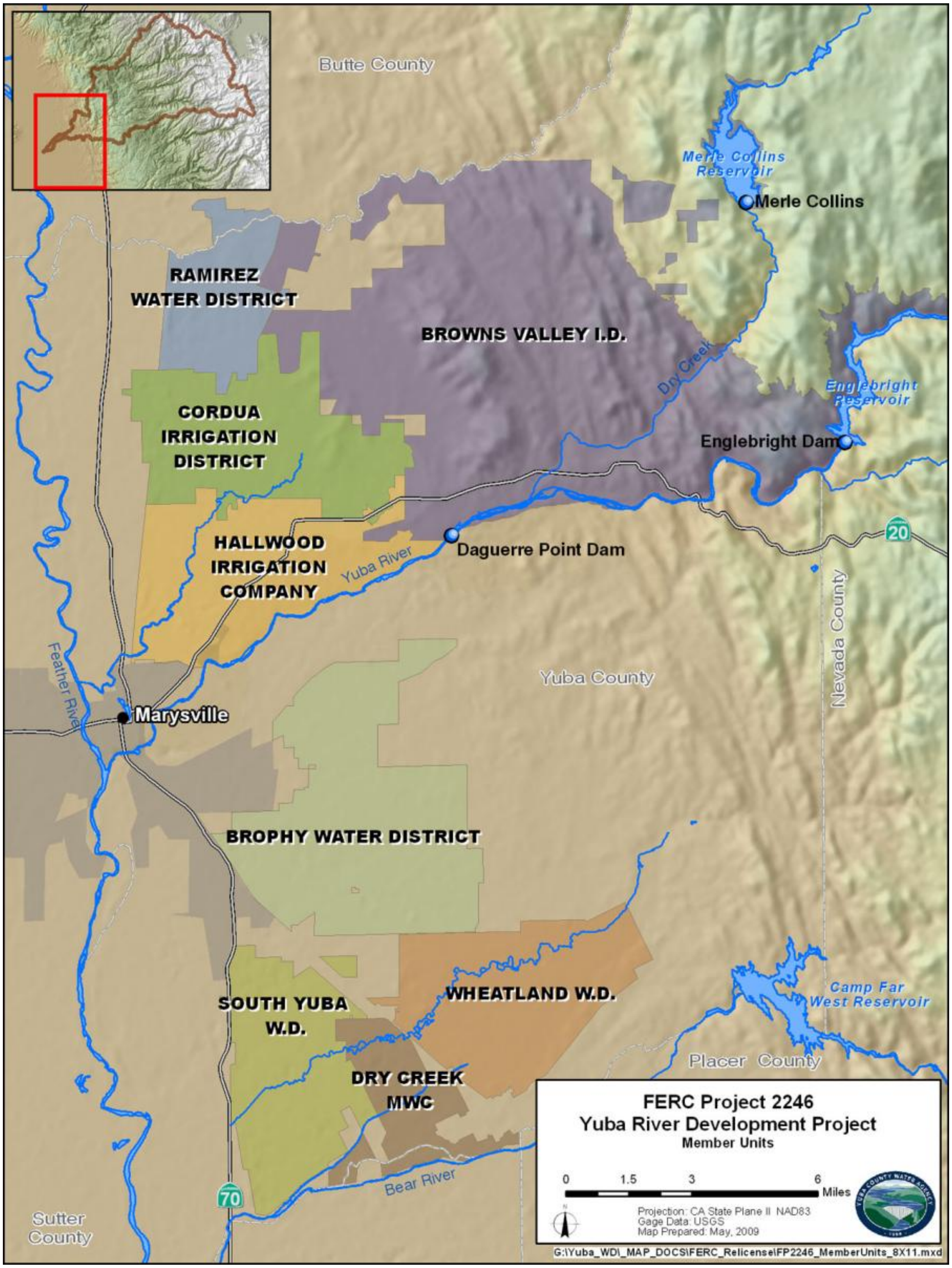

Figure 7.2.8-1. Yuba County Water Agency Member Unit service areas.

BVID, Cordua Irrigation District (CID), and Hallwood Irrigation Company (HIC) have their own water rights on the lower Yuba River (Table 7.2.8-6). Under settlement contracts with YCWA, CID and HIC receive surface water supplies as part of Project operations. Dry year deficiency criteria in these contracts are different from the deficiency criteria in YCWA's contracts with other member units. Provisions in YCWA's water right settlement contracts preclude deficiencies in water right settlement deliveries unless the California Department of Water Resources (CDWR) April forecast of unimpaired runoff as measured at the Smartville Gage is less than 40 percent of average. No deficiencies in such deliveries may be imposed on BVID. Contract shortage provisions are presented in Table 7.2.8-7.

Table 7.2.8-7. Yuba County Water Agency water supply contract shortage provisions.

Category	Unimpaired Runoff Forecast (f) [a]	Percentage of Settlement/ Contract Allocation Available
PRE-1914 RIGHTS SETTLEMENTS		
Base Project Water	$f > 85\%$	100%
	$50\% < f \leq 85\%$	85%
	$40\% \leq f \leq 50\%$	70%
	$f < 40\%$	50%
Browns Valley Irrigation District	All	100%
Cordua Irrigation District	$f \geq 40\%$	100%
Hallwood Irrigation Company	$f < 40\%$	80%
YCWA SUPPLY CONTRACTS		
Supplemental Water	All forecasts	Determined annually by Licensee in its reasonable discretion considering forecasted runoff and operational conditions.

Note: f -
[a] April 1 CDWR forecast of unimpaired Yuba River runoff near Smartville, in percentage of 50-year average.

YCWA's contract allocations are based on the gross acreage served by each member unit. The maximum "Base Project Water" allocation is computed by multiplying 90 percent of the gross acreage by 2.87 ac-ft per acre. The maximum "Supplemental Water Supply" is computed by multiplying 90 percent of the gross acreage by 2.13 ac-ft per acre. For member units that have water rights senior to YCWA's, their contract allocations are based on their water right amounts.

In 2009, YCWA started providing water to the Wheatland Water District (WWD) under a water service contract. Until then, water users within WWD relied on solely groundwater for irrigation. The Wheatland Project now conveys water, diverted by YCWA at USACE's Daguerre Point Dam, to WWD through the South Canal system. The Wheatland Project is being constructed in two phases. Phase 1, which was completed in 2009, provides for delivery of surface water to WWD and the immediate irrigation of approximately 7,750 acres of the approximately 9,200 acres that will be served upon the completion of both phases. Under Phase 1, WWD's contract with YCWA provides for a total allocation (base and supplemental) of 23,092 ac-ft per year. When Phase 2 is completed, this contract will allow for a total allocation (base and supplemental) of 40,230 ac-ft per year.

7.2.9 Existing Water Quality Information

As part of its acquisition of existing, relevant, and reasonably available data for inclusion in this document, Licensee found a considerable amount of water quality information, the most relevant

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of which was collected from the 1950s to the present. Licensee consulted with and reviewed the following sources of information to prepare the description of water quality in this section:

- Licensee's own data
- California's Office of Environmental Health Hazard Assessment (OEHHA) fish ingestion advisories
- CDWR
- NID's Yuba-Bear Hydroelectric Project Relicensing ongoing water quality and water temperature studies
- PG&E's Drum-Spaulding Project Relicensing ongoing water quality and water temperature studies
- Sacramento River Watershed Program (SRWP) regional monitoring data
- USGS' California Water Science Center Investigations
- USGS' National Water Information System (NWIS) Reports
- US EPA's Storage and Retrieval (STORET) Reports
- Yuba River Temperature Monitoring Project performed by the United States Fish and Wildlife Service (USFWS)
- Upper Yuba River Studies Program's (UYRSP) technical reports
- Water quality data from the South Yuba River Citizens League (SYRCL)
- Water quality data from the Friends of Deer Creek (FODC)

Quantitative information from the above source documents is summarized below. Licensee's water temperature and water chemistry data are provided in Attachment 7.2A and Attachment 7.2B, respectively.

7.2.9.1 Licensee's Water Temperature Data Collection Network

Table 7.2.9-1 lists Licensee's stream temperature data collection network. Licensee is actively collecting stream water temperature data: in areas upstream of the Project (i.e., on the Middle Yuba River upstream of Our House Diversion Dam, on Oregon Creek upstream of Log Cabin Diversion Dam, and on the North Yuba River upstream of New Bullards Bar Reservoir); within the Project Area (includes New Bullards Bar and Englebright reservoirs); and downstream of the Project (i.e., on the Yuba River downstream of the USACE Daguerre Point Dam). Data have been collected at several locations in the Yuba River below USACE's Englebright Dam since 2003 and at other locations since the summer of 2008. Reservoir temperature data have been recorded twice per month by Licensee since 1990 at a single point near the upstream face of New Bullards Bar Dam and at USACE's Englebright Dam. Normally, reservoir data have been collected at 10-foot depth intervals, along with *in situ* air temperature.

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Table 7.2.9-1. Key of Licensee's active stream temperature data collection locations.

Project Reach	Location	Designation for Recorders[1]	River Mile	Latitude	Longitude	Data Included in PAD	Streamflow Gage, if Co-Located[3]
MIDDLE YUBA RIVER							
--	Upstream of Our House Diversion Dam Impoundment	T10a T10b	MYR 12.2	39.413015	-120.994590	3/28/09-9/6/10	USGS 11408870 + 11408880
Our House Diversion Dam Reach	At Intake to Lohman Ridge Diversion Tunnel	T20	MYR 12.0	39.411910	-120.997427	7/3/08-6/6/10	USGS 11408870 (PG&E NY17)
	Downstream of Our House Diversion Dam	T30	MYR 11.9	39.410661	-120.998604	10/24/08-6/6/10	USGS 11408880 (PG&E NY18)
Oregon Creek Reach	Upstream of North Yuba River	T90a T90b	MYR 0.0	39.368639	-121.135658	8/19/08-12/18/08, 3/28/09-9/6/10	--
OREGON CREEK							
--	Upstream of Log Cabin Diversion Dam Impoundment	T40	OC 4.3	39.440146	-121.056149	7/8/08-6/6/10	USGS 11409300 (PG&E NY19)
Log Cabin Diversion Dam Reach	At Intake to Camptonville Diversion Tunnel	T50	OC 4.2	39.440491	-121.058746	7/8/08-6/6/10	USGS 11409350 (PG&E NY30)
	Downstream of Log Cabin Diversion Dam	T60	OC 4.0	39.439455	-121.059264	8/30/08-6/6/10	USGS 11409400 (PG&E NY20)
NORTH YUBA RIVER							
--	Upstream of New Bullards Bar Reservoir	T65a T65b	NYR 16.0	--	--	1/1/08-5/18/10	--
New Bullards Bar Dam Reach	At Low Flow Releases from New Bullards Bar Dam	T70a T70b	NYR 2.4	39.392348	-121.141584	7/18/08-6/6/10	USGS 11413517 (PG&E NY23)
	Upstream of Middle Yuba River	T80a T80b	NYR 0.0	39.368694	-121.136793	8/19/08-12/18/08, 3/28/09-9/6/10	--
DOBBINS CREEK							
--	At Lake Francis Outlet[2]	T140a T140b	DC 2.4	39.359171	-121.205168	4/2/09-9/6/10	--
--	Upstream of Yuba River	T145a T145b	DC 0.1	39.329735	-121.197641	4/3/09-9/6/10	--
DRY CREEK							
--	Upstream of Yuba River	T185a T185b	DryC 0.7	39.228930	-121.402270	4/1/09-6/7/10	--
DEER CREEK							
--	Upstream of Yuba River	T175a T175b	DeerC 0.9	39.224091	-121.269866	2/3/09-8/4/10	--
YUBA RIVER							
Middle/ North Yuba River Reach	Downstream of Confluence of North Yuba River and Middle Yuba River	T100a T100b	YR 39.5	39.367839	-121.136655	8/19/08-12/18/08, 3/28/09-9/6/10	--
	Upstream of New Colgate Powerhouse	T110a T110b	YR 34.1	39.330602	-121.187675	8/19/08-12/18/08, 3/28/09-9/6/10	--

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Table 7.2.9-1. (continued).

Project Reach	Location	Designation for Recorders[1]	River Mile	Latitude	Longitude	Data Included in PAD	Streamflow Gage, if Co-Located[3]
YUBA RIVER (continued)							
New Colgate Powerhouse Reach	In Colgate Powerhouse Penstock	T120	YR 34.0	39.330824	-121.191565	1/1/08-8/8/10	--
	Downstream of New Colgate Powerhouse	T130a T130b	YR 33.9	39.330260	-121.193169	8/19/08-12/18/08, 3/28/09-9/6/10	--
	Downstream of Dobbins Creek	T150a T150b	YR 33.6	39.328398	-121.196162	3/28/09-8/8/10	--
	In Narrows #2 Powerhouse Penstock	T160a T160b	YR 23.9	39.238911	-121.270034	5/5/09-8/2/10	(PG&E NY24)
	Downstream of Narrows #2 Powerhouse at Smartville	T170	YR 23.6	39.235799	-121.272688	4/15/09-8/2/10	USGS 11419000 (PG&E NY28)
	Downstream of Narrows #2 Powerhouse at Smartville (data collected on 1-hr interval, rather than every 15 min)	Smartville a Smartville b Smartville c	YR 23.6	39.235799	-121.272688	WY2003 - 2007	USGS 11419000 (PG&E NY28)
	Downstream of Deer Creek	T180a T180b	YR 22.7	39.230047	-121.285165	11/8/08-8/2/10	--
	Downstream of Dry Creek	T190a T190b	YR 13.3	39.219611	-121.415128	11/8/08-3/9/09	--
	Upstream of USACE's Daguerre Point Dam	T200a Y200b	YR 13.2	39.208009	-121.443116	11/8/08-9/9/10	--
USACE's Daguerre Point Dam Reach	At USACE's Daguerre Point Dam Fish Ladder	T210a T210b	YR 11.4	39.207853	-121.443529	11/18/08-9/7/10	--
	At USACE's Daguerre Point Dam Fish Ladder (data collected on 1-hr interval, rather than every 15 min)	Daguerre a Daguerre b Daguerre c	YR 11.4	39.208009	-121.443116	WY2003 – 2007	--
	At Walnut Avenue (Near Western Extent of Yuba Goldfields)	T220a T220b	YR 8.1	39.188220	-121.495307	8/28/08-9/13/10	--
	At Marysville Gage (data collected on 1-hr interval, rather than every 15 min)	Marysville a Marysville b Marysville c	YR 6.0	39.176164	-121.524386	WY2003 - 2007	USGS 11421000
	Upstream of Simpson Lane (Between Yuba Goldfields and Marysville)	T230a T230b	YR 4.8	39.165328	-121.541350	8/28/08-9/13/10	--
	At Marysville (Downstream of Highway 70 Bridge	T240a T240b	YR 0.7	39.134510	-121.590720	8/21/08-9/26/10	--

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Table 7.2.9-1. (continued).

Project Reach	Location	Designation for Recorders[1]	River Mile	Latitude	Longitude	Data Included in PAD	Streamflow Gage, if Co-Located[3]
FEATHER RIVER							
--	Upstream of Yuba River	T250a T250b	--	39.139425	-121.607282	8/15/08-9/26/10	--
--	Downstream of Yuba River on Right Bank	T260a T260b	--	39.108603	-121.603149	8/15/08-9/26/10	--
--	Downstream of Yuba River on Left Bank	T270a T270b	--	39.108594	-121.604663	8/19/08-9/26/10	--

1 Licensee has installed redundant water temperature recorders at all locations except locations that are co-located with secure USGS stream flow gages or secure penstock sites.
2 Water temperature data collected only when Lake Francis releases water.
3 Co-located means that a flow gage may be in the vicinity of the water temperature recorder but possibly not at the exact location.

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7.2.9.1.1 Water Temperature Upstream of the Project Area

Licensee began collecting continuous water temperature data upstream of the Project in 2005 and has installed continuous water temperature data in the following locations as of August 2010 (Table 7.2.9-1):

- North Yuba River (NYR) above New Bullards Bar Reservoir (NYR 10.7)
- Oregon Creek (OC) above Log Cabin Diversion Impoundment (OC 4.3)
- Middle Yuba River (MYR) above Our House Diversion Impoundment (MYR 12.2)
- South Yuba River (SYR) at Jones Bar above USACE's Englebright Reservoir (SYR 7.1)

Figures 7.2.9-1 through 7.2.9-9 provide a summary of recent surface water temperature data collected upstream of the Project. Attachment 7.2A includes all data collected to date, in portable document format (PDF). Daily average water temperatures have been found to exceed 20°C in all major reaches upstream of the Project with the exception of the North Yuba River.

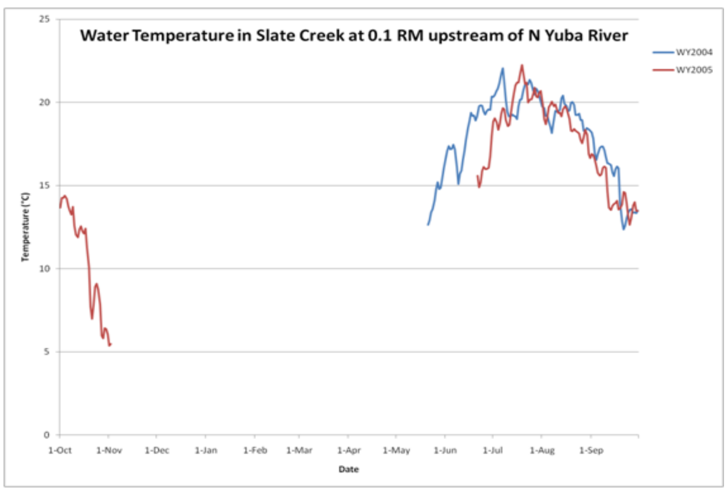

Figure 7.2.9-1. Mean daily water temperature collected in Slate Creek 0.1 mile upstream of the North Yuba River in 2004-2005.
Source: South Feather Water and Power Agency
Other Slate Creek thermograph locations at RM 0.2, 6.4, 8.9, 9.1 and 9.7.

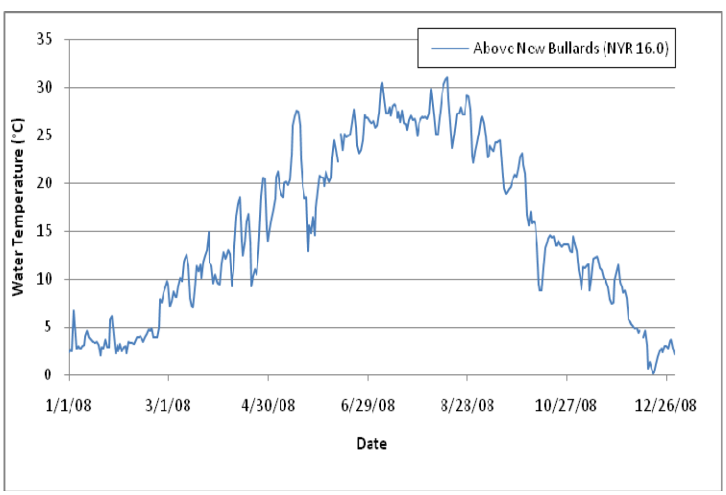

Figure 7.2.9-2. Mean daily water temperature collected in the North Yuba River upstream of New Bullards Bar Reservoir (NYR 16.0) in 2008.
Source: YCWA

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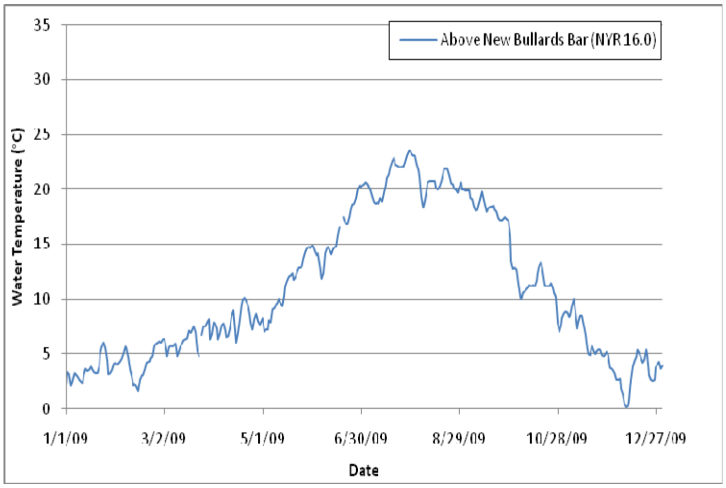

Figure 7.2.9-3. Mean daily water temperature collected in the North Yuba River upstream of New Bullards Bar Reservoir (NYR 16.0) in 2009.

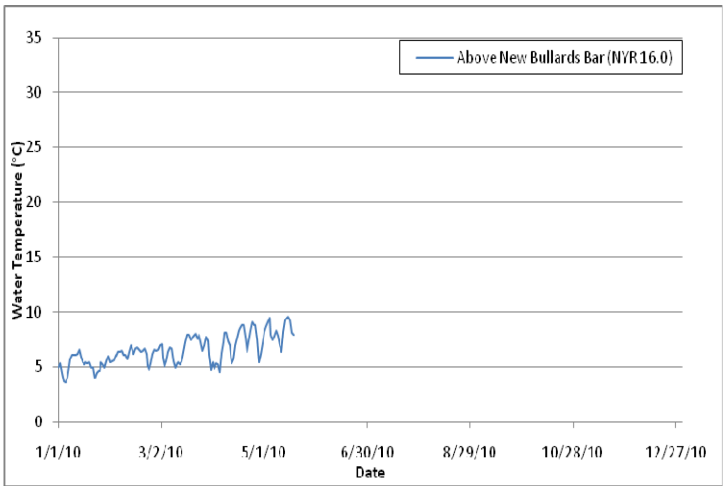

Figure 7.2.9-4. Mean daily water temperature collected in the North Yuba River upstream of New Bullards Bar Reservoir (NYR 16.0) in 2010.

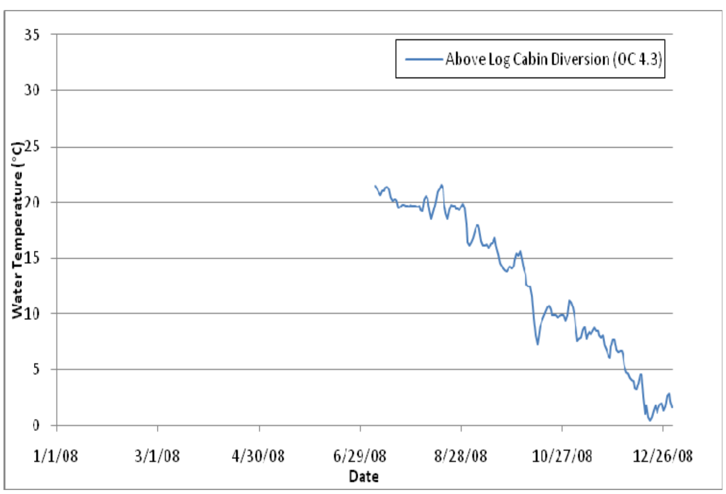

Figure 7.2.9-5. Mean daily water temperature in Oregon Creek upstream of Log Cabin Diversion Dam impoundment (OC 4.3) in 2008.

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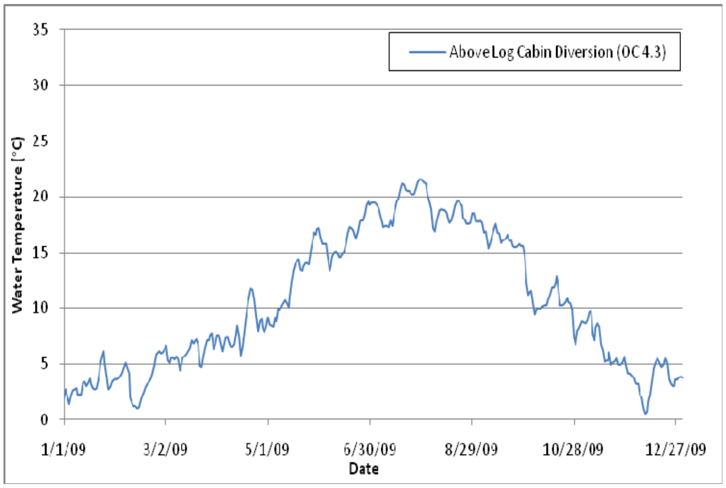

Figure 7.2.9-6. Mean daily water temperature in Oregon Creek upstream of Log Cabin Diversion Dam impoundment (OC 4.3) in 2009.

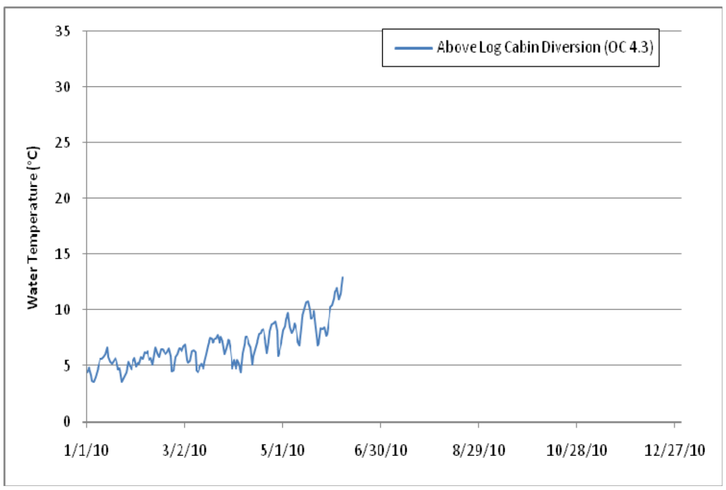

Figure 7.2.9-7. Mean daily water temperature in Oregon Creek upstream of Log Cabin Diversion Dam impoundment (OC 4.3) in 2010.

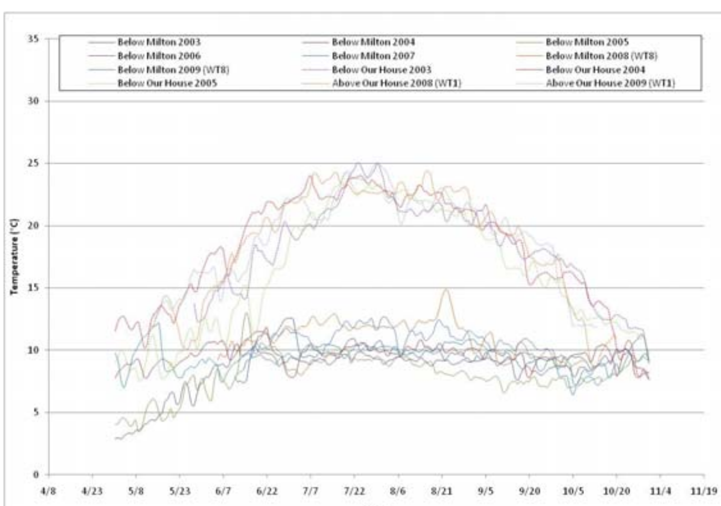

Figure 7.2.9-8. Mean daily water temperature in the Middle Yuba River upstream of Our House Diversion Dam (three monitoring locations) from 2003-2009.

Sources: 2003-2007 – UYRSP
2008-2009 - NID

Figure 7.2.9-9. Mean daily water temperature in the South Yuba River upstream of USACE's Englebright Reservoir (two monitoring locations) from 2004-2009.
Sources: 2004-2007 – UYRSP
2008-2009 – PGE&E

7.2.9.1.2 Water Temperature Within the Project Area

Licensee began collecting continuous water temperature data within the Project in 1995 and has installed continuous water temperature data recorders at 17 locations within the Project Area (Table 7.2.9-1). Figure 7.2.9-10 through Figure 7.2.9-28 below provide mean daily temperature measurements for locations with data. Licensee has collected reservoir temperature profiles on a generally bi-weekly basis in New Bullards Bar Reservoir and USACE's Englebright Reservoir since 1990. See Figures 7.2.9-19 and 7.2.9-25 for monthly profiles taken in 2008 at New Bullards Bar Reservoir and USACE's Englebright Reservoir respectively. Data collection is continuing through 2010.

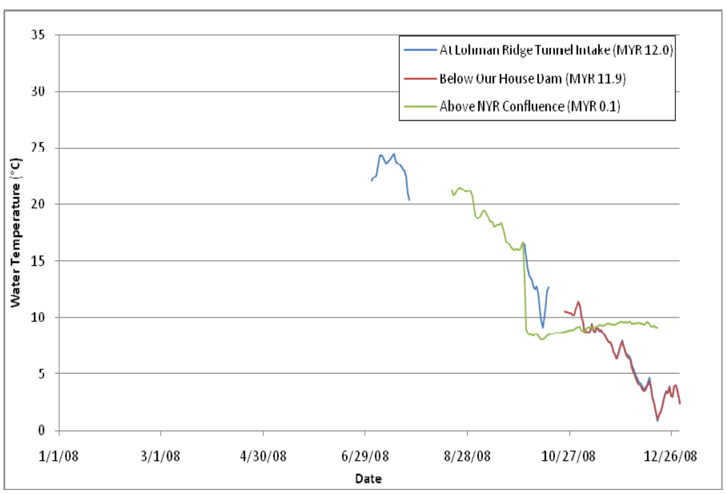

Figure 7.2.9-10. Mean daily water temperatures in the Middle Yuba River in 2008.

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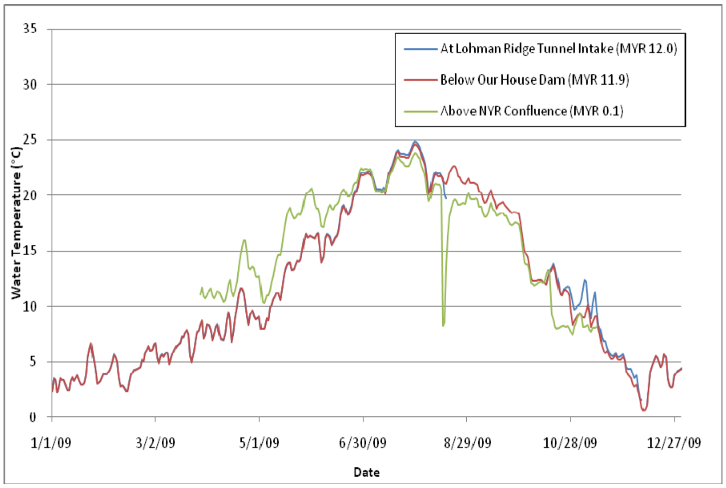

Figure 7.2.9-11. Mean daily water temperatures in the Middle Yuba River in 2009.

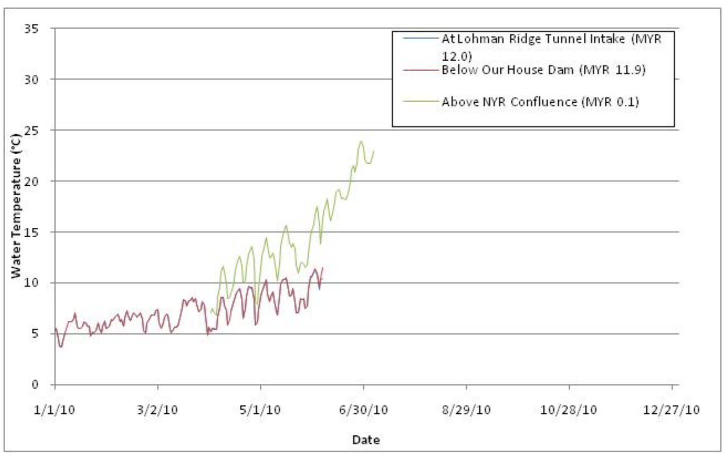

Figure 7.2.9-12. Mean daily water temperatures in the Middle Yuba River in 2010.

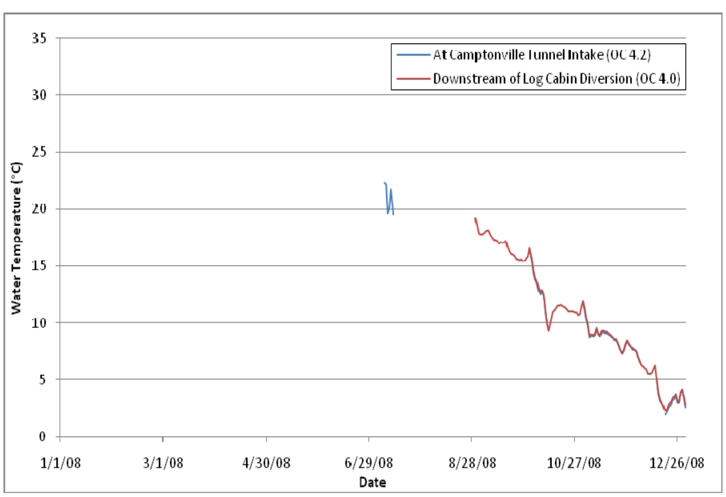

Figure 7.2.9-13. Mean daily water temperatures in Oregon Creek in 2008.

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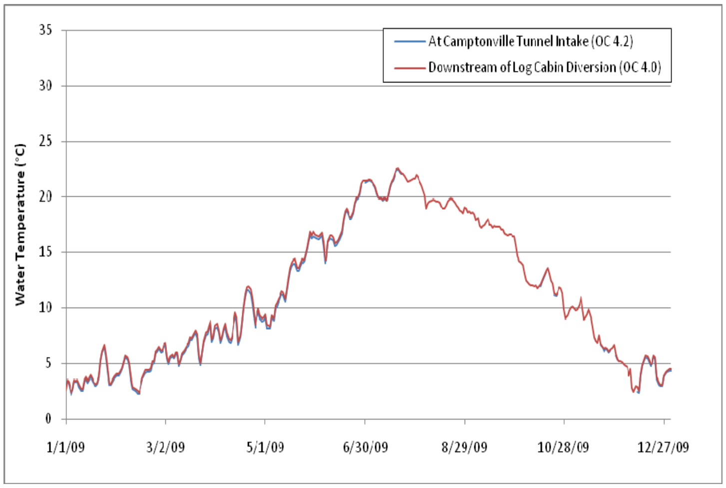

Figure 7.2.9-14. Mean daily water temperatures in Oregon Creek in 2009.

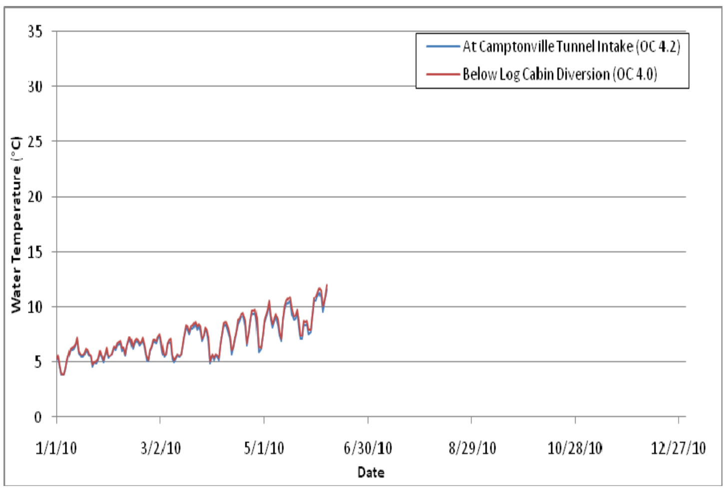

Figure 7.2.9-15. Mean daily water temperatures in Oregon Creek in 2010.

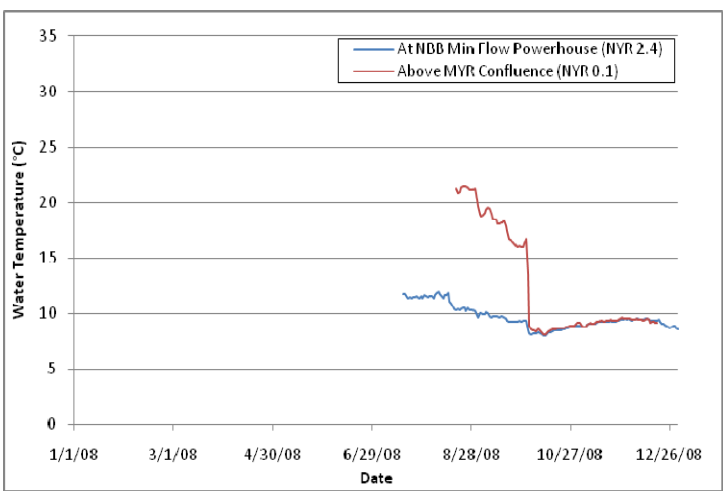

Figure 7.2.9-16. Mean daily water temperatures in North Yuba River in 2008.

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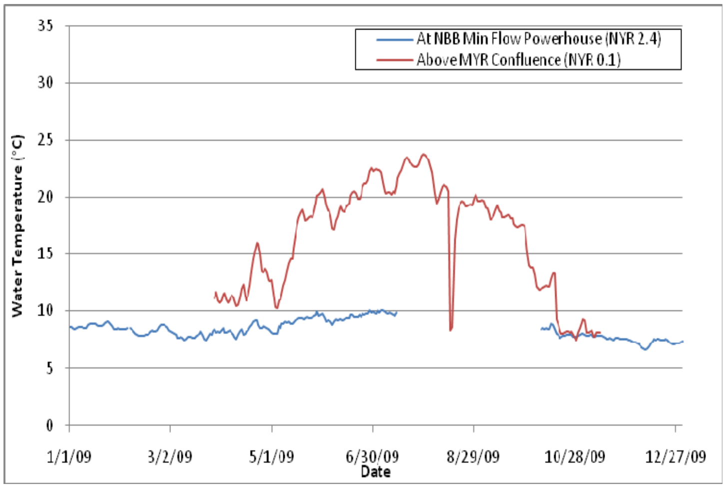

Figure 7.2.9-17. Mean daily water temperatures in North Yuba River in 2009.

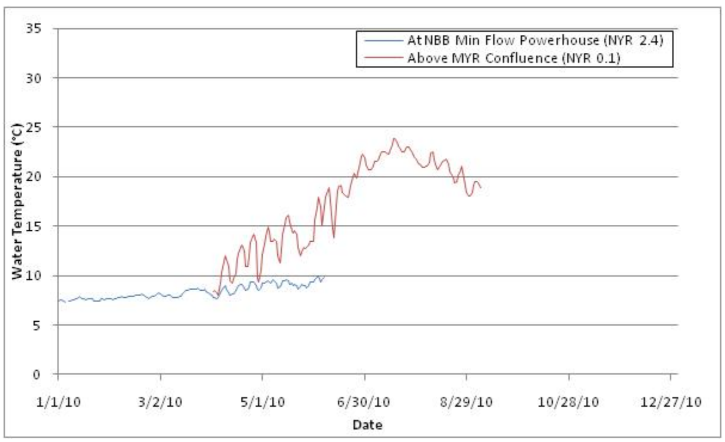

Figure 7.2.9-18. Mean daily water temperatures in North Yuba River in 2010.

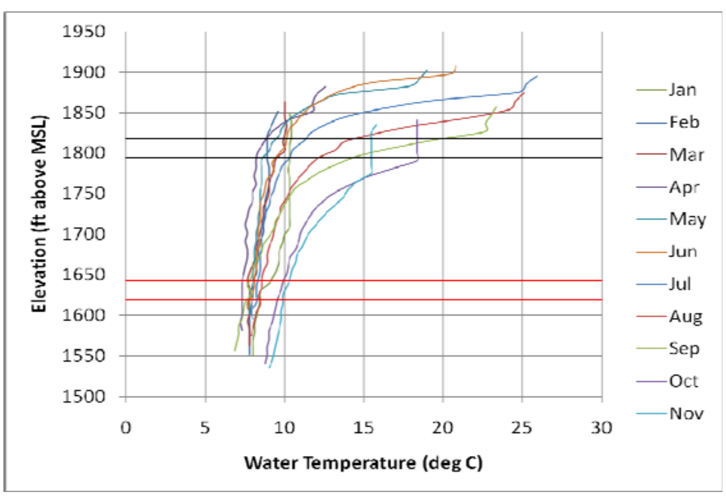

Figure 7.2.9-19. Monthly temperature profiles of New Bullards Bar Reservoir in 2008. Upper power intake, which is not used, elevation range is shown as horizontal black lines, and lower power intake elevation range is shown as horizontal red lines.

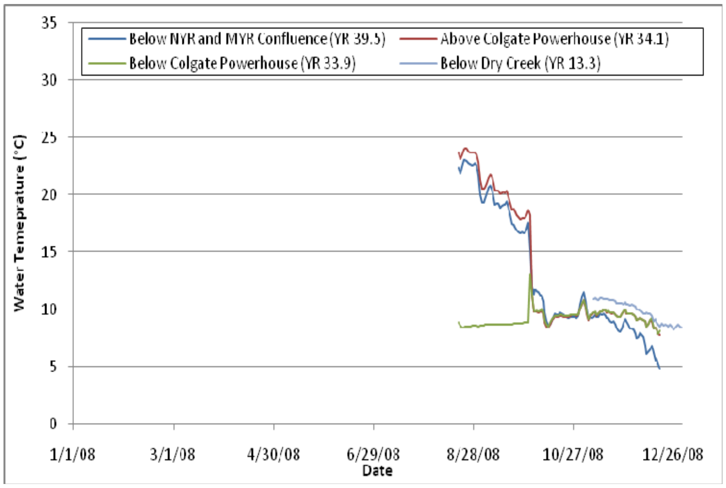

Figure 7.2.9-20. Mean daily water temperatures at four locations in the Yuba River in 2008.

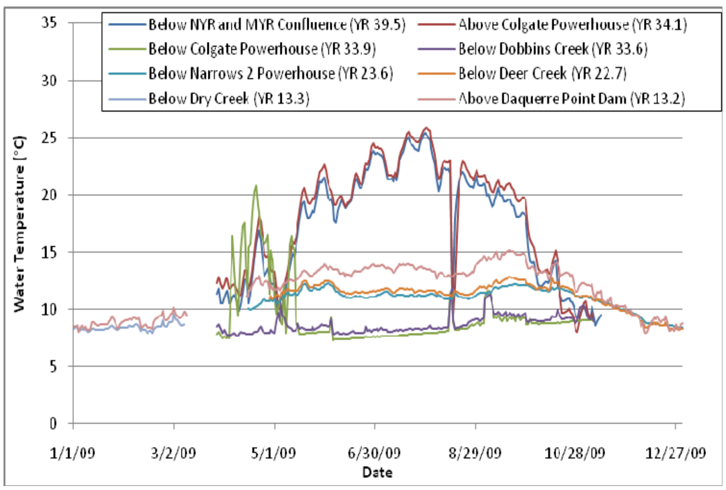

Figure 7.2.9-21. Mean daily water temperatures at eight locations in the Yuba River in 2009.

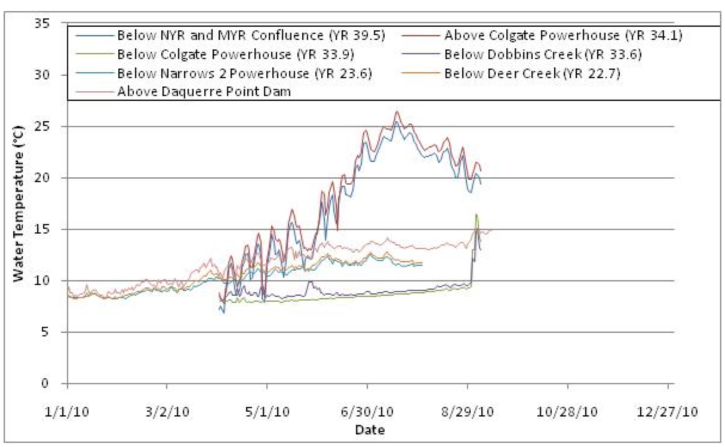

Figure 7.2.9-22. Mean daily water temperatures at seven locations in the Yuba River in 2010.

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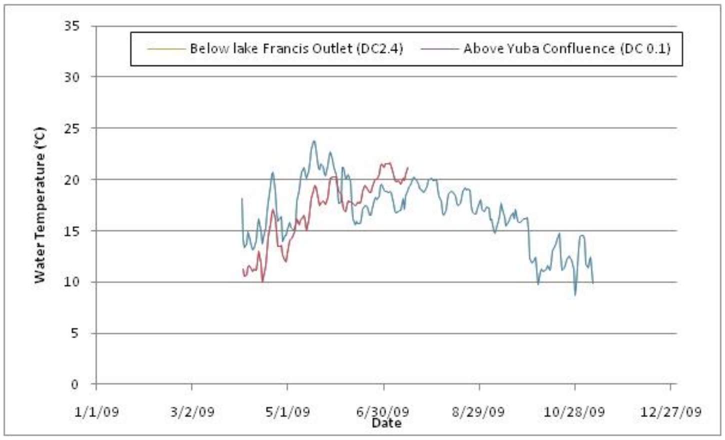

Figure 7.2.9-23. Mean daily water temperatures in Dobbins Creek in 2009.

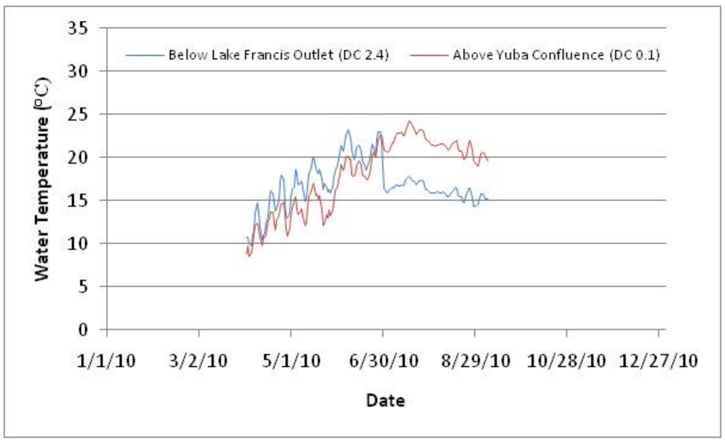

Figure 7.2.9-24. Mean daily water temperatures in Dobbins Creek in 2010.

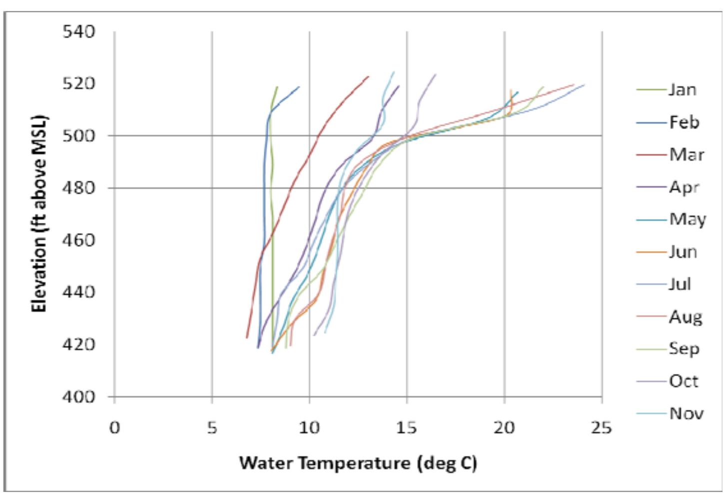

Figure 7.2.9-25. Monthly temperature profiles of USACE's Englebright Reservoir in 2008. Note that data were unavailable for December.

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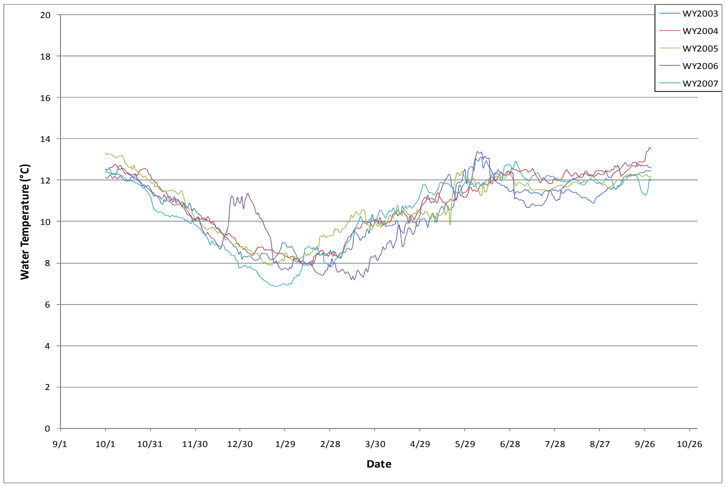

Figure 7.2.9-26. Mean daily water temperatures in the Yuba River at Smartsville (YR 23.6) from 2003 through 2007.
Source: YCWA

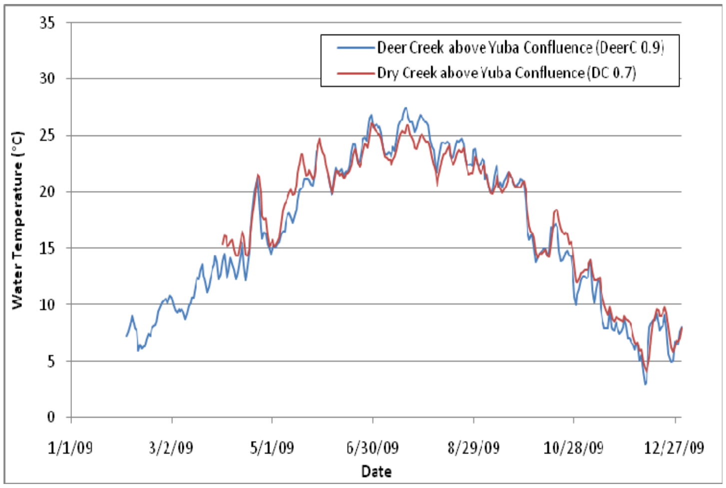

Figure 7.2.9-27. Mean daily water temperatures in Deer Creek and Dry Creek in 2009.

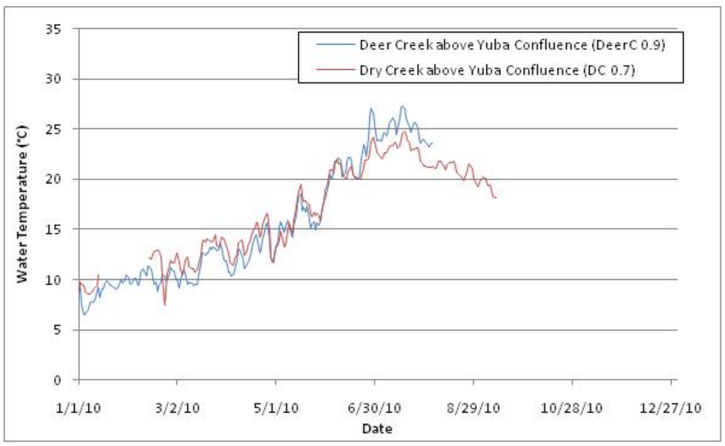

Figure 7.2.9-28. Mean daily water temperatures in Deer Creek and Dry Creek in 2010.

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7.2.9.1.3 Water Temperature Downstream of the Project Area

Licensee began collecting continuous water temperature data downstream of the Project Area (i.e., on the Yuba River downstream of the USACE's Daguerre Point Dam) in 2003 (Table 7.2.9-1). Figure 7.2.9-29 through Figure 7.2.9-30 provide mean daily temperature measurements for Water Year 2003 through Water Year 2007 between USACE's Daguerre Point Dam and the Yuba River at Marysville. Figure 7.2.9-31 through 7.2.9-36 provide an overlay comparison of Licensee data collection that began in summer 2008 for locations downstream of USACE's Daguerre Point Dam. Data collection is continuing through 2010.

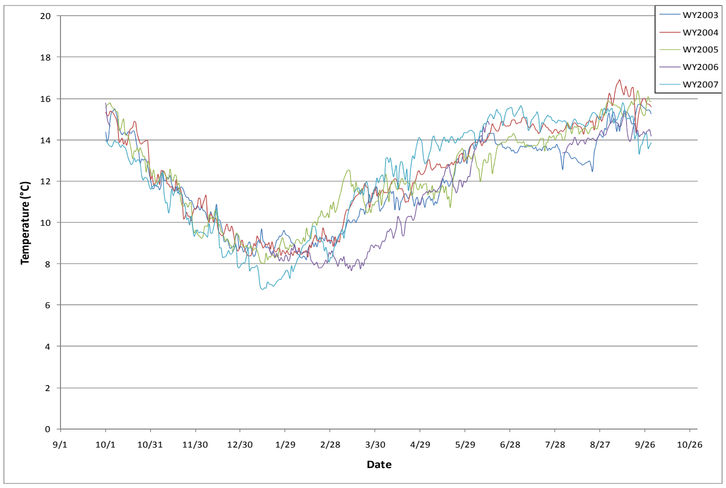

Figure 7.2.9-29. Mean daily water temperatures in the Yuba River at USACE's Daguerre Point Dam Fish Ladder from 2003 through 2007.
Source: YCWA.

Figure 7.2.9-30. Mean daily water temperatures in the Yuba River at USGS' Marysville gage from 2003 through 2007.
Source: YCWA

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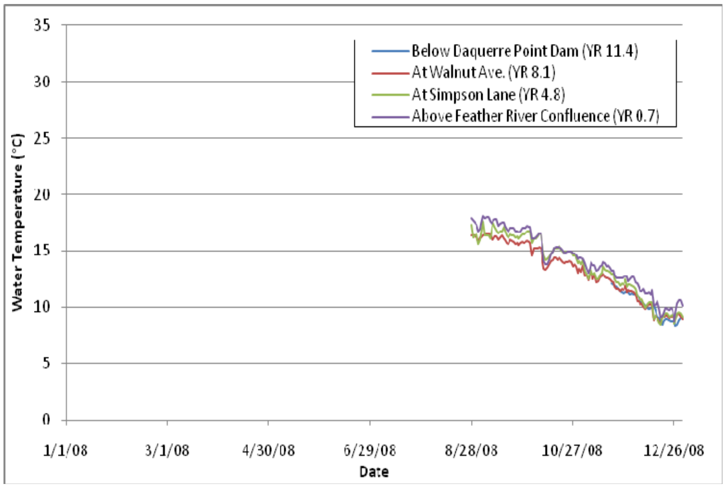

Figure 7.2.9-31. Mean daily water temperatures in the Yuba River downstream of USACE's Daguerre Point Dam in 2008.
Source: YCWA.

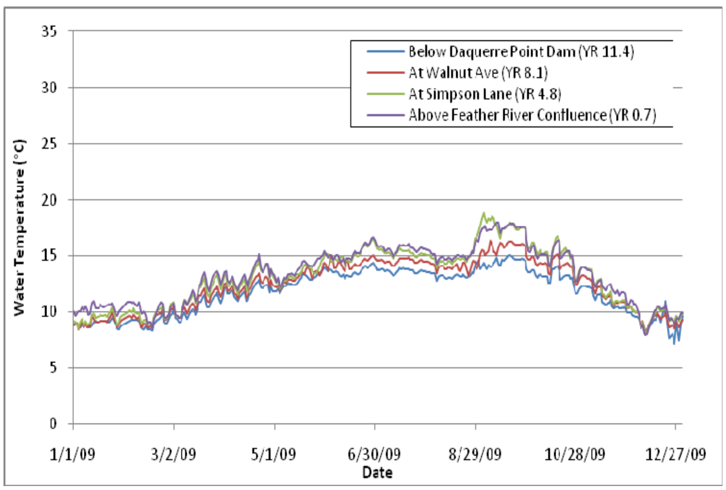

Figure 7.2.9-32. Mean daily water temperatures in the Yuba River downstream of USACE's Daguerre Point Dam in 2009.
Source: YCWA.

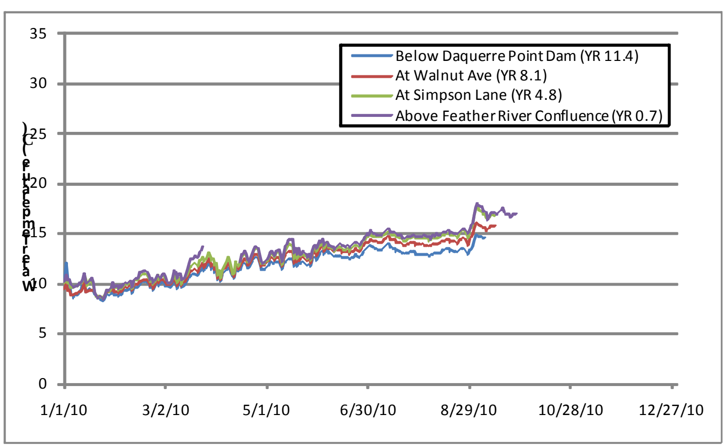

Figure 7.2.9-33. Mean daily water temperatures in the Yuba River downstream of USACE's Daguerre Point Dam in 2010.
Source YCWA.

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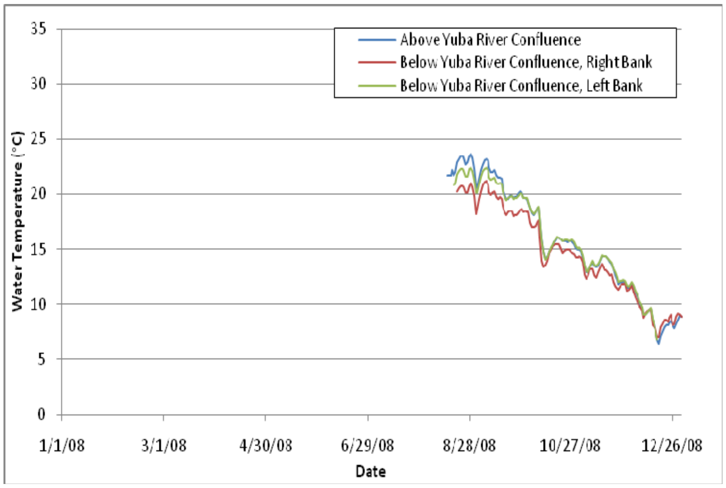

Figure 7.2.9-34. Mean daily water temperatures in the Feather River near the Yuba River confluence in 2008.
Source: YCWA.

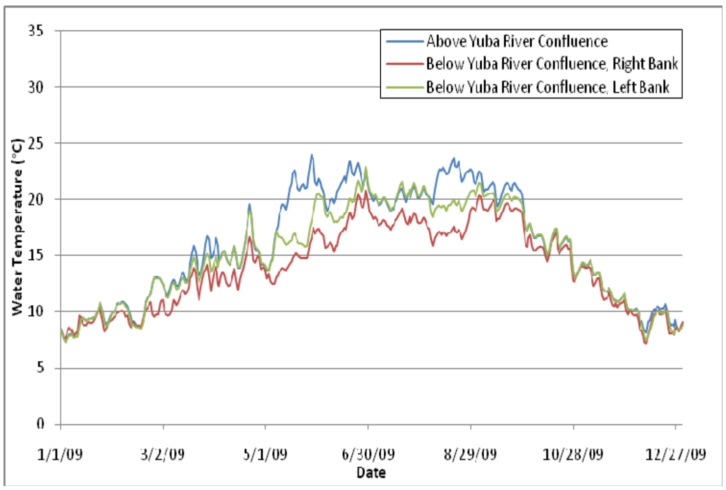

Figure 7.2.9-35. Mean daily water temperatures in the Feather River near the Yuba River confluence in 2009.
Source: YCWA.

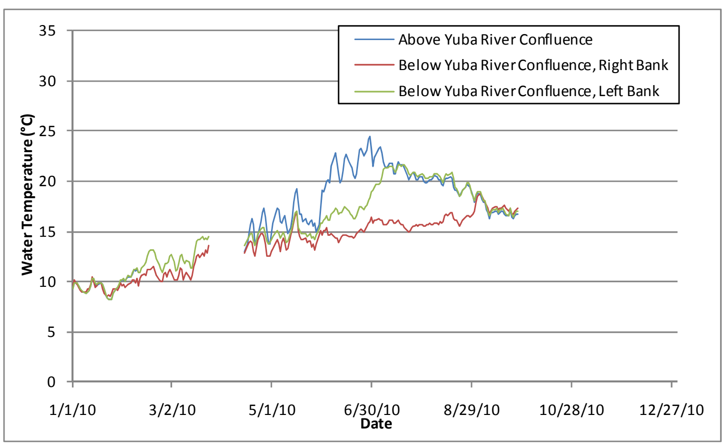

Figure 7.2.9-36. Mean daily water temperatures in the Feather River near the Yuba River confluence in 2010.
Source: YCWA.

7.2.9.2 Water Chemistry

Water chemistry data were obtained from samples collected upstream, within, and downstream of the Project.

7.2.9.2.1 Water Chemistry Upstream of the Project Area

Surface water flows into Project facilities from several sources: the North Yuba River; Oregon Creek at the Log Cabin Diversion Dam impoundment; the Middle Yuba River at Our House Diversion Dam impoundment; and the South Yuba River at USACE's Englebright Reservoir. Existing, relevant, and reasonably available water chemistry information for stream reaches upstream of the Project (i.e., on the Middle Yuba River upstream of Our House Diversion Dam, on Oregon Creek upstream of Log Cabin Diversion Dam, and on the North Yuba River upstream of New Bullards Bar Reservoir) is summarized in Table 7.2.9-2 and described further below. The contents of these source documents, as well as anecdotal information, are described.

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Table 7.2.9-2. Existing and relevant water chemistry data upstream of the Project Area.

Location	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (μg/L)	Metals (μg/L)	Pesticides (μg/L)	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
NORTH YUBA RIVER											
North Yuba River below Slate Creek	NYR 18	7/58 – 4/68	8.89 - 11.11	7.1 - 7.8	10.6- 10.8	--	--	--	27 - 61	Nitrate dissolved 0.2 - 0.5	STORET 2009
		10/71 – 6/72	--	1.0 - 11.0	--	20-30	Mercury filtered 0.4 - 0.6 Mercury unfiltered 0.2	Assorted pesticides—Not Detected	18-39	Nitrate + nitrite 0 - 0.04 Orthophosphate dissolved 0 - 0.06	USGS 2009
North Yuba River Upstream of New Bullards Bar Reservoir	NYR 17	2001	--	7-8.1	8.3-12.3	--	--	--	--	Nitrate + nitrite 0.025 - 0.05	SYRCL 2005 *In* YCWA, et al. 2007
		09/09	8.8	8.3	10.2	60.2	Trace metals	--	72	Nitrate + nitrite Not detected Orthophosphate 0.028 J	Attachment 7.2B
OREGON CREEK											
Oregon Creek above Log Cabin Diversion	OC 4.2	09/09	15.9	8.1	9.7	1770	Trace metals	--	90	Nitrate + nitrite 0.08 J Orthophosphate Not detected	Attachment 7.2B
Oregon Creek below Log Cabin Diversion	OC 4.1	09/09	16.1	7.8	7.9	56	Trace metals	--	79	Nitrate + nitrite Not detected Orthophosphate Not detected	Attachment 7.2B
MIDDLE YUBA RIVER											
Middle Yuba River Upstream of Our House Dam[1]	MYR 12.1	5/08–10/08	8.4 – 24.4	--	--	--	--	--	--	--	NID and PG&E 2010e
	MYR 12.1 and upstream	2001-2007	1.8-22.7	5.6-8.5	2.2-14.5	--	Arsenic 15.8 (avg)	--	--	--	SYRCL 2007
	MYR 12.1 and upstream	7/98 – 9/98	7.3 – 25.3	--	--	--	--	--	--	--	USFWS 1999
	MYR 12.1	09/09	18.3	7.5	8.2	83	Trace metals	--	75	Nitrate + nitrite 0.07 J Orthophosphate Not detected	Attachment 7.2B

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Table 7.2.9-2. (continued)

Location	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (µg/L)	Metals (µg/L)	Pesticides (µg/L)	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
Middle Yuba River Downstream of Our House Dam	MYR 12.0	09/09	18.0	7.3	7.7	31.8	Trace metals	--	64	Nitrate + nitrite Not detected Orthophosphate Not detected	Attachment 7.2B
Middle Yuba River Below Oregon Creek	MYR 4.3	10/52-10/67	9.4-17	6.4-7.9	8.5-11	--	Arsenic 0.20	--	23-72	0	STORET 2009
	MYR 4.3	7/98 – 9/98	17.3 – 25.5	--	--	--	--	--	--	--	USFWS 1999
Middle Yuba River at Freemans Crossing	MYR 4	5/65-10/67	10.8	--	--	--	--	--	--	--	STORET 2009
SOUTH YUBA RIVER											
South Yuba River below Lake Spaulding	--	--	--	--	--	--	--	--	--	--	--
South Yuba River Below Canyon Creek	SYR 32.5	6/08-8/08	15.5-18.8	7.3-7.8	7.3-7.3	<10	Methyl-mercury, dissolved <0.050 µg/L Lead <0.04	--	26	Nitrate + nitrite <0.1-0.15	NID and PG&E 2010e
South Yuba River at Jones Bar	SYR 6.2	4/58 – 4/68	11.94 - 12.78	6.4 - 7.3	10.2 - 11.8	--	--	--	18.9 - 27	--	STORET 2009
South Yuba River at Bridgeport	SYR 0.1	10/57 – 4/68	12.78 - 22.22	7.2 - 8.0	7.7 - 11.5	--	--	--	23 - 56	--	STORET 2009
		09/09	20.9	79	7.3	35.5	Trace metals	--	48	Nitrate + nitrite Not detected Orthophosphate Not detected	Attachment 7.2B

[1] Includes SYRCL sampling sites 7, 8, 27, 37, and 46.
OC Oregon Creek
MYR Middle Yuba River
NYR North Yuba River
SYR South Yuba River

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Source Information

Licensee found five source documents[4] of relevant information regarding existing water quality in the Yuba River watershed upstream of the Project Area.

Licensee's Summer 2009 Data

Information regarding water quality upstream of the Project Area was gathered during the low flow summer season in 2009, a period when Project operation and maintenance (O&M) effects were expected to be most pronounced, if they occur (Attachment 7.2B). Samples were collected upstream of the Project Area from the North Yuba River, Oregon Creek, the Middle Yuba River, and the South Yuba River. Each sample was analyzed for 35 analytes.

Surface water samples were collected between September 15 and 17, 2009. Temperatures ranged between 8.8 to 20.9 degrees Centigrade (°C). The sample collected in the South Yuba River upstream of Lake Englebright had the temperature of 20.9°C. Dissolved oxygen (DO) was generally between 7.3 and 9.5 milligrams per liter (mg/L). pH ranged between 7.3 and 10.2 standard units (su), while turbidity ranged from non-detect to 14.5 Nephelometric Turbidity Units (NTU) and hardness ranged from 48 to 90 mg/L.

NID's Yuba-Bear and PG&E's Drum-Spaulding Hydroelectric Project Relicensing Studies

Water quality and water temperature monitoring studies are on-going in the Middle and South Yuba rivers upstream of the Project as part of the Federal Energy Regulatory Commission (FERC) relicensing of NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project. The closest upstream sample locations to the Project were the Middle Yuba River below Jackson Meadows Dam and the South Yuba River below the Canyon Creek confluence. Data were collected at these locations during the spring and summer of 2008 (NID and PG&E 2010e). Samples were analyzed for general chemistry, inorganic ions, metals, including methylmercury and mercury, and nutrients. Analyte concentrations were below aquatic toxicity benchmarks set forth by the EPA (EPA 2000; 2003), the CVRWQCB, and others in both seasons.

SFWPA's South Feather Power Project Relicensing Studies

Water temperature monitoring studies were conducted in 2004 and 2005 as part of SFWPA's South Feather Power Project relicensing (FERC No. 2088). Stream temperature monitoring results on Slate Creek below SFWPA's Slate Creek Diversion Dam, a tributary to the North Yuba River, are included in this section were reviewed.

South Yuba River Citizens League (2000-2009)

South Yuba River Citizens League has been performing monitoring since 2000 (SYRCL 2010). collected samples from the North Yuba River just upstream of New Bullards Bar Reservoir during an 8- to 12-month period in 2001 (SYRCL 2006). Seven samples were collected for six general water quality parameters: pH (7-8.1), turbidity (0-45 NTU), dissolved oxygen (8.3-12.3 mg/L), total organic carbon (TOC) (0.59-2.6 mg/L), nitrate-nitrite (0.025-0.05 mg/L), and electrical conductivity (20-30 microSiemens (µS)/cm).

[4] A "source document" contains original data collected by the authors and associated conclusions, interpretations and other information developed *de novo* by the authors.

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SYRCL collected *Escherichia coli* (*E. coli*) samples at various locations in the South Yuba and Middle Yuba rivers. In the upper reaches of these river systems, including the Jackson Meadows Dam Reach, *E. coli* concentrations were extremely low (0 MPN (most probable number)/100ml to 1 MPN/100ml). In the lower reaches of the South Yuba River, *E. coli* were more abundant, but still relatively low (0 MPN/100ml to 40 MPN/100ml).

In the Middle Yuba River, all of the average levels of bacteria and metals data collected by SYRCL, except for arsenic, are within EPA's drinking water standards (SYRCL 2006). The EPA standard for arsenic is 10 parts per billion (ppb), while the average measured arsenic level in the Middle Yuba River is 15.84 ppb. Kanaka Creek, which feeds into the Middle Yuba River 4 miles upstream of Our House Diversion Dam, is listed under Section 303(d) of the Clean Water Act as "impaired" due to arsenic levels and contributes to the measured high levels of arsenic (SYRCL 2007). This site accounted for the highest measured level of arsenic (47.2 ppb in August 2002).

SYRCL provided water quality data collected between 2001 and 2007 from five sites along the Middle Yuba River upstream of the Project: Site 7 (Below Jackson Meadows Reservoir); Site 8 (Plumbago Crossing above Kanaka Creek); Site 27 (Kanaka Creek); Site 37 (Milton Reservoir); Middle Fork downstream of Jackson Meadows; and Site 46 (Our House Dam Pike). The overall minimum and maximum conductivity values were 10 μS/cm and 430 μS/cm, respectively. The average conductivity was 102.9 μS/cm. The overall minimum and maximum DO values were 2.2 mg/L and 14.5 mg/L, respectively. The average DO value was 9.9 mg/L. The overall minimum and maximum water temperature values were 1.8°C and 22.7°C, respectively. The overall average water temperature value was 10.7°C. The overall minimum and maximum turbidity values were 0 NTU and 6.89 NTU, respectively. The average turbidity value was 0.29 NTU. The overall minimum and maximum pH values were 5.6 and 8.5, respectively. The average pH value was 7.2.

SYRCL monitored total suspended solids (TSS), and bacterial levels at the five sites (#7, 8, 27, 37 and 46) as well. For these years, TSS averaged 2.36 mg/L with a high of 9.4 mg/L. The levels of *E. coli* averaged 9.74 MPN/100mL with a high of 101.7 MPN/100ml.

SYRCL provided temperature data to the CVRWQCB for the South Yuba River between Lake Spaulding and USACE's Englebright Reservoir for the years 2001 to 2006 (CVRWQCB 2009). In 2009, the CVRWQCB recommended that the South Yuba River be identified as impaired for temperature.

<u>USFWS</u>

USFWS performed a stream and reservoir water temperature study of the Yuba River and its upstream tributaries in 1998-1999, in order to "*formulate and implement a water temperature monitoring program that was sufficiently comprehensive to provide an initial basin-wide estimate of thermal diversity in the Yuba River watershed under current conditions*. (USFWS 1999)" Field data collection was performed in summer 1998, and the data collection network extends to reaches upstream of, within, and downstream of the Project. Bi-weekly water temperature profiles were taken at the Licensee's New Bullards Bar Reservoir and USACE's Englebright Reservoir.

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Anecdotal Information

Licensee found three sources of anecdotal information that may be relevant to water quality upstream of the Project Area. The contents of these anecdotal sources are described here.

EPA's STORET Database

Surface water quality data were retrieved for the Project Area from the STORET database management system on May 7, 2009 (EPA 2009). Results of the STORET query yielded six observations above the Project on the North Yuba River, six observations above the Project on the Middle Yuba River, and 10 observations above the Project on the South Yuba River. Summarized in Table 7.2.9-2, all data reflect surface water quality between 1952 and 1968.

Sierra Foothill Research and Extension Center

Bordering USACE's Englebright Reservoir, the Sierra Foothill Research and Extension Center (REC) is one of nine agricultural research and extension centers in California administered by the University of California, Division of Agriculture & Natural Resources. It provides land, labor, facilities and management for agricultural research in oak woodland habitats, particularly range management.

One area of research for the Sierra Foothill REC is studying how water flowing through foothill woodlands is affected by such land management activities, such as oak tree removal and livestock grazing. This includes studies of how dissolved organic carbon and bacteria, such as total coliform and *E. coli*, are transported to streams located on the property used for grazing. Although no chemical data from Project waters were found from this source, scoping research performed by one researcher was informative. SYRCL is concerned with bacteria levels in Yuba surface water yet no data besides the SYRCL data were found. Chu et al. (2008) confirms that Yuba County agencies have not conducted any bacterial monitoring of freshwater recreational areas.

USGS National Water Information System

Surface water quality data were retrieved for the Project Area from the USGS NWIS database management system on May 7, 2009 (USGS 2009). Results of the NWIS query yielded one observation above the Project on the North Yuba River, two observations above the Project on the Middle Yuba River below the confluence with Oregon Creek, and no observations above the Project on the South Yuba River (USGS 2009). Summarized in Table 7.2.9-2, all data reflect surface water quality between 1960 and 2004.

7.2.9.2.2 Water Chemistry within the Project Area

Existing, relevant, and reasonably available water chemistry information collected from the Project is summarized in Table 7.2.9-3 and described below. The contents of these source documents, as well as anecdotal information, are described.

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Table 7.2.9-3. Existing and relevant water quality data within the Project Area.

Location	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (µg/L)	Metals (µg/L)	Pesticides	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
NEW BULLARDS BAR RESERVOIR											
Bullards Bar Reservoir Near Little Oregon Creek	NYR 4.4	5/65	15	7.5	--	--	--	--	30	--	STORET 2009
Bullards Bar Reservoir Near North San Juan	NYR 3.8	10/67	8.33-25.00	6.8 - 7.8	1.8 - 8	--	--	--	--	--	STORET 2009
Bullards Bar Reservoir Near Dam	NYR 3.1--surface	09/09	23.2	8.4	7.7	15.5	Trace metals	--	38	Nitrate + nitrite Not detected Orthophosphate 0.028 J	Attachment 7.2B
	NYR 3.1--bottom	09/09	7.4	7.2	8.02	14.5	Trace metals	--	34	Nitrate + nitrite Not detected Orthophosphate 0.028 J	Attachment 7.2B
NEW BULLARDS BAR DAM REACH											
North Yuba River at Bullards Bar Powerhouse	NYR 3	10/52 – 5/65	11.11 - 22	7.5 - 7.8	8.0	--	--	--	--	--	STORET 2009
		09/09	8.8	8.3	10.2	43.9	Trace metals	--	36	Nitrate + nitrite 0.08 J Orthophosphate Not detected	Attachment 7.2B
MIDDLE/NORTH YUBA RIVER REACH											
Yuba River Above New Colgate Powerhouse	YR 34.2	4/58-4/68	6.7-27	6.7-9.3	6.7-12.7	dissolved 20	Arsenic dissolved 10	--	19-76	Nitrate/Nitrite 0.2-1.0	STORET 2009
		10/02	12.0	7.9	5.9	--	--	--	--	--	USGS 2009
NEW COLGATE POWERHOUSE REACH											
Below New Colgate Powerhouse	YR 33.7	1/01 – 6/02	5.0 - 14.0	6.4 - 7.9	8.3 - 13.2	--	--	--	--	Trace amounts of nitrate, nitrite, ammonia & phosphates.	USGS 2009
		2000-2009	7.1-18.4	6.8-8.6	9.5-14.5	--	--	--	--	--	SYRCL 2010
		09/09	8.4	7.7	10.1	43	Trace metals	--	34	Nitrate + nitrite 0.09 J Orthophosphate Not detected	Attachment 7.2B

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Table 7.2.9-3. (continued)

Location	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (µg/L)	Metals (µg/L)	Pesticides	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
USACE'S ENGLEBRIGHT RESERVOIR											
USACE's Englebright Reservoir Near Dam	YR 24 -- surface	09/09	20.0	8.3	9.2	21.3	Trace metals	--	36	Nitrate + nitrite Not detected Orthophosphate Not detected	Attachment 7.2B
	YR 24 -- bottom	09/09	9.1	7.4	6.1	19.6	Trace metals	--	21	Nitrate + nitrite 0.12 J Orthophosphate Not detected	Attachment 7.2B
NARROWS 2 POWERHOUSE REACH											
Yuba River below USACE's Englebright Dam	YR 23.6	5/71	18.89	7.2	9.8	--	Mercury, total non-detect	--	--	--	STORET 2009
		10/60 - 3/66	N/A	7.1 - 8.2	--	dissolved 0 - 10	--	--	18 - 86	Nitrate dissolved, filtered 0 - 5.6	STORET 2009
		12/66-11/99	7.0 - 21.5	7.1 - 8.6	6.4 - 15.9	dissolved <10 – 86	Trace amounts of mercury	--	--	Nitrate dissolved, filtered 0 – 0.7	USGS 2009
		2/01 - 5/04	8.0 - 16.0	6. 3 -8.3	7 - 15.4	--	--	Trace amounts of pesticides	--	Trace amounts of nitrate, nitrite, ammonia & phosphates.	USGS 2009
		10/03-4/05	--	7.25-7.48	--	--	Copper 0.3-0.8 Mercury 0.00047-00371 Zinc 1-10.8	--	--	Nitrate + Nitrite Non-Detect Orthophosphate (filtered) 0.02-0.02	Jones & Stokes 2005
Parks Bar Bridge (Hwy 49)	YR 18	4/51-9/69	3.89-25.56	6.7- 8.4	7.5-14	--	--	--	17- 66	--	STORET 2009
Yuba River at Smartville	YR 23.6	3/60-3/66	--	7.3-8.1	--	--	--	--	21-62	--	USGS 2009
		09/09	11.4	7.6	7.5	64.0	Trace metals	--	37	Nitrate + nitrite 0.07 J Orthophosphate Not detected	Attachment 7.2B

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Table 7.2.9-3. (continued)

Location	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (µg/L)	Metals (µg/L)	Pesticides	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
DEER CREEK (*tributary creek in the Project vicinity but not a Project-affected reach*)											
Deer Creek	Confluence @ YR 23	10/57-9/69	8.3-25	7.3-8.2	8.5-12.7	--	--	--	29-73	Nitrite, dissolved 0.1-1.3	STORET 2009
		09/09	12.4	7.8	9.5	43.9	Trace metals	--	36	Nitrate + nitrite Not detected Orthophosphate Not detected	Attachment 7.2B
USACE'S DAGUERRE POINT DAM IMPOUNDMENT											
USACE's Daguerre Point Dam Impoundment	YR 11.4 to 11.5	*After a review of the data resources listed above, the Licensee is unaware of existing water quality data for this area.*									

Note:
NYR North Yuba River
SYR South Yuba River
YR Yuba River

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Source Information

Licensee found three source documents with relevant information regarding existing water quality in the Project Area. The contents of these source documents, as well as anecdotal information, are described here.

Licensee's Summer 2009 Data

Information regarding water quality in the Project Area was gathered during the low flow summer season in 2009, a period when Project O&M effects were expected to be most pronounced, if they occur (Attachment 7.2B). The study consisted of two elements: a general water quality element and a recreation element. The general water quality element consisted of collecting samples from the reservoirs and stream reaches of the Project Area and analyzing each sample for 35 analytes. The recreation study element consisted of collecting bacteria samples five times over 30 days, including one day on the Labor Day weekend. Secchi disc measurements were also made within reservoirs.

Surface water samples were collected between September 14 and 17, 2009. Temperatures ranged between 7.43 to 23.3 degrees °C. Dissolved oxygen was generally between 7.3 and 9.5 mg/L. Ph ranged between 6.1 (within Englebright Reservoir's hypolimnion) and 10.2 standard unit (su), while turbidity ranged from non-detect to 147.2 NTU and hardness ranged from 21 to 38 mg/L. The Secchi disc measurement for New Bullards Bar was 9 feet and for USACE's Englebright Reservoir, the Secchi disc depth was 12 feet. Within Project facilities, metals and dissolved metals concentrations were either non-detect using laboratory methods or present in trace amounts.

The recreation study element consisted of collecting samples adjacent to New Bullards Bar Reservoir's Emerald Cove and Dark Day Campground boat ramps on five separate days over a 30-day period that included the Labor Day weekend. Bacteria counts were made for these samples. Fecal coliform and *E. coli* were not found, while total coliform was found.

Lake Wildwood Wastewater Treatment Plant Improvement Project. Phase IIA Baseline Yuba River Technical Studies

From 2003 to 2005, the lake Wildwood Wastewater Treatment Plant is not within the Project Area, but on Deer Creek. However, the Lake Wildwood community conducted several studies in the Project Area to explore changing its wastewater discharge location from Deer Creek to the Yuba River below USACE's Englebright Reservoir (Jones & Stokes 2005). Water quality samples collected from the Yuba River below USACE's Englebright Reservoir from 2003 to 2005 were analyzed for pesticides, selected metals, nutrients, and water treatment by-products. Pesticides were not detected. Of the metals analyzed, aluminum ranged between 18.8 and 125 microgram/Liter (μg/L), copper ranged between 0.3 and 0.8 μg/L, mercury ranged between 0.00047 and 0.00371 μg/L, and zinc ranged from 1 to 10.8 μg/L. Silver and lead were not detected. Other constituents measured included: pH (7.24-7.48 su), specific conductance (74-79 μmhos/cm), TOC (<0.6-2.1 mg/L), nitrate + nitrite (<0.03 - <0.06 mg/L), and electrical conductivity (20-30 μS/cm).

USFWS

USFS performed a stream and reservoir water temperature study of the Yuba River and its upstream tributaries in 1998-1999, in order to "*formulate and implement a water temperature monitoring program that was sufficiently comprehensive to provide an initial basin-wide estimate of thermal diversity in the Yuba River watershed under current conditions*. (USFWS 1999)" Field data collection was performed in summer 1998, and the data collection network extends to reaches upstream of, within, and downstream of the Project. Bi-weekly water temperature profiles were taken at Licensee's New Bullards Bar Reservoir and USACE's Englebright Reservoir. Summary results are presented in Table 7.2.9-2.

Anecdotal Information

Licensee found five sources of anecdotal information that may be relevant to water quality in the Project Area. The contents of these anecdotal sources are described here.

EPA's STORET Database

Surface water quality data were retrieved for the Project Area from the STORET database management system on May 7, 2009 (EPA 2009). Results of the STORET query yielded four observations within New Bullards Bar Reservoir. All data reflect surface water quality between 1952 and 1967. Data were also found from four locations between New Bullards Bar Reservoir and USACE's Daguerre Point Dam. Of the four locations, the water quality below USACE's Englebright Reservoir has been sampled the most; STORET contains over 300 sample results of samples collected between 1960 and 1971.

Sierra Foothill Research and Extension Center

Bordering USACE's Englebright Reservoir, the Sierra Foothill REC is one of nine agricultural research and extension centers in California administered by the University of California, Division of Agriculture & Natural Resources. It provides land, labor, facilities and management for agricultural research in oak woodland habitats, particularly range management.

One area of research for the Sierra Foothill REC is studying how water flowing through foothill woodlands is affected by such land management activities, such as oak tree removal and livestock grazing. This includes studies of how dissolved organic carbon and bacteria, such as total coliform and *E. coli*, are transported to streams located on the property used for grazing. Although no chemical data from Project waters were found from this source, scoping research performed by one researcher was informative. SYRCL is concerned with bacteria levels in Yuba surface water, yet no data besides the SYRCL data were found. Chu et al. (2008) confirms that Yuba County agencies have not conducted any bacterial monitoring of freshwater recreational areas.

pH

Upon review of the data resources listed above, Licensee found that Deer Creek, a tributary creek in the Project vicinity but not a Project-affected reach, has been identified as impaired for pH (SWRCB 2006).

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South Yuba River Citizens League

Since 2000, as weather and access have allowed, SYRCL has been sampling up to 33 sites in the Yuba River watershed for dissolved oxygen, pH, conductivity, temperature, turbidity, total suspended solids, and some metals (arsenic, mercury), sometimes as often as monthly (SYRCL 2010). Based on these data, SYRCL has identified arsenic, bacteria, and mercury as constituents of concern in the watershed (SYRCL 2006, 2010). In the Project Area, SYRCL has been sampling downstream of Colgate Powerhouse, measured constituents consisted of pH (6.8-8.6 su), DO (9.5-14.5 mg/L), temperature (7.1-18.4 C), turbidity (0-16.6 NTU), and electrical conductivity (60-143 µS/cm).

USGS National Water Information System

Surface water quality data were retrieved for the Project Area from the USGS NWIS database management system on May 7, 2009 (USGS 2009). Results of the NWIS query yielded one observation above the Project on the North Yuba River; two observations above the Project on the Middle Yuba River below the confluence with Oregon Creek, and no observations above the Project on the South Yuba River. Summarized in Table 7.2.9-3, all data reflect surface water quality between 1960 and 2004.

7.2.9.2.3 Water Chemistry Downstream of the Project Area

Existing, relevant, and reasonably available water chemistry information for stream reaches downstream of the Project Area (i.e., on the Yuba River downstream of USACE's Daguerre Point Dam is summarized in Table 7.2.9-4 and described further, below. The contents of these source documents, as well as anecdotal information, are described.

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Table 7.2.9-4. Existing and relevant water quality data downstream of the Project Area.

River Reach	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (µg/L)	Metals (µg/L)	Pesticides (µg/L)	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
USACE'S DAGUERRE POINT DAM REACH											
Below USACE's Daguerre Point Dam	YR 11.3	10/67-4/68	13.6-18.3	7.7-8.1	9.9-11.5	--	--	--	32-52	--	STORET 2009
		09/09	14.3	7.7	7.3	14.0	Trace metals	--	37	Nitrate + nitrite Not detected Orthophosphate Not detected	Attachment 7.2B
Yuba River at Walnut Avenue	YR 8.1	09/09	16.6	8.1	8.7	33.2	Trace metals	--	38	Nitrate + nitrite Not detected Orthophosphate Not detected	Attachment 7.2B
Yuba River at Marysville	YR 0.7	10/67-6/82	3.33-27.22	6.6-8.1	8.0-16.2	--	--	--	20-90	--	STORET 2009
		12/76-11/95	7 – 21.5	7.1-8.6	7.3-12.5	<10-30	Not-detected	--	23-56	Trace nutrients	USGS 2009
		1996-98		7-7.8	8.-12	--	Mercury, total 1.19-46.7 ng/L	--	--	Nitrate-Nitrite 0.05-0.14	LWA 2000
		2002-04		7.1-7.4	8.4-14.2	--	--	--	--	Nitrate-Nitrite <0.01-0.08	CDWR 2006
		09/09	16.1	8.0	7.7	243	Trace metals	--	40	Nitrate + nitrite Not detected Orthophosphate Not detected	Attachment 7.2B

su standard units
YR Yuba River

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Source Information

Licensee found four source documents with relevant information regarding existing water quality downstream of the Project Area. The contents of these source documents, as well as anecdotal information, are described here.

Licensee's Summer 2009 Data

Information regarding water quality in downstream of the Project was gathered during the low flow summer season in 2009, a period when Project O&M effects were expected to be most pronounced, if they occur (Attachment 7.2B). Samples were collected downstream of the Project in the Lower Yuba River from three locations. Each sample was analyzed for 35 analytes.

Surface water samples were collected between September 14 and 17, 2009. Temperatures ranged between 14.3 to 16.6 °C. DO was observed between 7.3 and 8.7 mg/L and pH ranged between 7.7 and 8.1 su. Turbidity and hardness increased from upstream to downstream: turbidity ranged from 1.2 to 15.4 NTU and hardness ranged from 37 to 40 mg/L.

Sacramento River Watershed Program

The Sacramento River Watershed Program collected 27 samples over a 3-year period between 1996 and 1998 from a site near Marysville directly upstream of the Yuba River's confluence with the Feather River (LWA 2000). Samples were analyzed for pH (7-7.8 su), turbidity (1-153 mg/L), DO (8-12 mg/L), TOC (0.7-2.4 mg/L), nitrate-nitrite (0.05-0.14 mg/L), electrical conductivity (EC; 44-105 µS/cm), and mercury (total; 1.19-46.7 nanogram (ng)/L). Samples collected in the earliest rounds were also analyzed for seven trace metals which were taken off the analyte list in 1999, after these metals were found only in concentrations consistently below drinking water criteria (LWA 2000).

Oroville Relicensing Water Quality Study

In support of the Oroville Dam's relicensing effort, between 2002 and 2004, CDWR collected 30 samples from a site near Marysville, directly upstream of the Yuba River's confluence with the Feather River (DWR 2004b). CDWR analyzed each sample for more than 50 analytes, including total and dissolved metals. General chemistry results were pH (7.1-7.4 su), turbidity (0.5-17.2 mg/L), DO (8.4-14.2 mg/L), TOC (0.8-3.6 mg/L), nitrate-nitrite (<0.01-0.08 mg/L), and electrical conductivity (76-28 µS/cm).

USFWS

USFWS performed a stream and reservoir water temperature study of the Yuba River and its upstream tributaries in 1998-1999, in order to *"formulate and implement a water temperature monitoring program that was sufficiently comprehensive to provide an initial basin-wide estimate of thermal diversity in the Yuba River watershed under current conditions.*(USFWS 1999)*"* Field data collection was performed in summer 1998, and the data collection network extends to reaches upstream of, within, and downstream of the Project. Bi-weekly water temperature profiles were taken at the Licensee's New Bullards Bar Reservoir and USACE's Englebright Reservoir. Summary results are presented in Table 7.2.9-2.

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Anecdotal Information

Licensee found four sources of anecdotal information that may be relevant to water quality downstream of the Project Area. The contents of these anecdotal sources are described here.

EPA's STORET Database
Surface water quality data were retrieved for the Project Area from the STORET database management system on May 7, 2009 (EPA 2009). As shown in Table 7.2.9-4, results of the STORET query yielded observations from two locations below USACE's Daguerre Point Dam. More than 500 records are available from the site above the confluence with the Feather River. All data reflect surface water quality between 1967 and 1982.

Sierra Foothill Research and Extension Center
Bordering USACE's Englebright Reservoir, the Sierra Foothill REC is one of nine agricultural research and extension centers in California administered by the University of California, Division of Agriculture & Natural Resources. It provides land, labor, facilities and management for agricultural research in oak woodland habitats, particularly range management.

One area of research for the Sierra Foothill REC is studying how water flowing through foothill woodlands is affected by such land management activities, such as oak tree removal and livestock grazing. This includes studies of how dissolved organic carbon and bacteria, such as total coliform and *E. coli*, are transported to streams located on the property used for grazing. Although no chemical data from Project waters were found from this source, scoping research performed by one researcher was found to be informative. SYRCL is concerned with bacteria levels in Yuba surface water, yet no data besides the SYRCL data were found. Chu et al. (2008) confirms that Yuba County agencies have not conducted any bacterial monitoring of freshwater recreational areas.

South Yuba River Citizens League
Since 2000, as weather and access have allowed, SYRCL has been sampling up to 33 sites in the Yuba River watershed for dissolved oxygen, pH, conductivity, temperature, turbidity, total suspended solids, and some metals (arsenic, mercury) (SYRCL 2010). Based on these data, SYRCL has identified arsenic, bacteria, and mercury as constituents of concern in the watershed (SYRCL 2006, 2010).

USGS National Water Information System
Surface water quality data were retrieved for the Project Area from the NWIS database management system on May 7, 2009 (USGS 2009). Results of the NWIS query yielded observations made from 1976 to 1995 on the Yuba River above Marysville.

7.2.9.3 Mercury in the Yuba Watershed

Mercury contamination in sport fish is found to be widespread in water bodies throughout northern California due to both: 1) historic mercury mining in the Coast Ranges; and 2) the use of mercury in the gold extraction processes of the Sierra-Nevada gold mines (CDWR 2007; Davis et al. 2008). In the Sierra-Nevada, a large fraction of the mercury used in hydraulic

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mining of placer ores in the late 1800's was lost during processing and now persists in the environment. Mercury associated with gold mining has been measured in the sediment, water, and biota from the Sierra Nevada's gold mining regions, the Central Valley, the Sacramento-San Joaquin Delta and San Francisco Bay (CDWR 2007; Davis et al. 2008). Mercury is of concern because it is a potent neurotoxin that bioaccumulates in muscle tissue.

Since the early 1990's, the upper Yuba River watershed has been studied by University of California, Davis, and the USGS (Alpers et al. 2005; Hunderlach et al. 1999; May et al. 2000; Slotton et al. 1995 in May et al. 2000; and Slotton et al., in preparation in OEHHA 2009). Findings from these studies indicate that significant amounts of Gold Rush era mercury still exist in sediments, surface water and fish of the upper Yuba watershed. Sediments are being transported downstream into reservoirs on the Yuba River, where they are largely trapped (Hunderlach et al. 1999; Alpers et al. 2005).

Findings from these studies also indicate that fish tissue concentrations of mercury are greater than human health based criteria at some locations. As shown in Table 7.2.9-5, mercury in its bioavailable form, and attributable to historic gold mining, has been found in fish tissue at concentrations above reference concentrations[5] and California's OEHHA 1999 guideline of 0.30 parts per million (ppm) wet-weight in the North Fork Yuba, the Middle Fork Yuba, the South Fork Yuba River, and the lower Yuba River (May et al. 2000; OEHHA 2003; CVRWQCB 2009). Consequently, in the Project Area and its immediate vicinity, New Bullards Bar Reservoir, USACE's Englebright Reservoir, the reaches between New Bullards Bar Reservoir, the Middle Yuba River, the South Yuba River downstream of Lake Spaulding to USACE's Englebright Reservoir, and the Yuba River downstream of USACE's Englebright Reservoir to the Feather River, are all listed or proposed for listing for mercury impairment (Medium TMDL Priority).[6] Further, human-health based fish consumption advisories are also in place for USACE's Englebright Reservoir (OEHHA 2009).[7]

Table 7.2.9-5. Mercury measured in fish tissue collected from the Project Vicinity.

Location	Species Sampled	Number of Fish	Mercury, Total (ppm)[1]	Total Length (mm)	Data Source
UPSTREAM OF THE PROJECT AREA					
North Yuba River near Canyon Creek	Rainbow trout	5	0.19 – 0.14 (avg 0.11)	236 - 311	Slotton et al. (1997)
Middle Yuba River one mile upstream of Plumbago Road	Rainbow trout	5	0.05 - 0.19 (avg 0.11)	292 - 415	CVRWQCB (2009)
Middle Yuba River upstream of Kanaka Creek [one mile upstream of Tyler Foote crossing]	Rainbow trout	9	0.10 - 0.24 (avg 0.16)	210 - 387	

5 Fish tissue, water, and sediment samples taken from the reference locations selected for these studies were non-zero but below regulatory benchmarks, as ambient sources of mercury also exist (May *et al*. 2000; Alpers *et al*. 2005). Ambient sources include aerial deposition from industrial sources and forest fires that release mercury sequestered biomass.

6 Based on a review of the 2006 California 303(d) List and Total Maximum Daily Loads (TMDL) Priority Schedule and its 2009 proposed updates, as shown on the SWRCB's website: http://www.swrcb.ca.gov.

7 OEHHA previously provided consumption advisories for the South Yuba River from Lake Spaulding to USACE's Englebright Reservoir and for Deer Creek (a tributary creek), but determined in 2009 that their sample size was inadequate to make this determination and retracted the advisory (OEHHA 2009).

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Table 7.2.9-5. (continued)

Location	Species Sampled	Number of Fish	Mercury, Total (ppm)[1]	Total Length (mm)	Data Source
UPSTREAM OF THE PROJECT AREA (continued)					
Middle Yuba River just upstream of Oregon Creek and Highway 49	Rainbow Trout	3	0.15-0.21 (avg 0.18)	204 - 278	
	Sacramento Pikeminnow	2	0.56 and 0.81	321 - 339	
Middle Yuba River one mile downstream of the Highway 49 crossing	Sacramento Pikeminnow	4 (composite)	0.64	≥ 150	CVRWQCB (2009)
South Yuba River below Lake Spaulding	Brown trout	2	0.07 and 0.07	224 -249	Slotton et al. (1997) *IN* CVRWQCB (2009)
	Rainbow trout	3	0.06-0.11 (avg 0.080	180 - 228	
South Yuba River at Washington	Rainbow trout	13	0.10 - 0.30 (avg 0.15)	183 - 345	Slotton et al. (1997) *IN* CVRWQCB (2009)
South Yuba River just downstream of Edwards Crossing	Rainbow trout	2	0.09 and 0.15	182 - 270	May et al. (2000) *IN* CVRWQCB (2009)
South Yuba River near Bridgeport	Smallmouth Bass	3 (composite)	0.69	≥ 150	CVRWQCB (2009)
WITHIN THE PROJECT AREA					
New Bullards Bar Reservoir--East Arm near its confluence with the West Arm	Smallmouth Bass	13	0.22 - 0.68 avg 0.39	≥ 150	CVRWQCB (2009)
New Bullards Bar Reservoir--East Arm near the Willow Creek inlet	Bluegill	3	0.12-0.39 (avg 0.21)	≥ 150	Melwani et al. (2007) *IN* CVRWQCB (2009)
	Carp	11	0.34-0.83 (avg 0.52)	≥ 150	
	Largemouth Bass	1	0.61	≥ 150	
	Smallmouth Bass	10	0.29-0.72 (avg 0.48)	≥ 150	
	Carp	6 (composite)	0.61	≥ 150	CVRWQCB (2009)
	Smallmouth Bass	5 (composite)	0.63	≥ 150	
New Colgate Powerhouse Reach, approximately 1.3 miles upstream of USACE's Englebright Reservoir	Smallmouth Bass	5	0.27 - 0.56 avg of 0.38	≥ 150	CVRWQCB (2009)
USACE's Englebright Reservoir—South Yuba Arm, Hogsback Ravine Arm, and mid-section.	largemouth smallmouth and spotted bass	56	0.45 (mean)	338 (mean)	May et al. (2000) and Slotton et al. (1997) IN CVRWQCB (2001); Slotton et. al. in press *IN* OEHHA (2009)
	Bluegill and green sunfish	31	0.30 (mean)	161 (mean)	
	Rainbow trout	49	0.08 (mean)	290 (mean)	
	Carp	1	0.88	440	Slotton et al. (1997)
	Hardhead	1	0.47	540	
	Sacramento sucker	5	0.41-0.89	410-523	
Narrows 2 Powerhouse Reach, Lower Yuba River, approximately 2.2 miles downstream of Englebright Dam	Rainbow Trout	9	0.07 - 0.13 avg 0.10	≥ 150	Slotton et al. (1997) in CVRWQCB (2009)
Little Deer Creek at Pioneer Park, less than one mile from the confluence with Deer Creek (tributary to Yuba River)	Brown trout	6	0.23 - 0.39 avg 0.32	≥ 150	May et al. (2000); CVRWQCB (2009)

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Table 7.2.9-5. (continued)

Location	Species Sampled	Number of Fish	Mercury, Total (ppm)[1]	Total Length (mm)	Data Source
DOWNSTREAM OF THE PROJECT AREA					
Daguerre Point Dam Reach, Lower Yuba River, approximately 0.9 miles upstream of its confluence with the Feather River	Rainbow Trout	1	0.02	≥ 150	CVRWQCB (2009)
	Sacramento Pikeminnow	1	0.46		
	Sacramento Sucker	2	0.22 and 0.38		
	Smallmouth Bass	4	0.26-0.72 (avg 0.43)		
Lower Yuba River, approximately 3.6 miles upstream of its confluence with the Feather River	Sacramento Pikeminnow	2	0.31 and 1.43	≥ 150	CVRWQCB (2009)
	Sacramento Sucker	5 (composite)	0.39		
	Rainbow Trout	3	0.08-0.1 (avg 0.09)	310 (avg)	Grenier et al. (2007) *IN* CVRWQCB (2009)
	Sacramento Pikeminnow	5	0.19-1.58 (avg 0.84)	≥ 150	
	Sacramento Sucker	3	0.11-0.73 (avg 0.26)	420 (avg)	

[1] All concentrations are in wet-weight.

In the Project Area, Slotton et al. (1997) also observed notably lower invertebrate mercury concentrations below many of the foothill reservoirs, as compared to concentrations in similar biota upstream. Specifically, the invertebrates below New Bullards Bar Dam were considerably lower in mercury than those collected upstream of the reservoir on the North Yuba River. Similarly, the invertebrates collected below the USACE's Englebright Reservoir were consistently far lower in mercury than samples collected upstream of the reservoir on the Middle and South Yuba River. In contrast, however, reservoir dwelling fish had higher mercury tissue concentrations than fish collected from Coastal Range reservoirs, near historic mercury mines. This would suggest that mercury in the Sierra Nevada reservoirs is in a more bioavailable form than mercury in the Coastal Range reservoirs (Slotton et al. 1997).

7.2.10 List of Attachments

This section includes two attachments:

- Attachment 7.2A – Licensee's Water Temperature Data
- Attachment 7.2B – Licensee's 2009 Water Quality Data

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Section 7.2
Water Resources Attachment

- **Attachment 7.2A: Licensee's Water Temperature Data**

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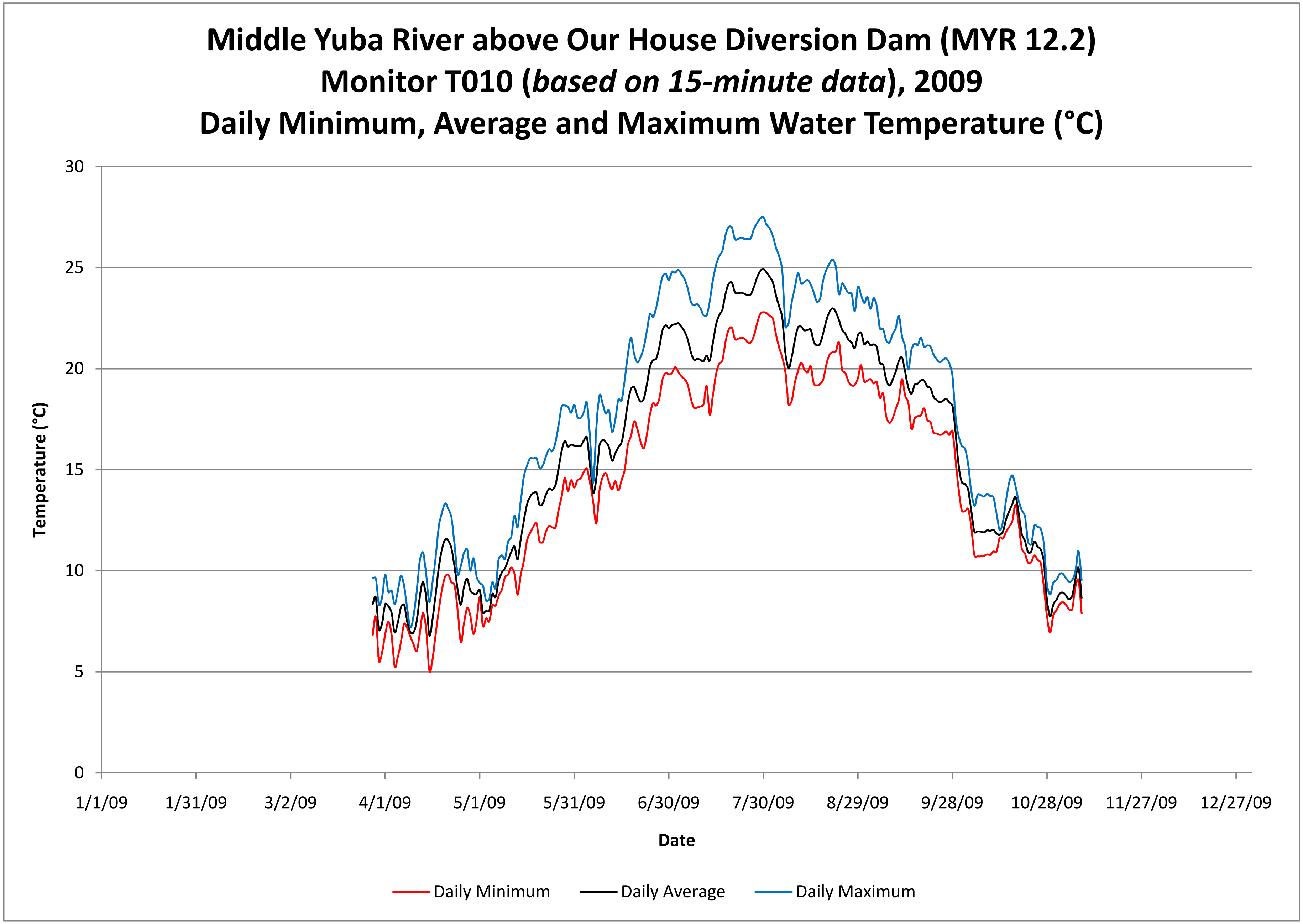

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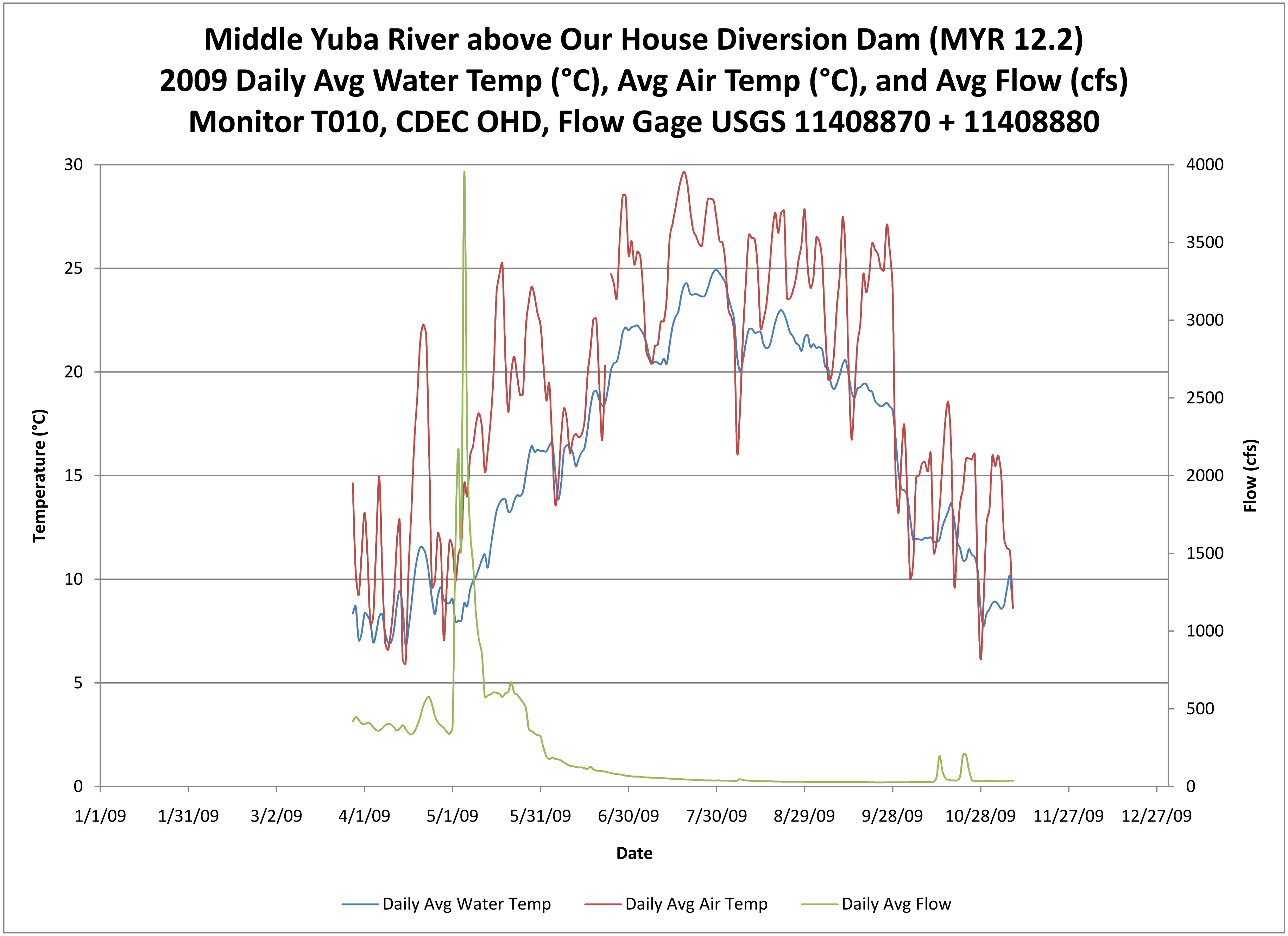
Middle Yuba River above Our House Diversion Dam (MYR 12.2)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T010, CDEC OHD, Flow Gage USGS 11408870 + 11408880
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
4000
3500
3000
2500
2000
1500
1000
500
0
1/1/09
1/31/09
3/2/09
4/1/09
5/1/09
5/31/09
6/30/09
7/30/09
8/29/09
9/28/09
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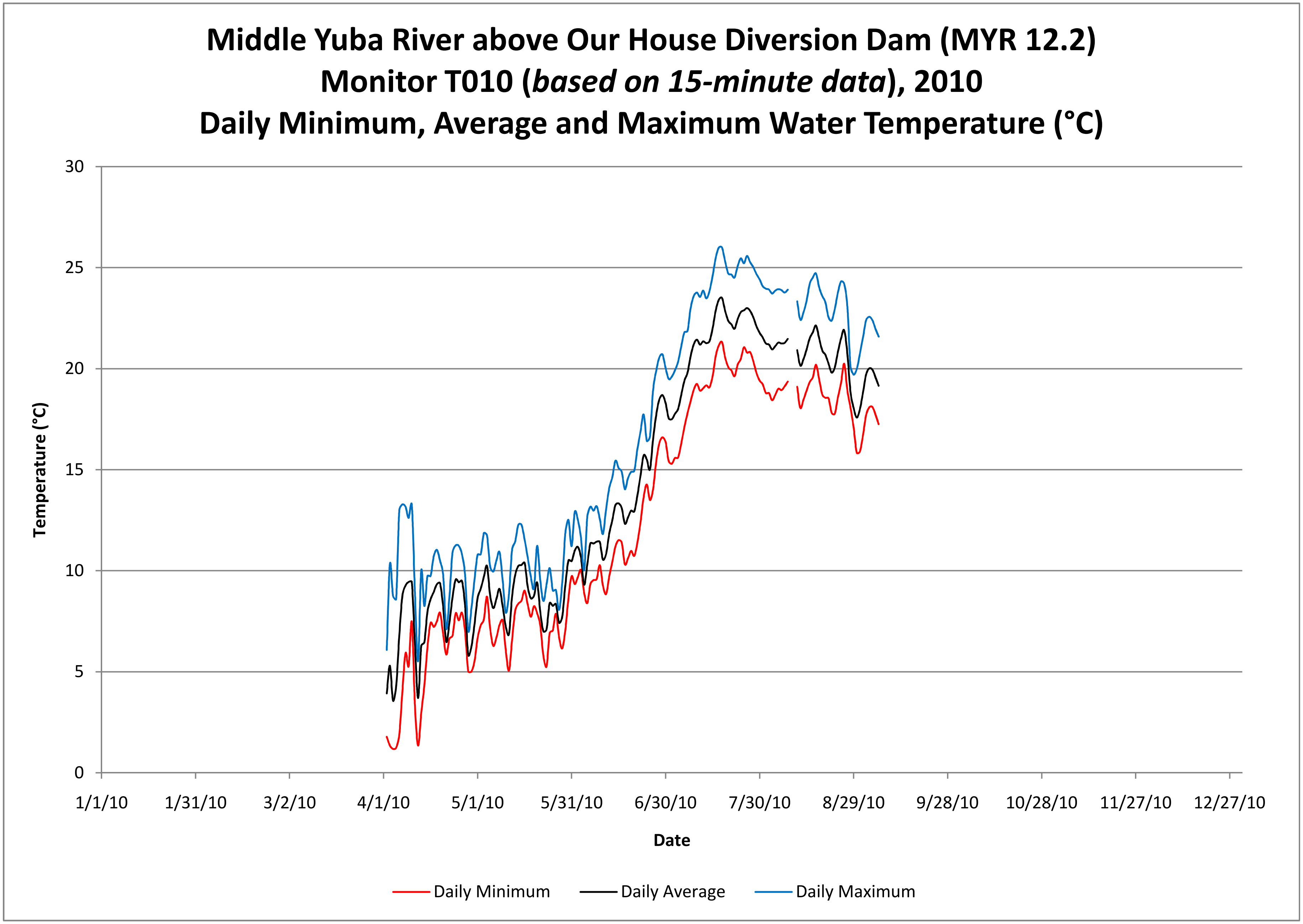
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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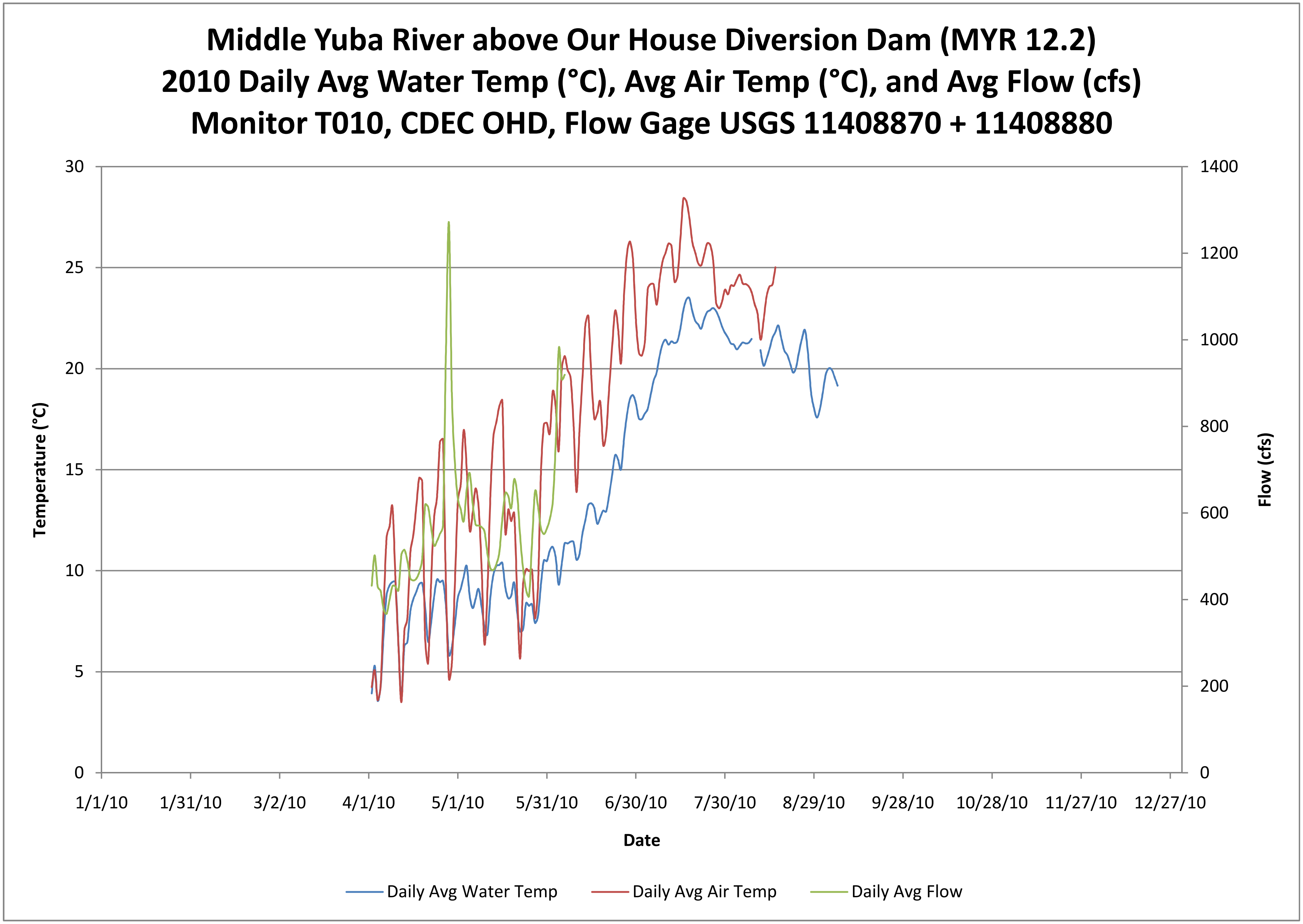
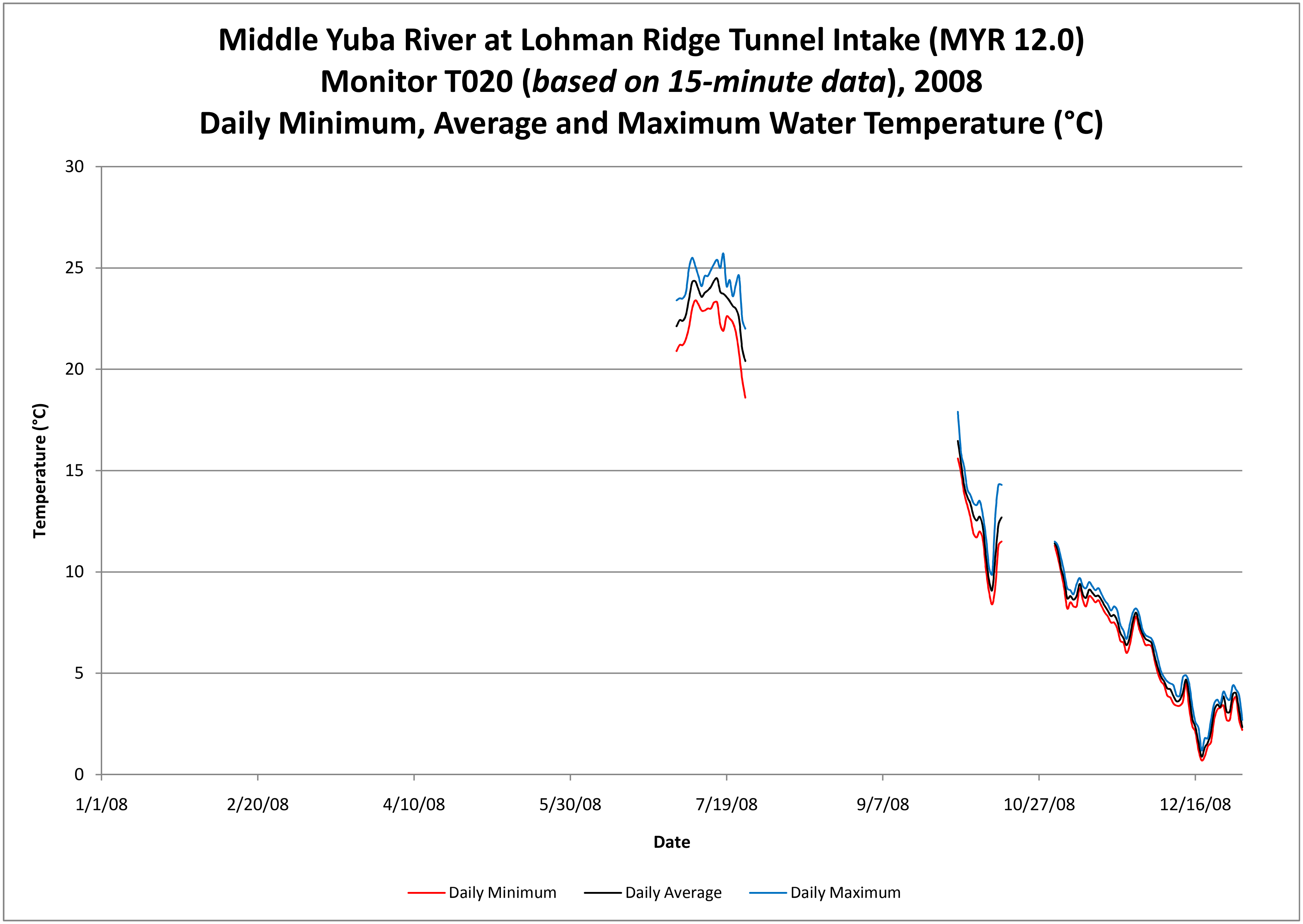
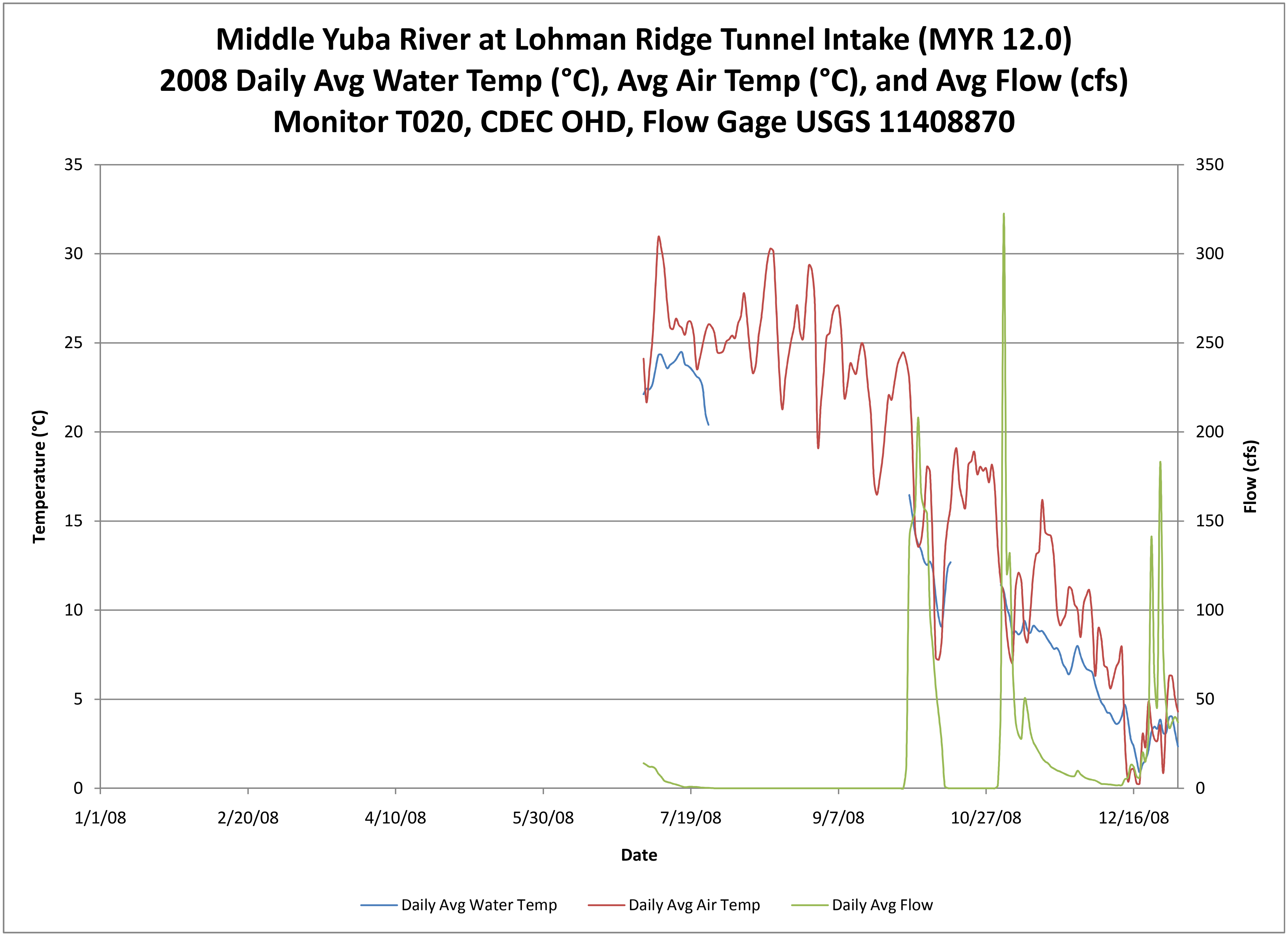

Middle Yuba River above Our House Diversion Dam (MYR 12.2)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T010, CDEC OHD, Flow Gage USGS 11408870 + 11408880
Temperature (°C)
0
5
10
15
20
25
30
Flow (cfs)
0
200
400
600
800
1000
1200
1400
1/1/10
1/31/10
3/2/10
4/1/10
5/1/10
5/31/10
6/30/10
7/30/10
8/29/10
9/28/10
10/28/10
11/27/10
12/27/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Middle Yuba River at Lohman Ridge Tunnel Intake (MYR 12.0)
Monitor T020 (based on 15-minute data), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum



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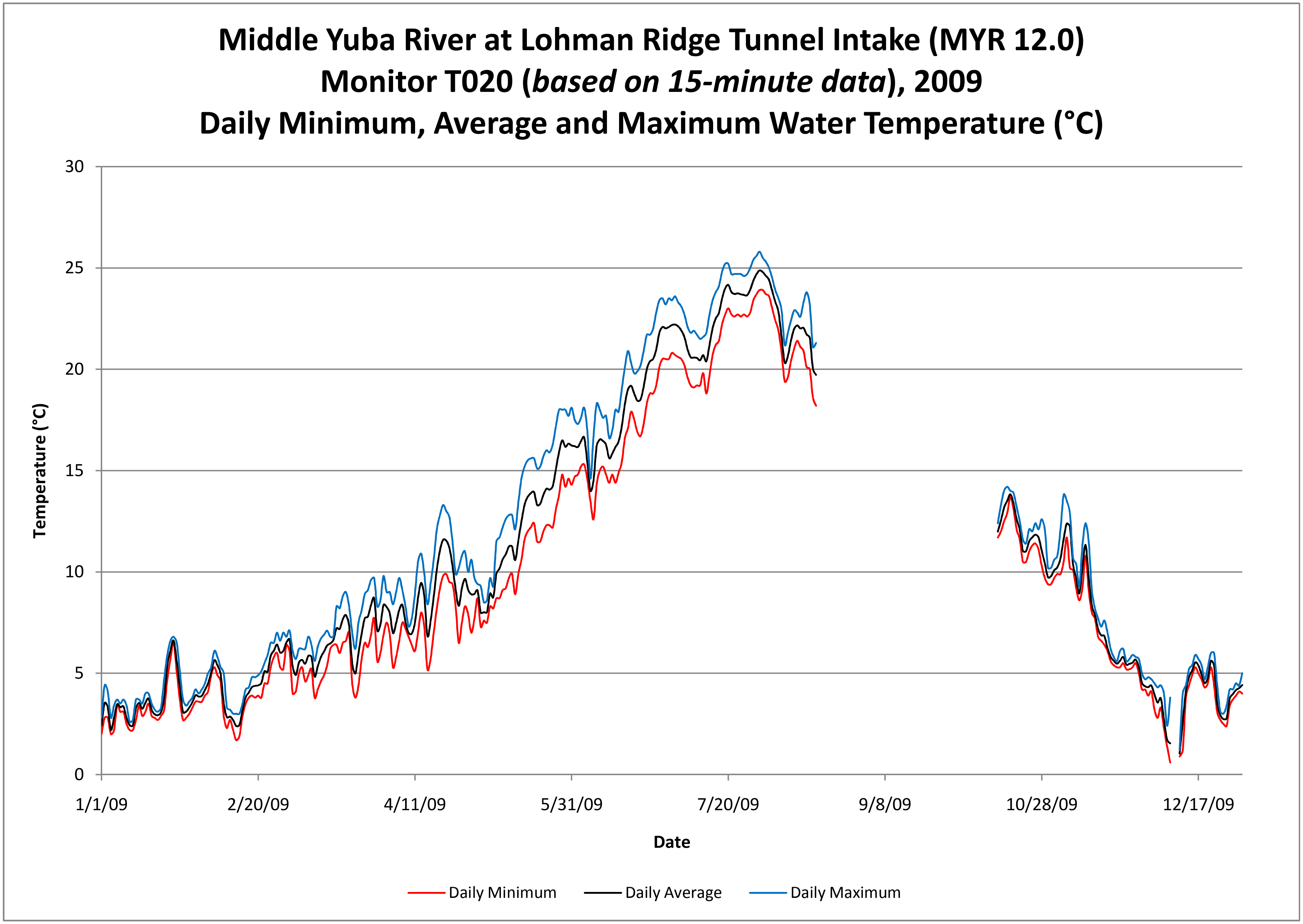
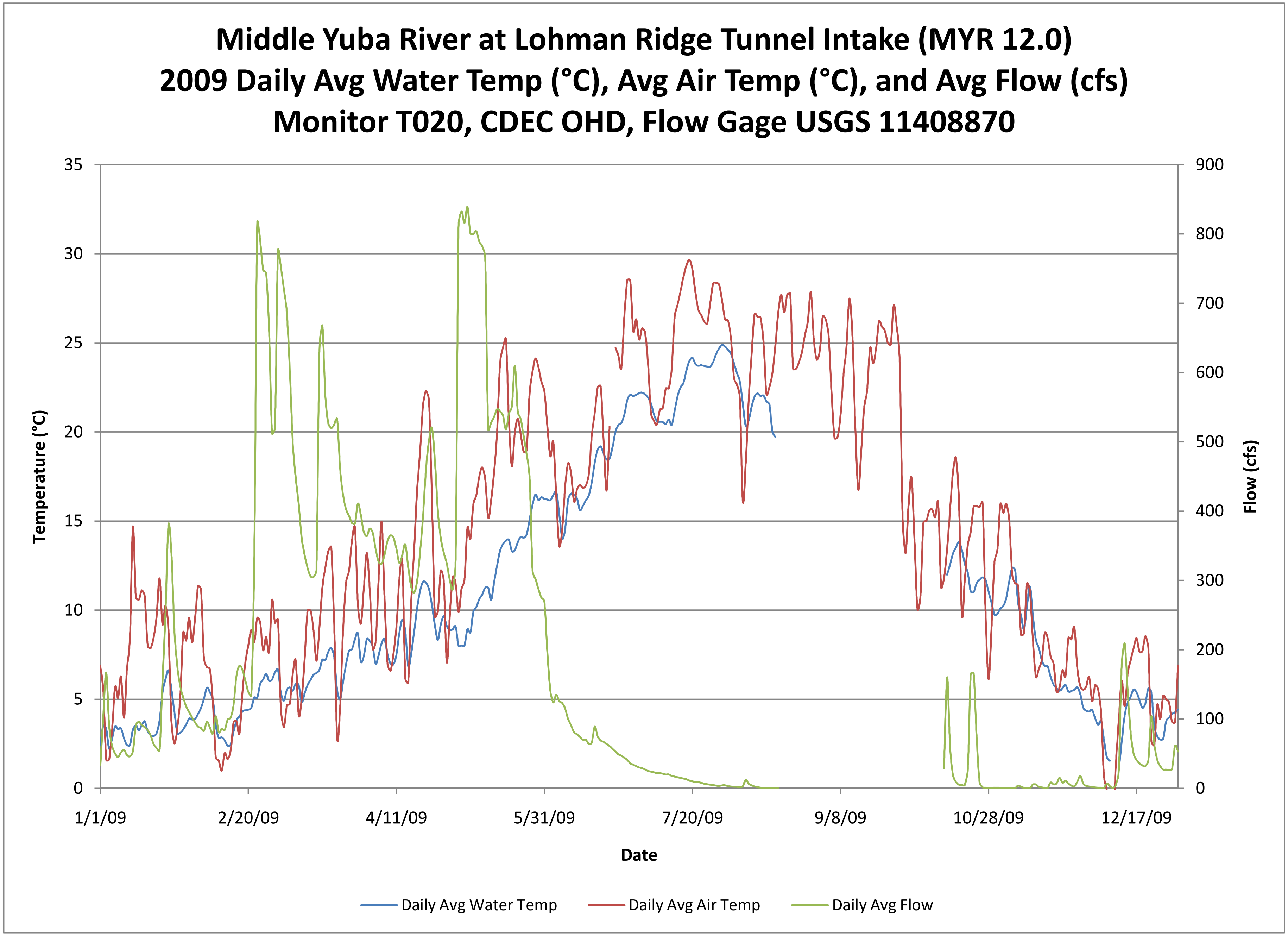
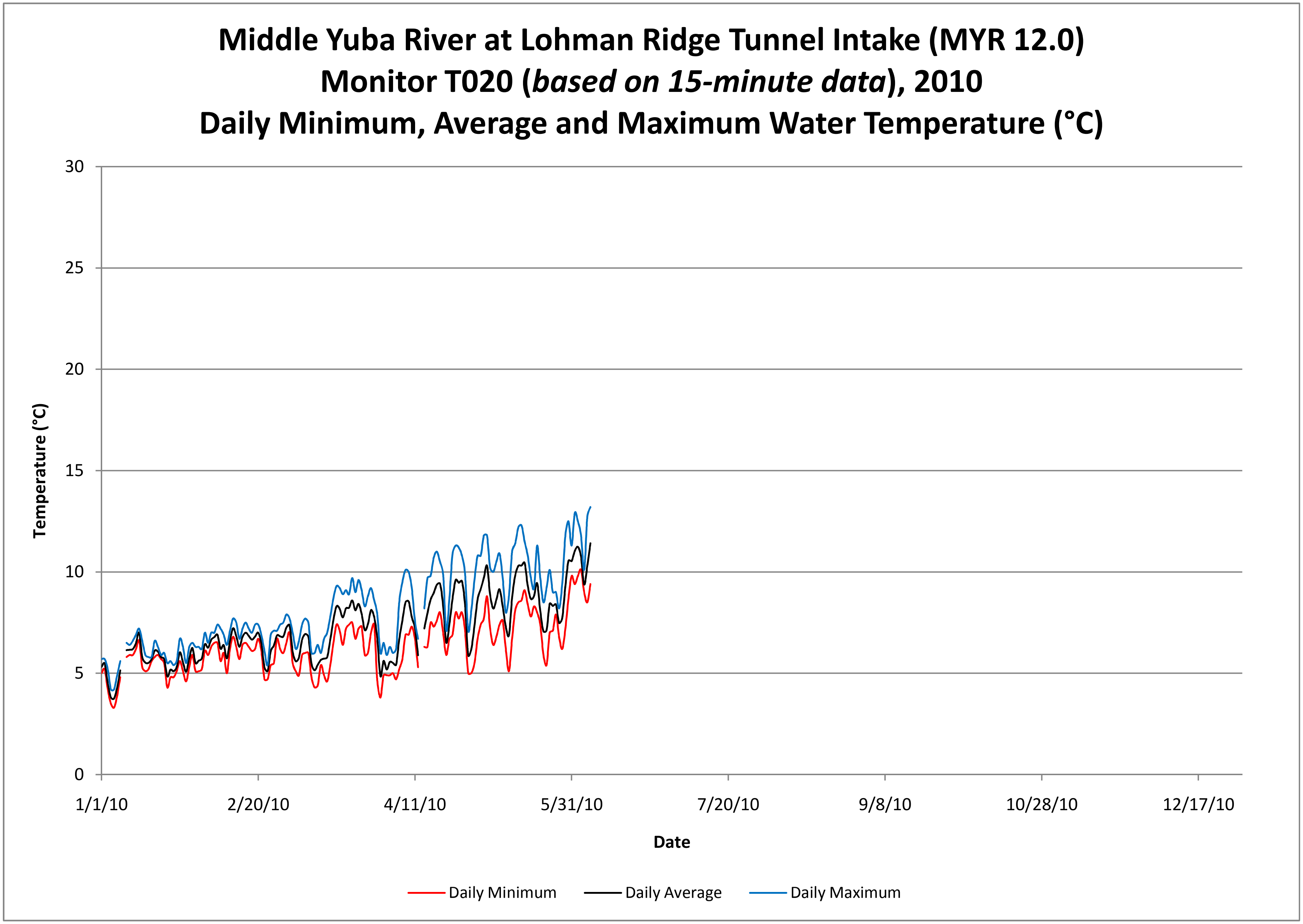

Middle Yuba River at Lohman Ridge Tunnel Intake (MYR 12.0)
Monitor T020 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
0
5
10
15
20
25
30
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Middle Yuba River at Lohman Ridge Tunnel Intake (MYR 12.0)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T020, CDEC OHD, Flow Gage USGS 11408870
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
900
800
700
600
500
400
300
200
100
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow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Monitor T020 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
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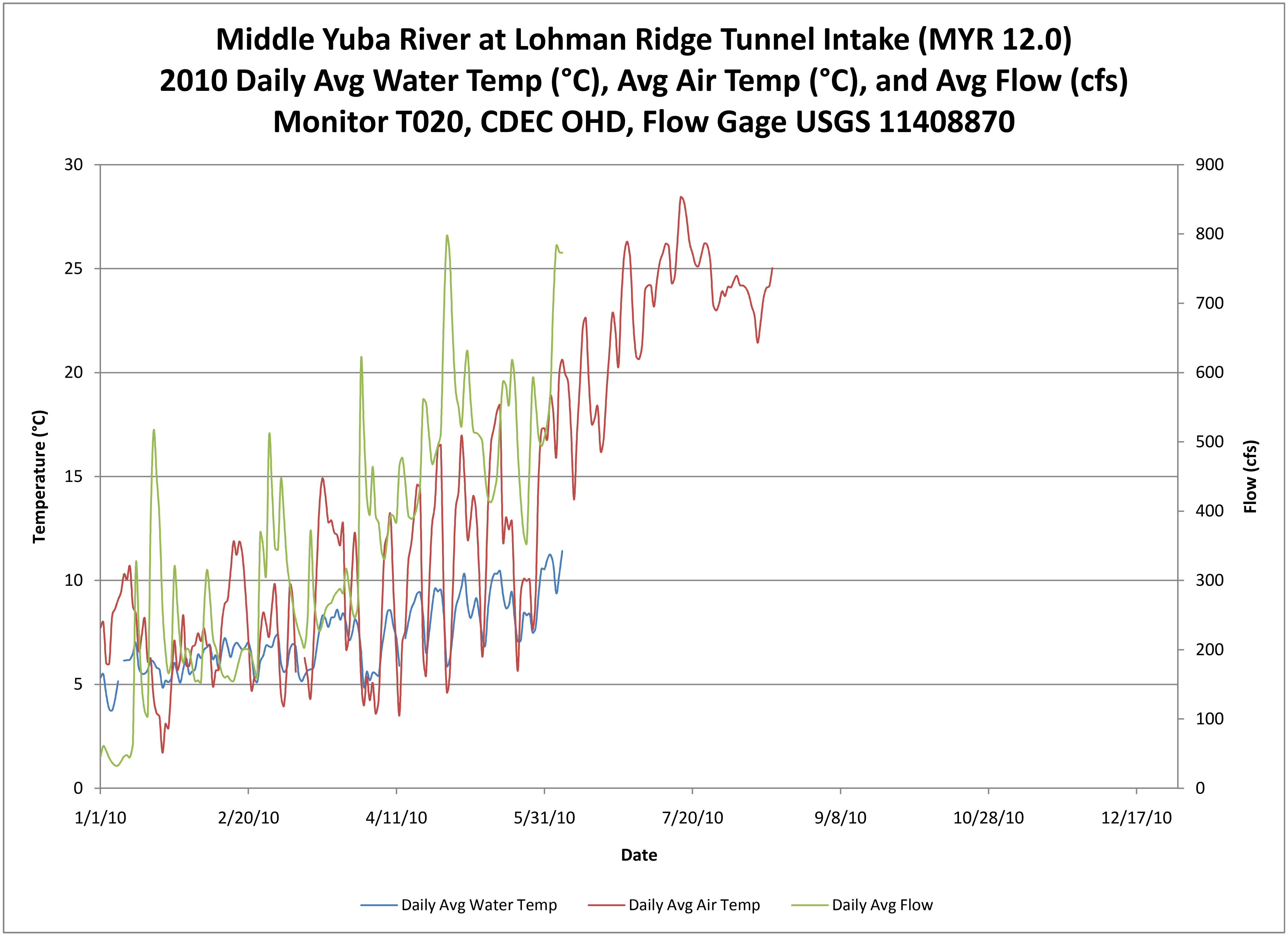
Date
Daily Minimum
Daily Average
Daily Maximum



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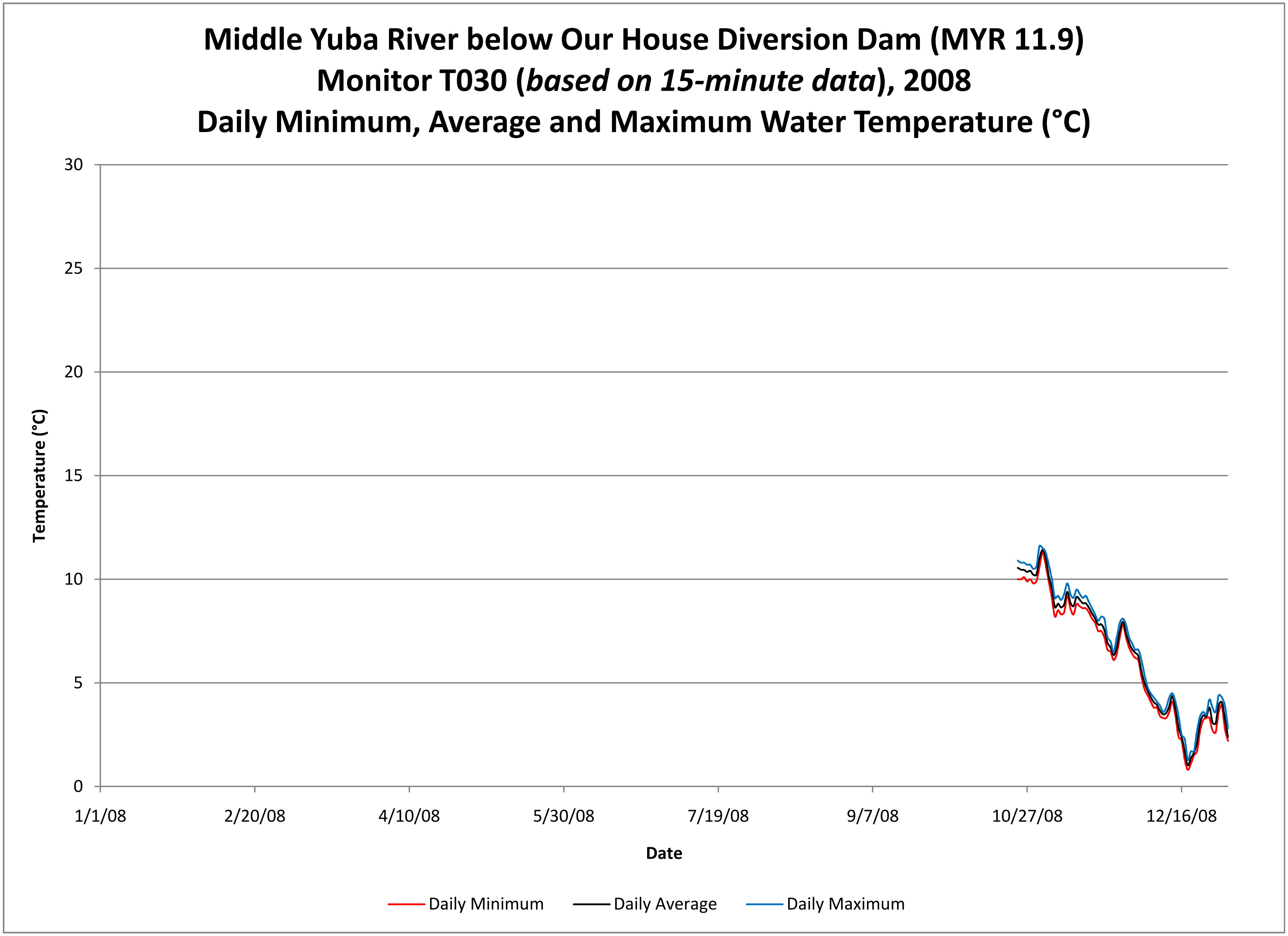
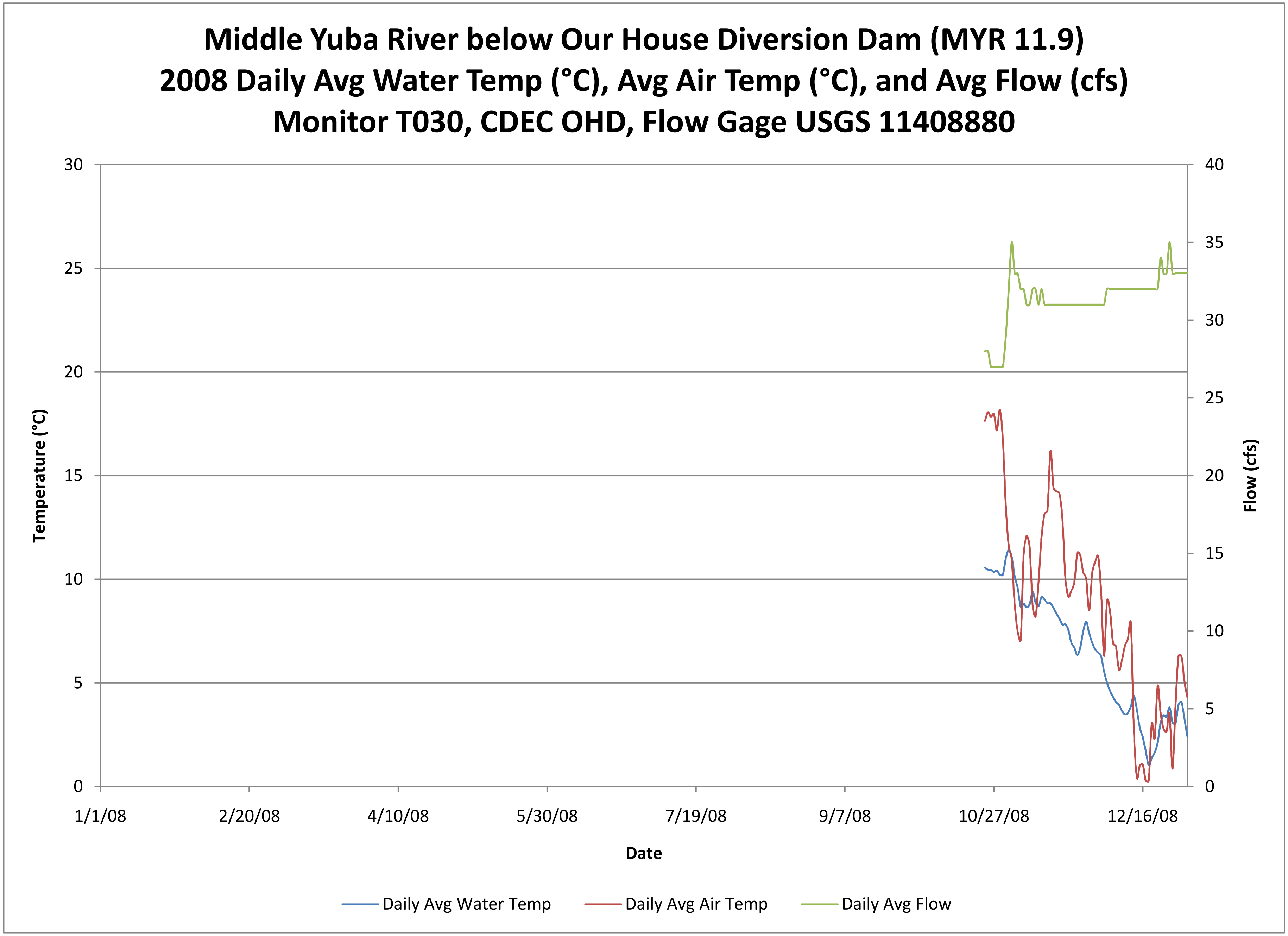
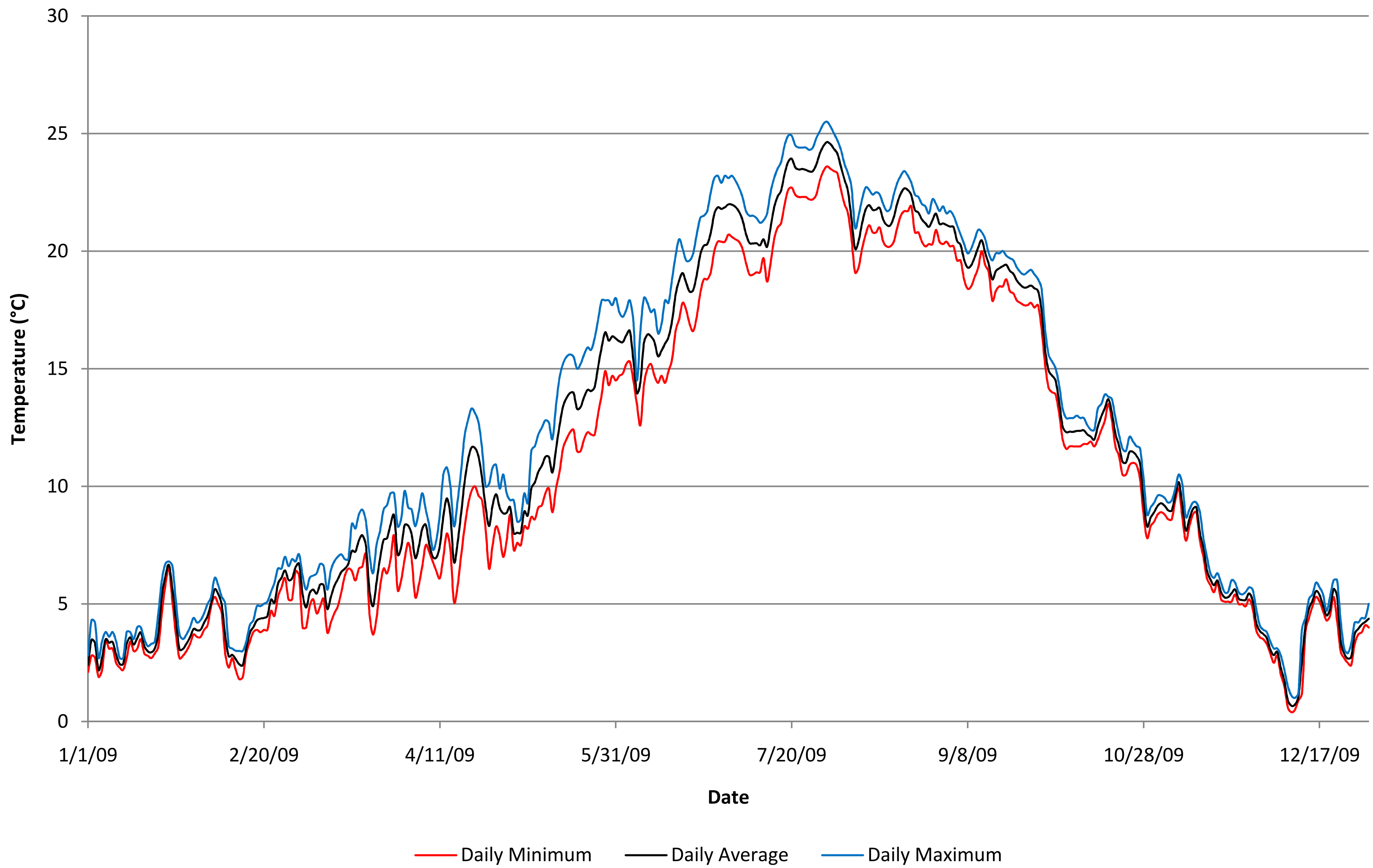
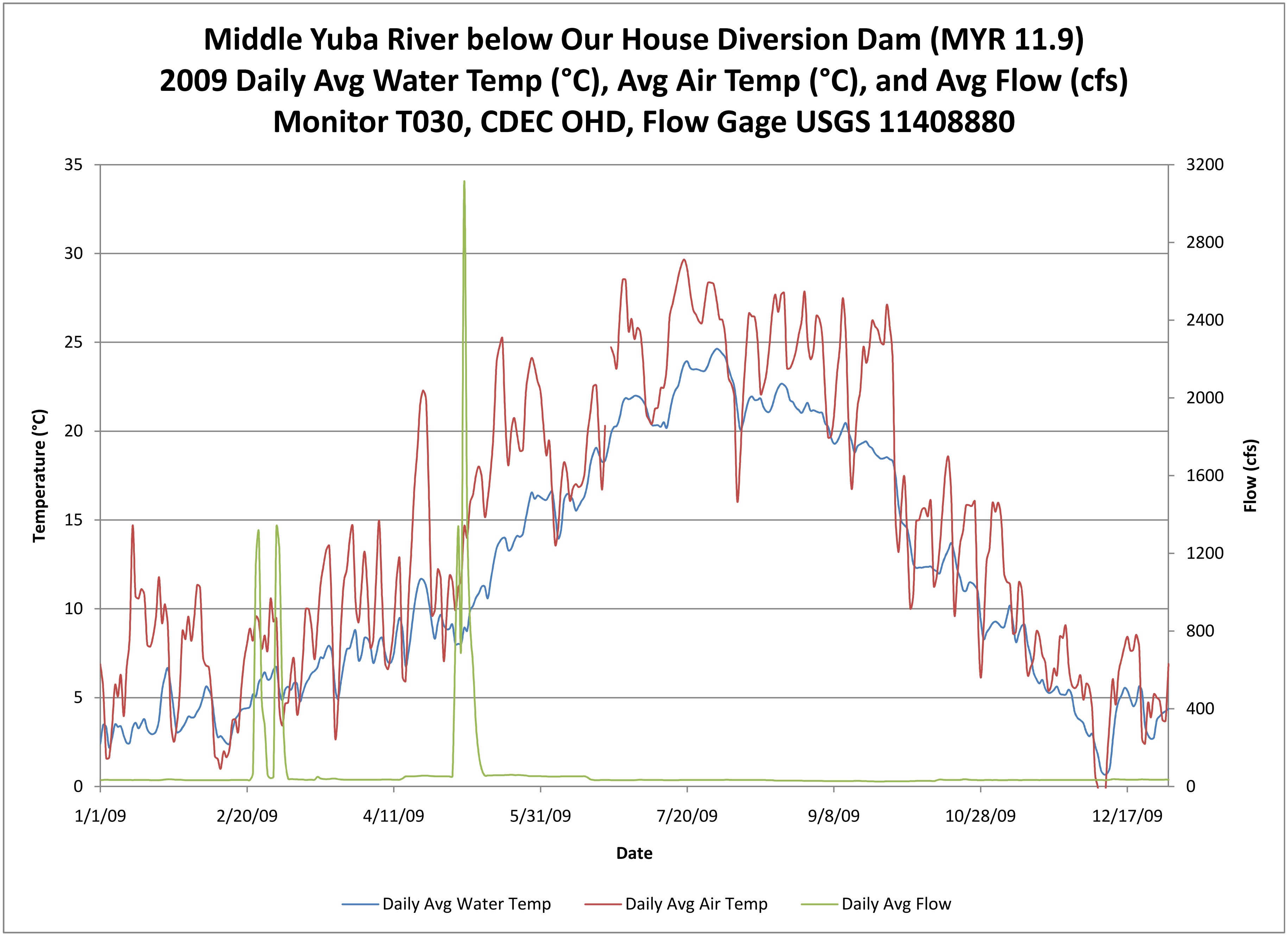

Middle Yuba River below Our House Diversion Dam (MYR 11.9)
Monitor T030 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


Middle Yuba River below Our House Diversion Dam (MYR 11.9)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T030, CDEC OHD, Flow Gage USGS 11408880
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
40
35
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

Middle Yuba River below Our House Diversion Dam (MYR 11.9)
Monitor T030 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temeprature (°C)




Middle Yuba River below Our House Diversion Dam (MYR 11.9)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T030, CDEC OHD, Flow Gage USGS 11408880
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
3200
2800
2400
2000
1600
1200
800
400
0
1/1/09
2/20/09
4/11/09
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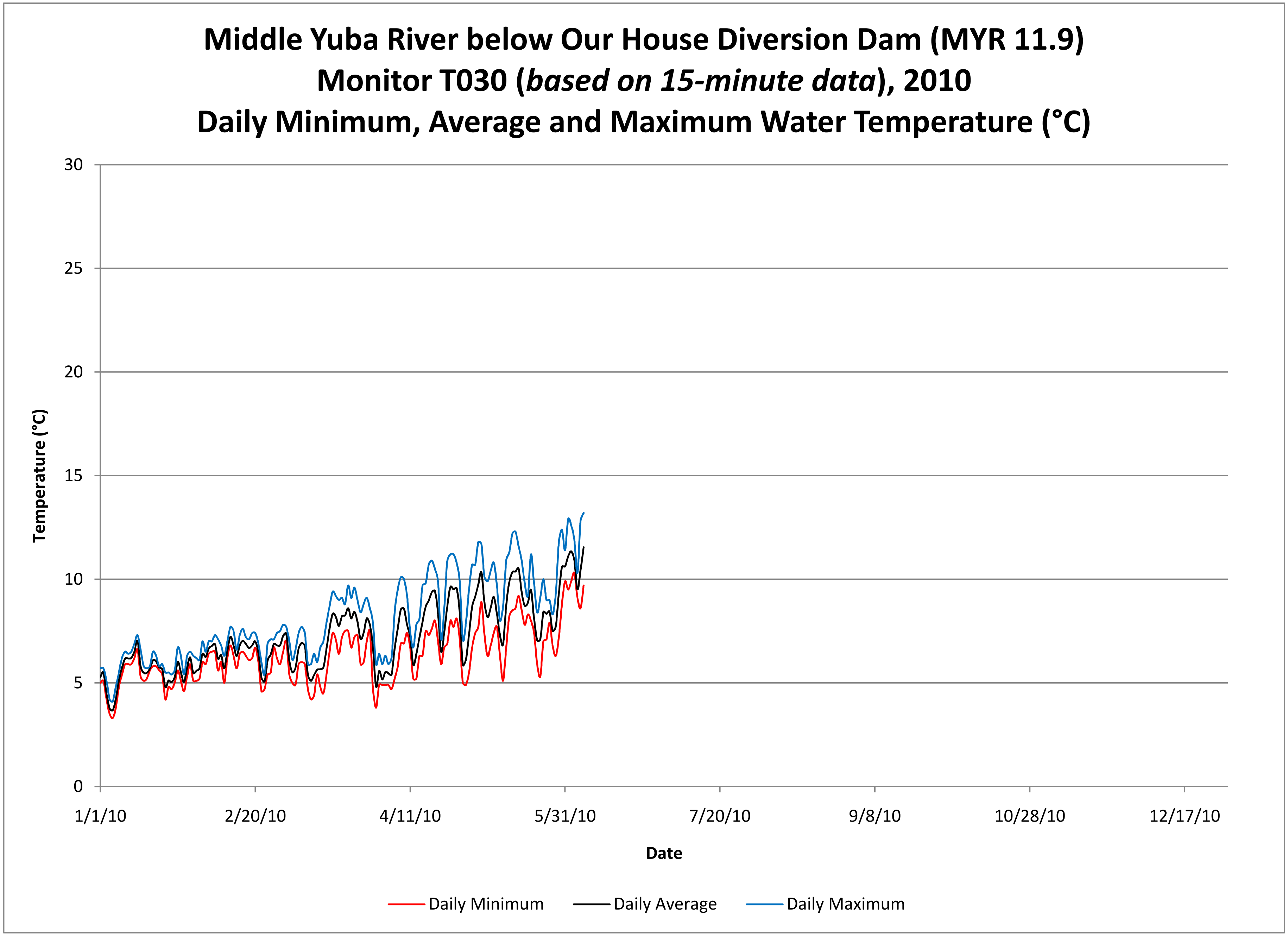
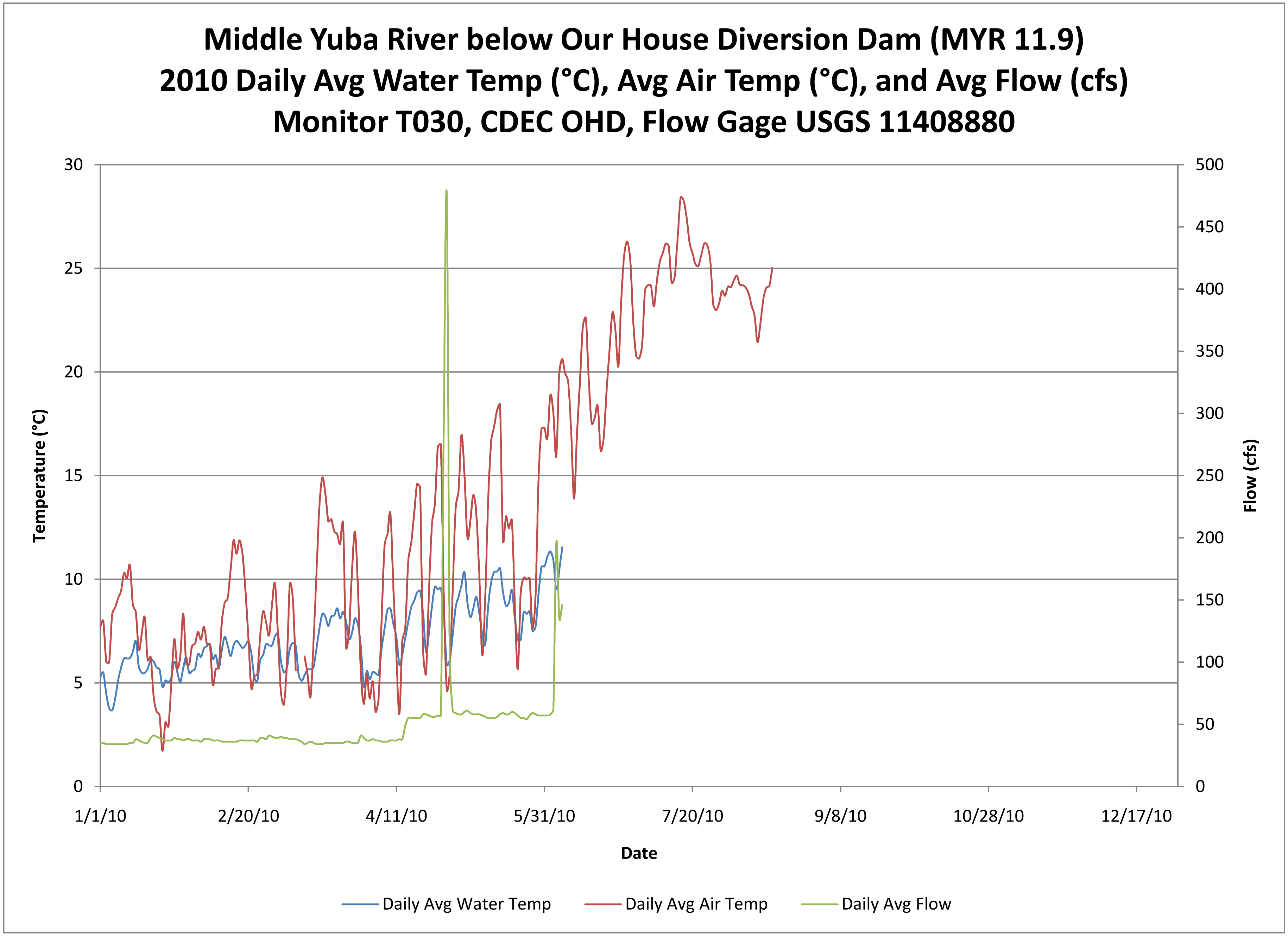
Daily Avg Air Temp
Daily Avg Flow


Middle Yuba River below Our House Diversion Dam (MYR 11.9)
Monitor T030 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum



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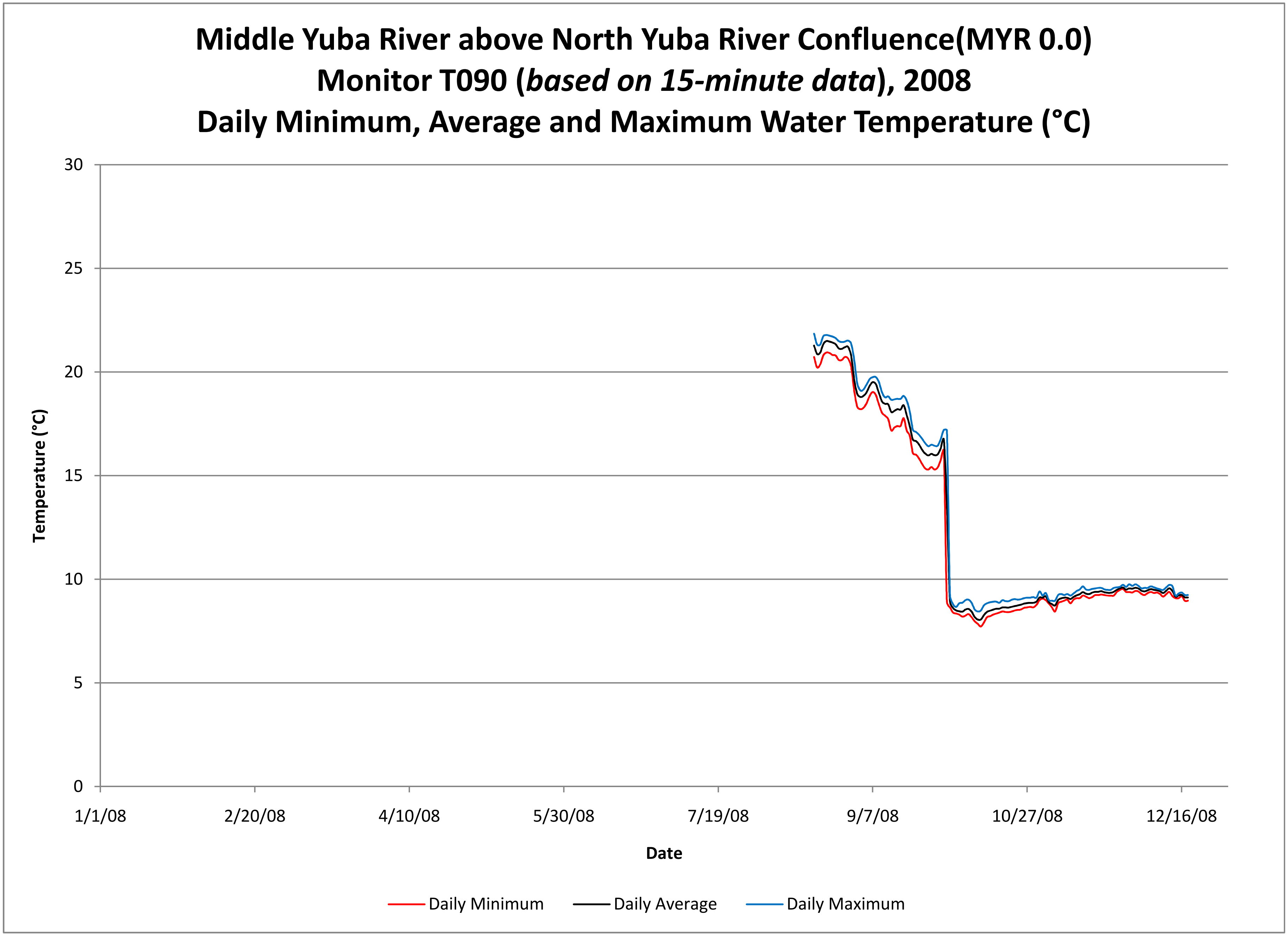
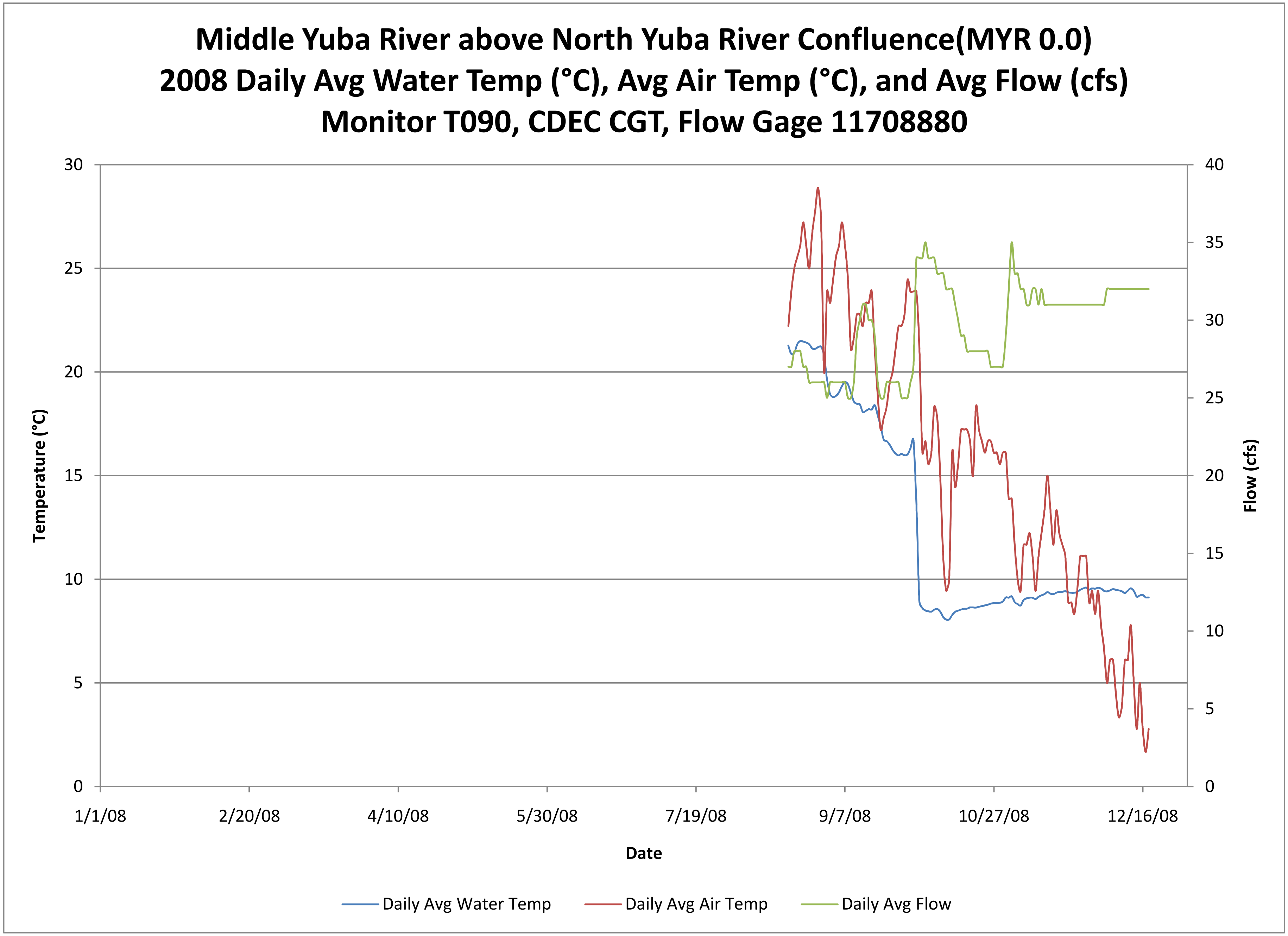
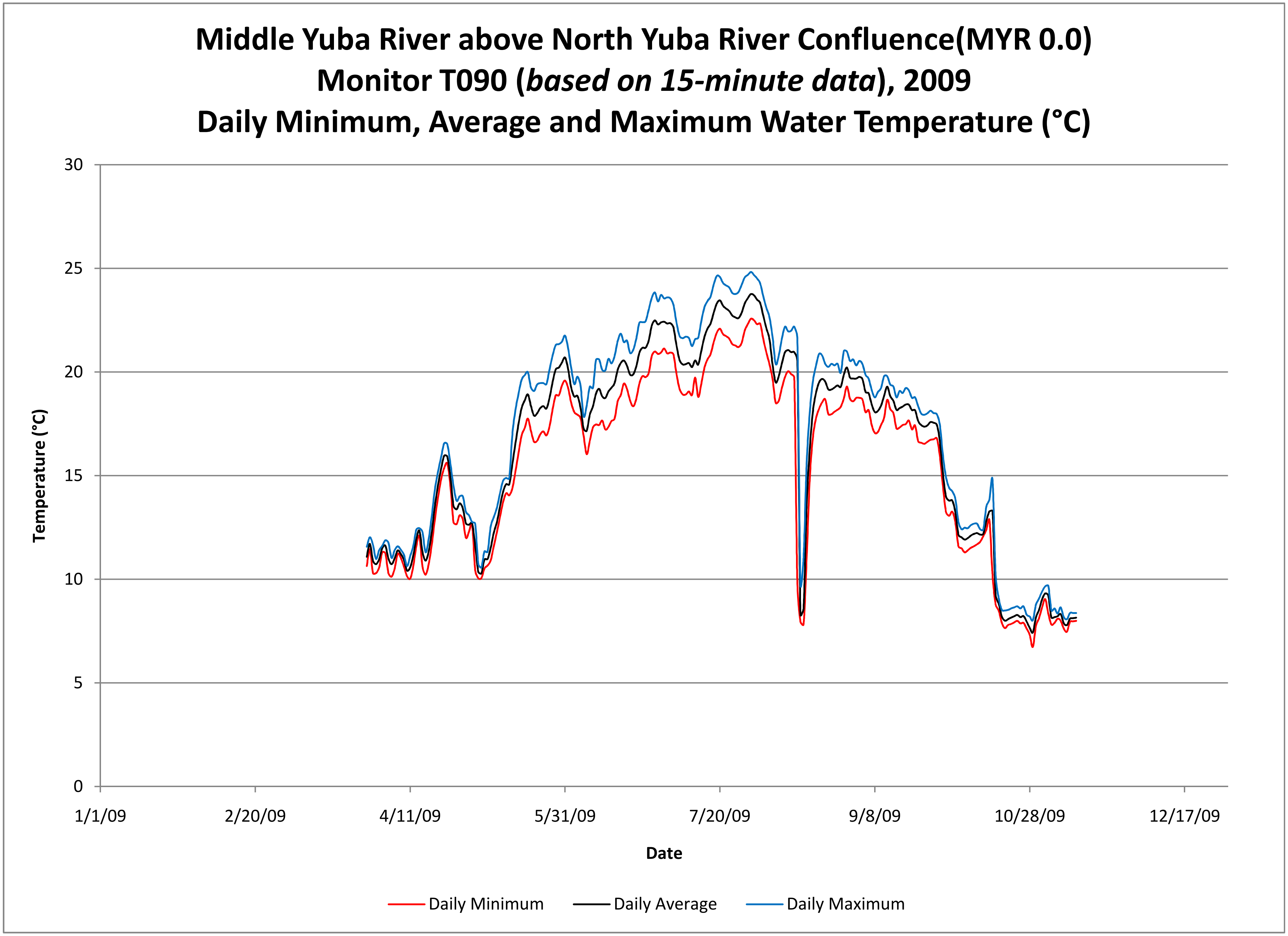
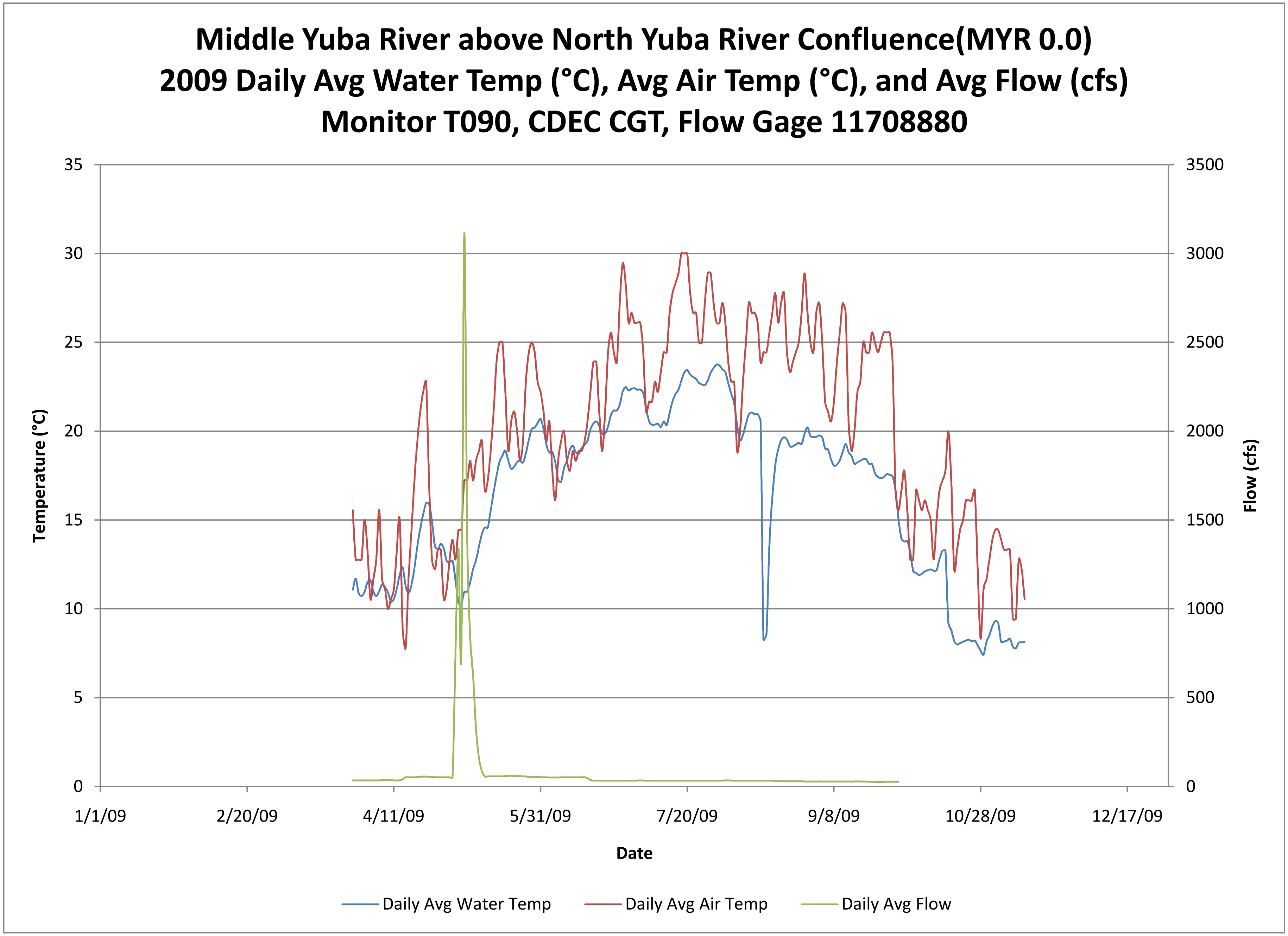

Middle Yuba River above North Yuba River Confluence(MYR 0.0)
Monitor T090 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


Middle Yuba River above North Yuba River Confluence(MYR 0.0)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T090, CDEC CGT, Flow Gage 11708880
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
40
35
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Middle Yuba River above North Yuba River Confluence(MYR 0.0)
Monitor T090 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum



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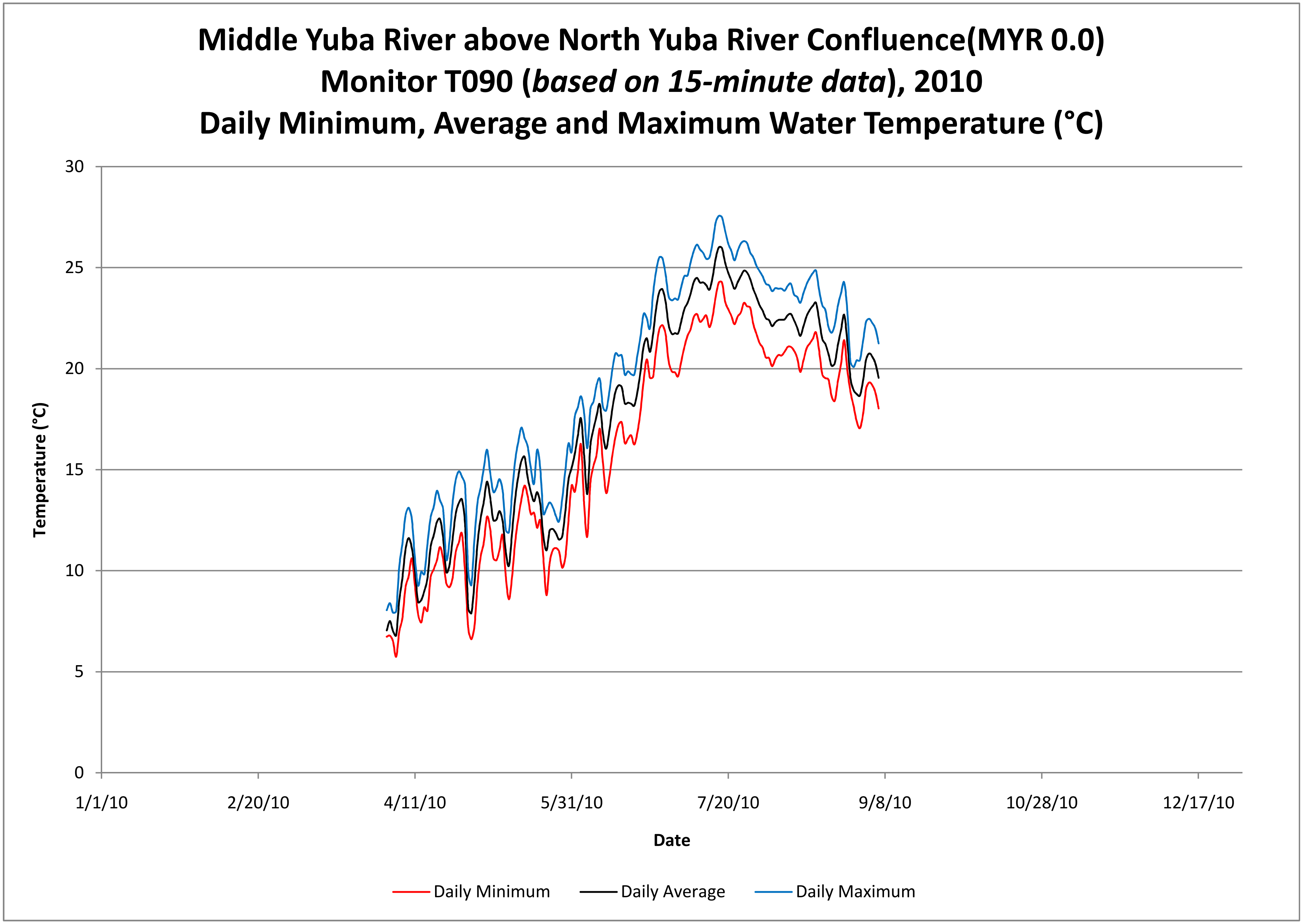

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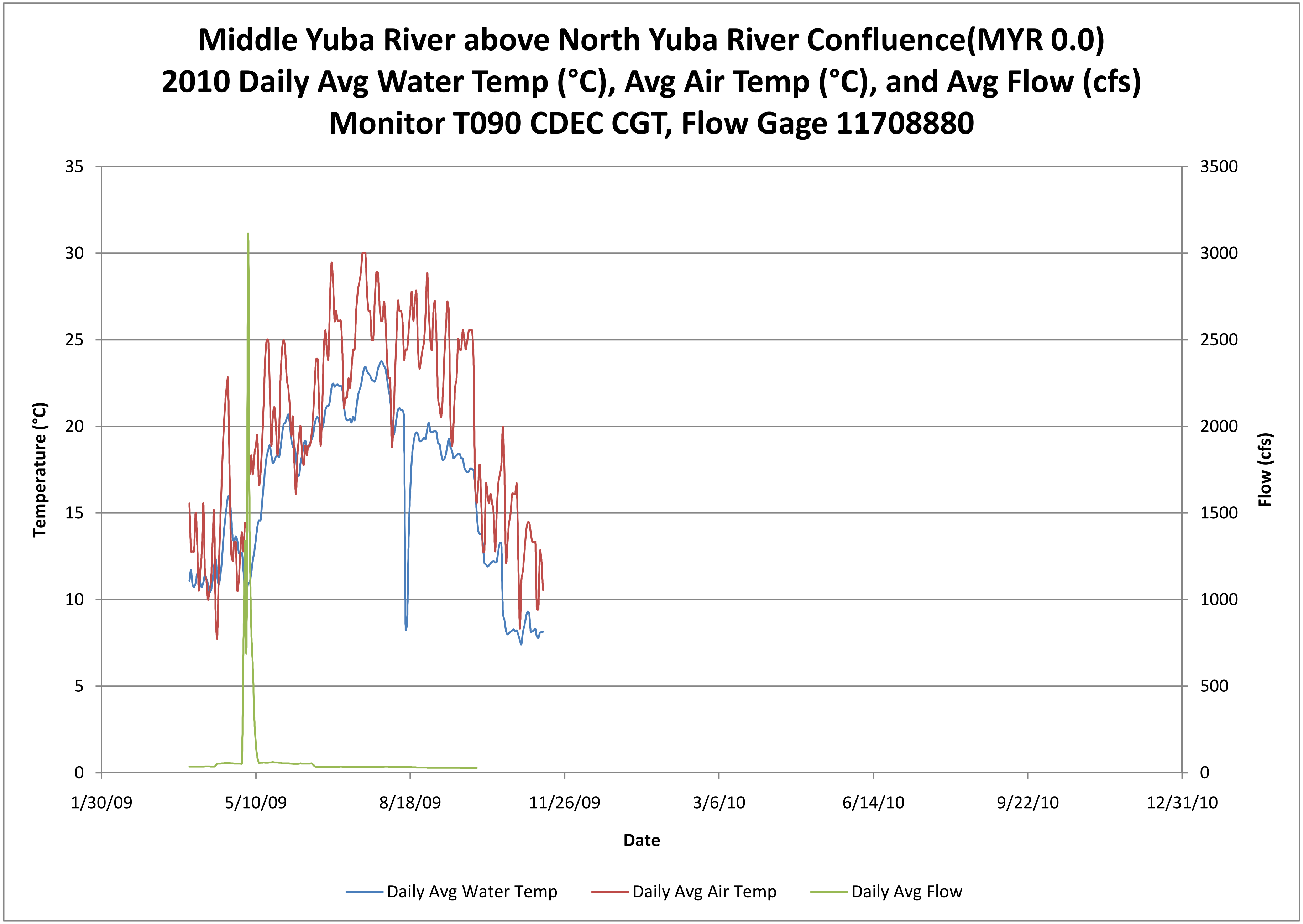
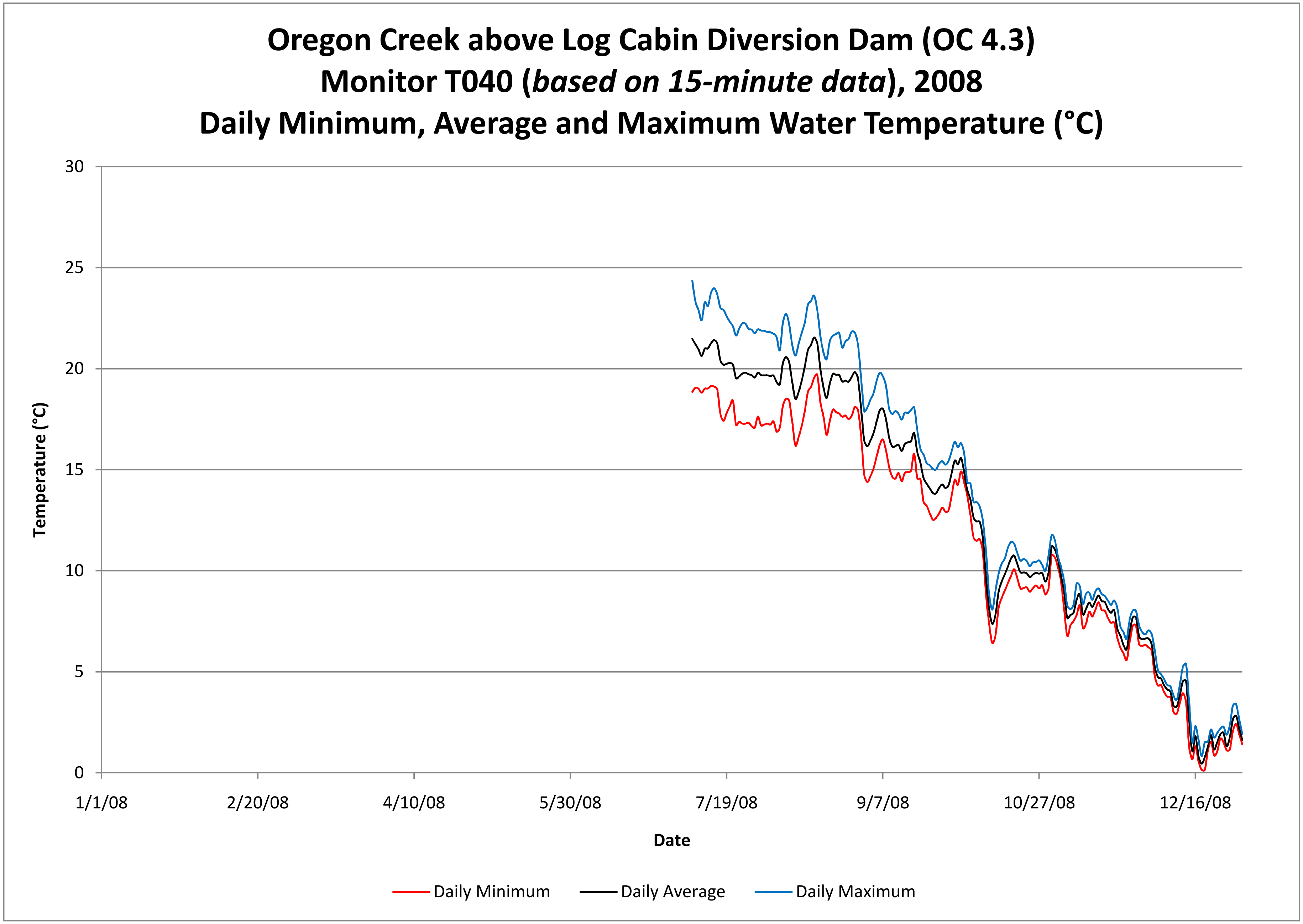
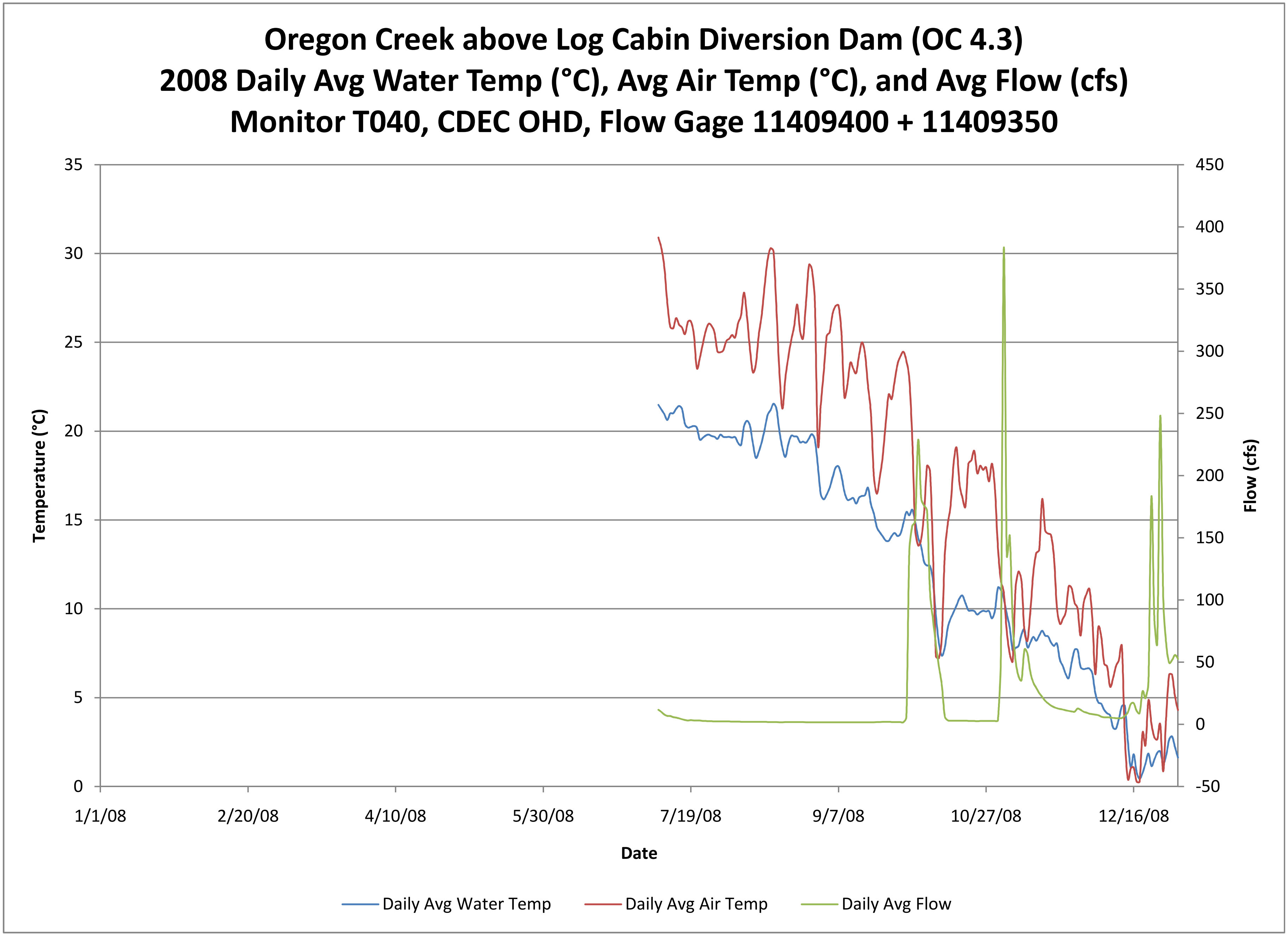
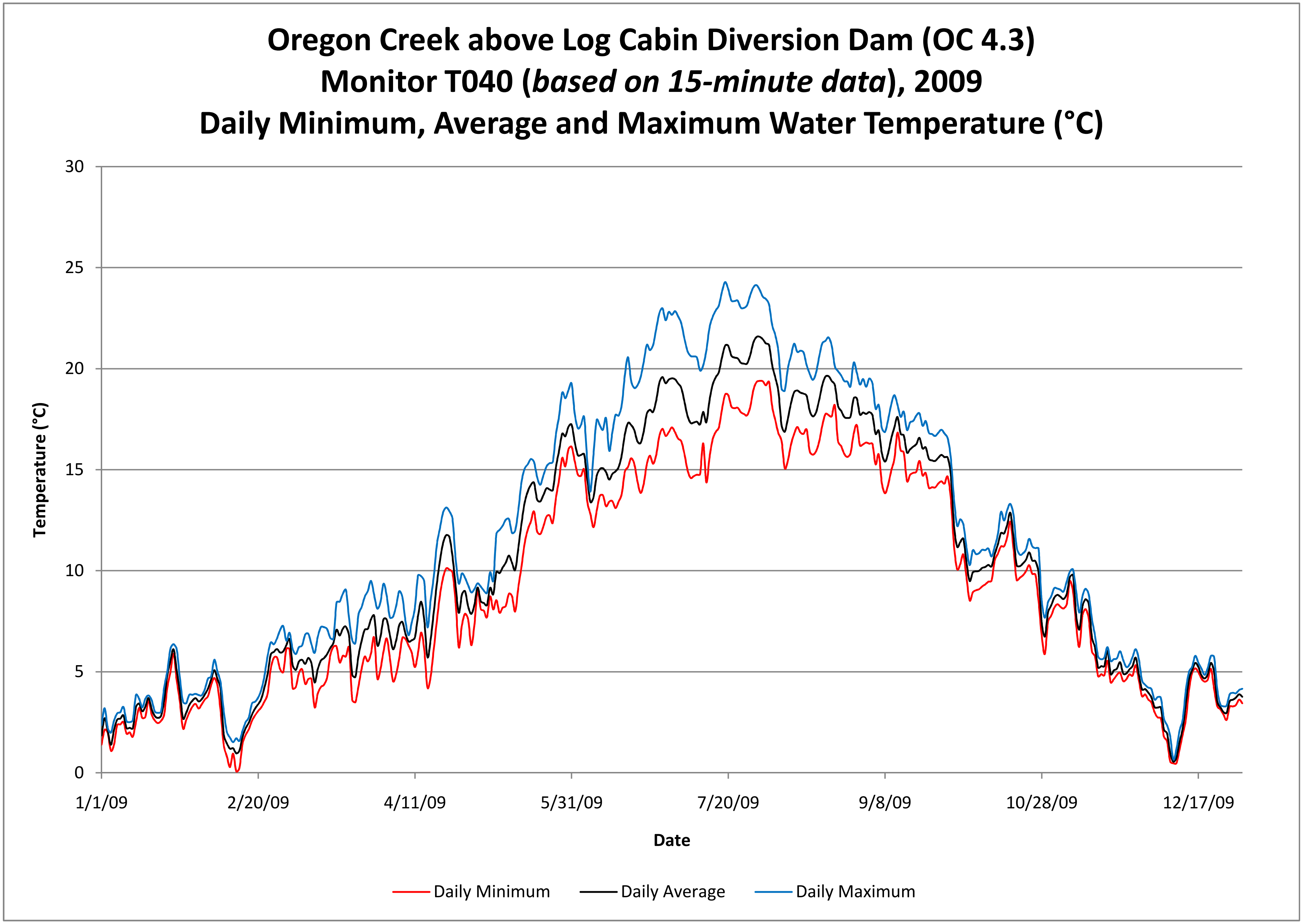
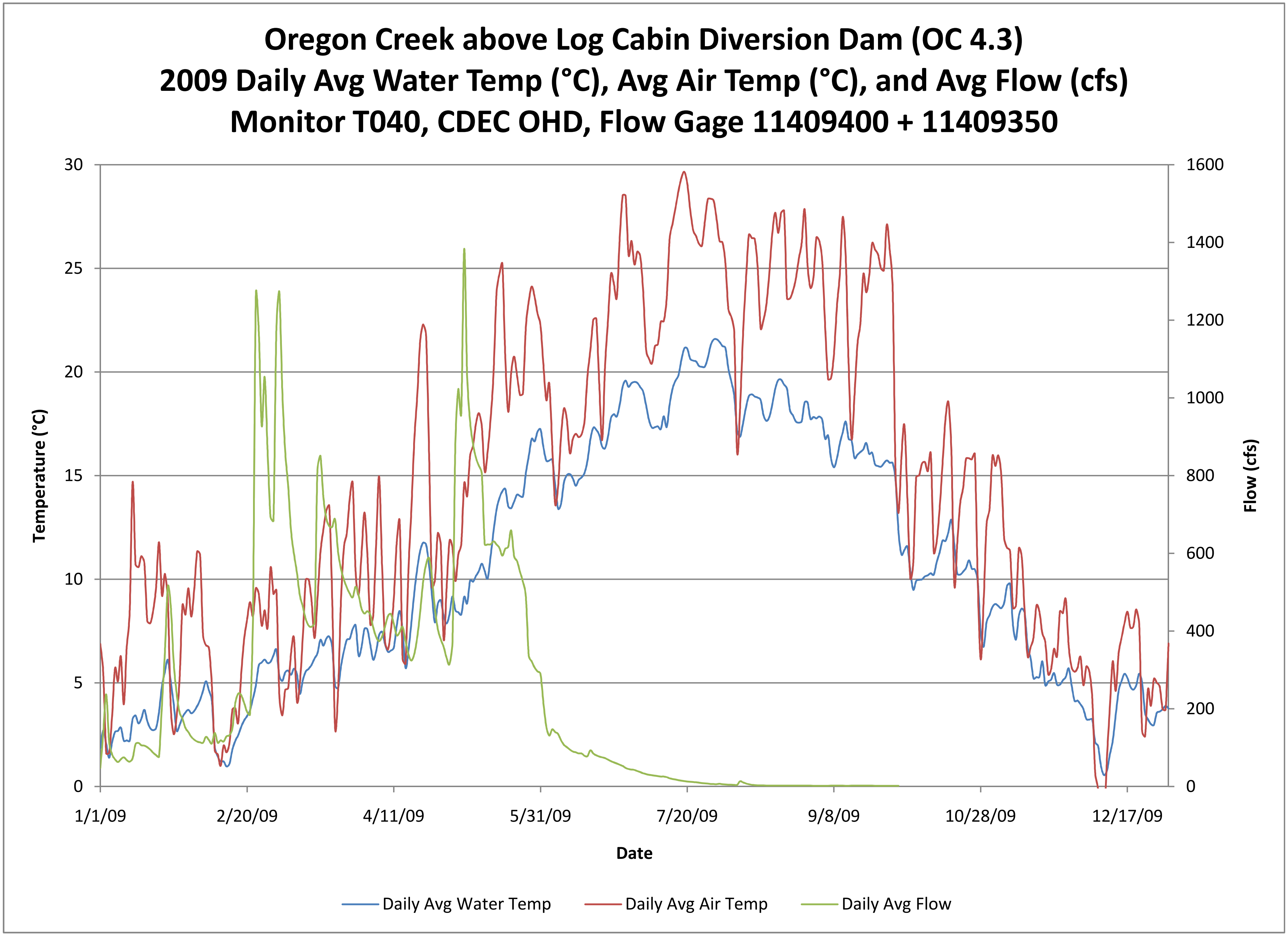


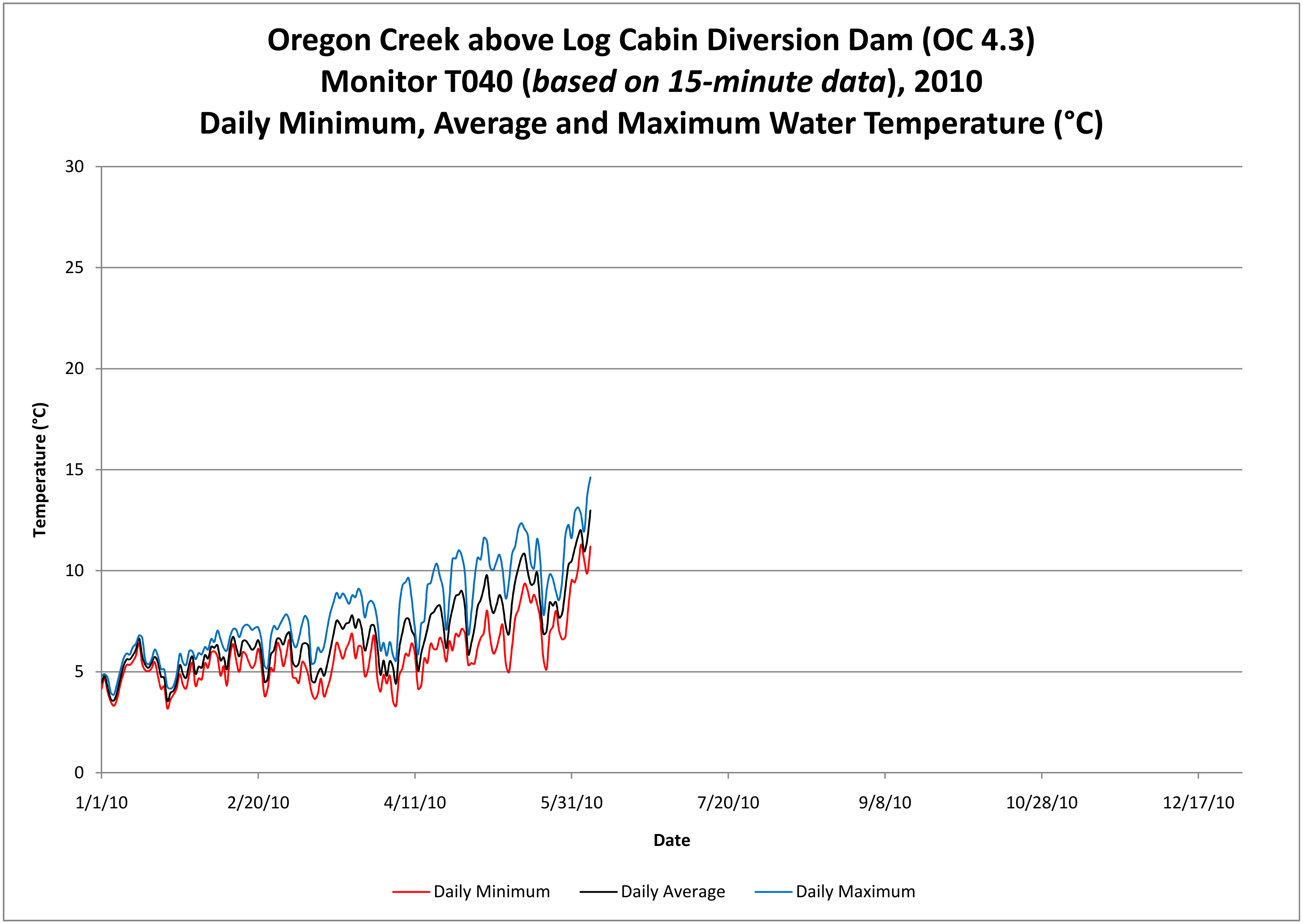
©2010, Yuba County Water Agency

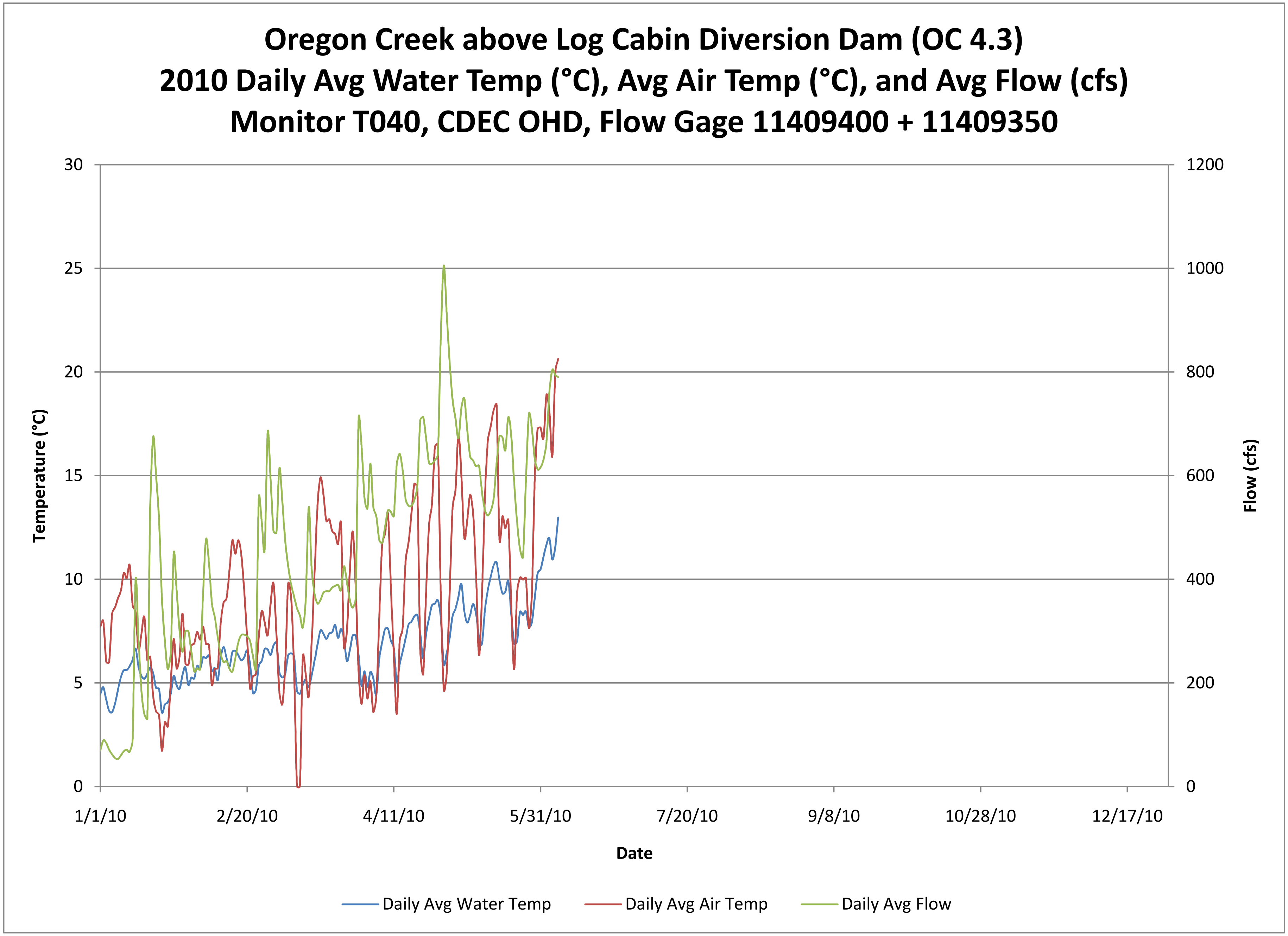

Oregon Creek above Log Cabin Diversion Dam (OC 4.3)
Monitor T040 (based on 15-minute data), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum

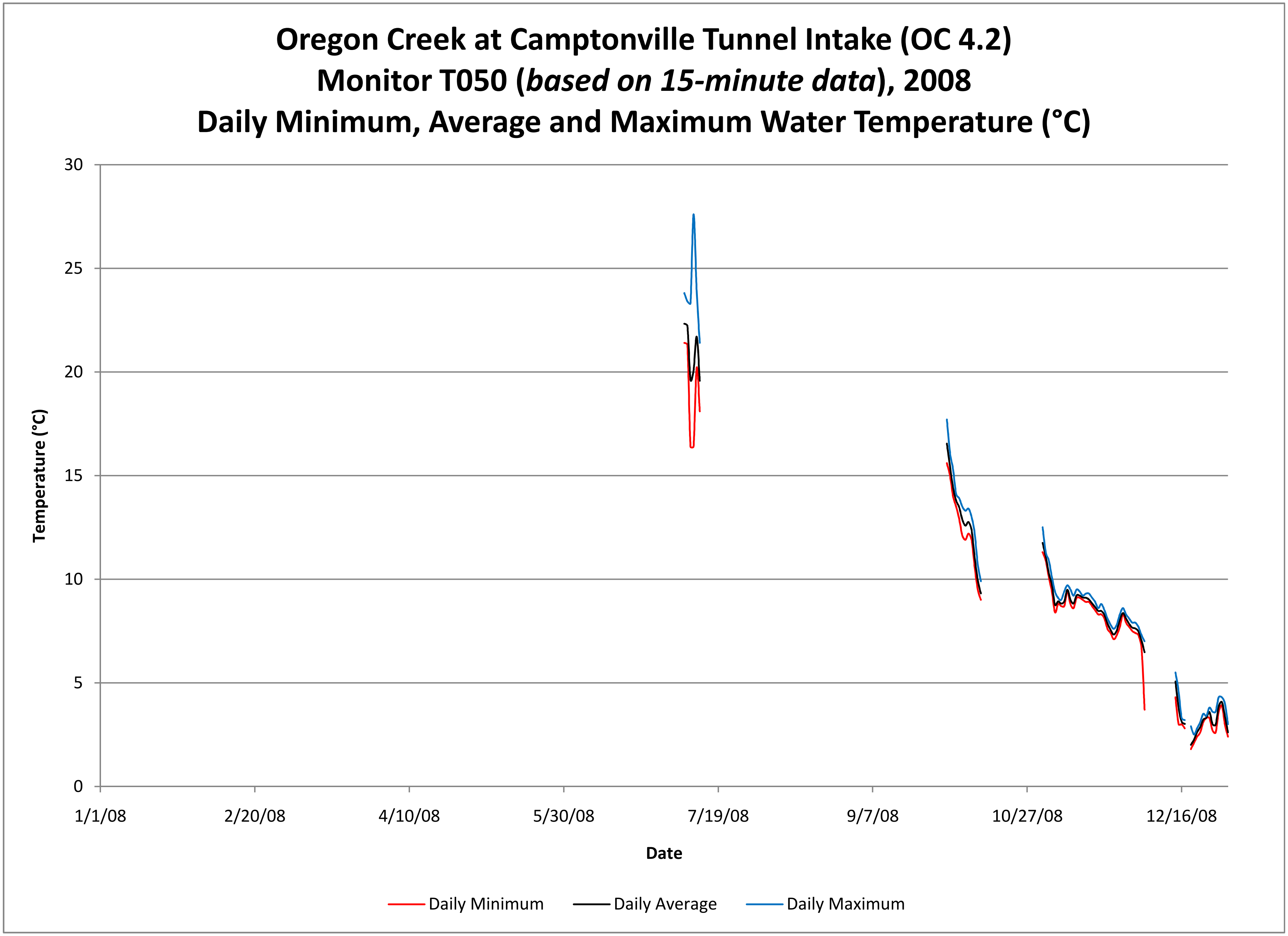

Oregon Creek above Log Cabin Diversion Dam (OC 4.3)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T040, CDEC OHD, Flow Gage 11409400 + 11409350
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
450
400
350
300
250
200
150
100
50
0
-50
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

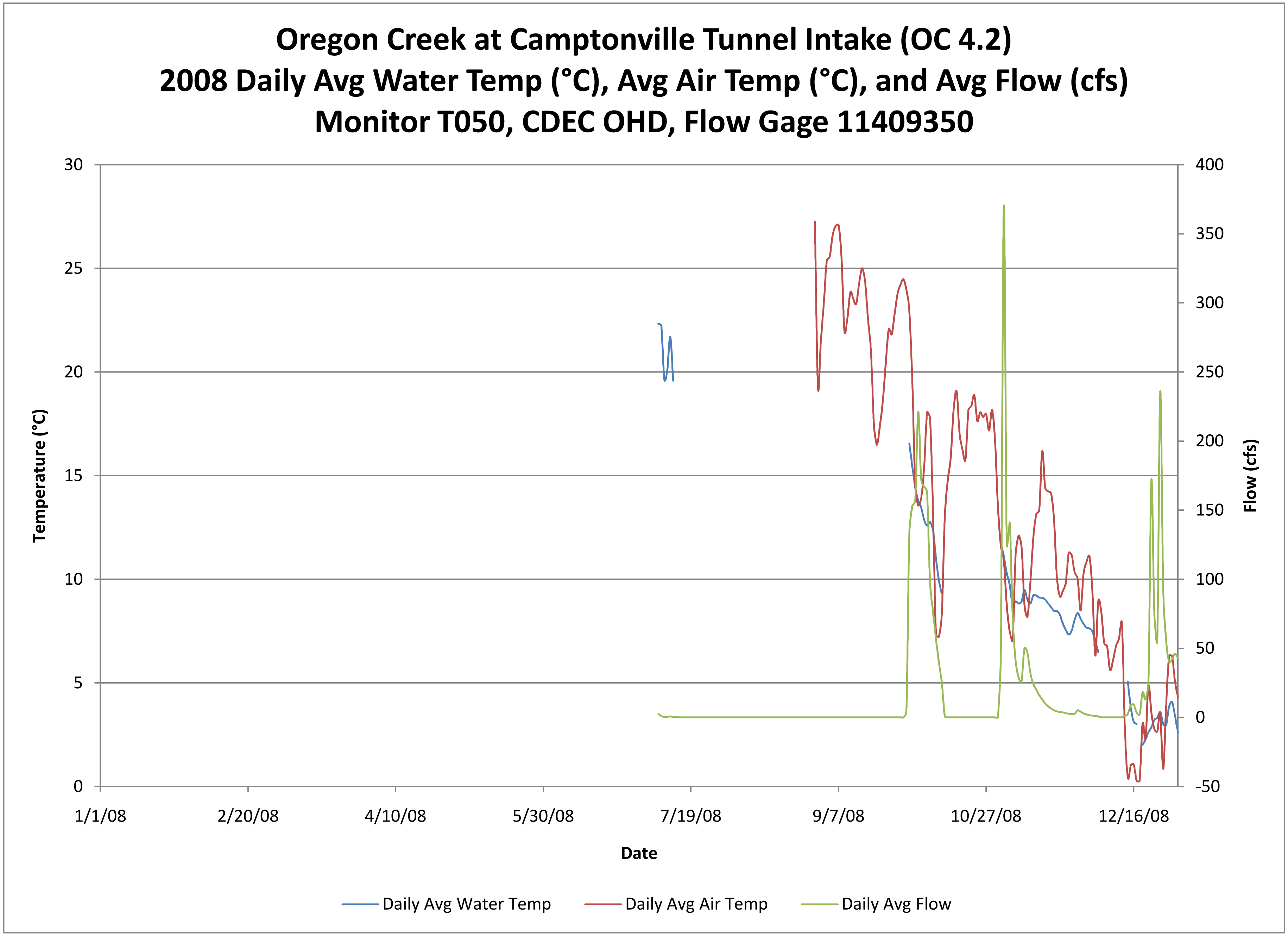

Oregon Creek above Log Cabin Diversion Dam (OC 4.3)
Monitor T040 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum

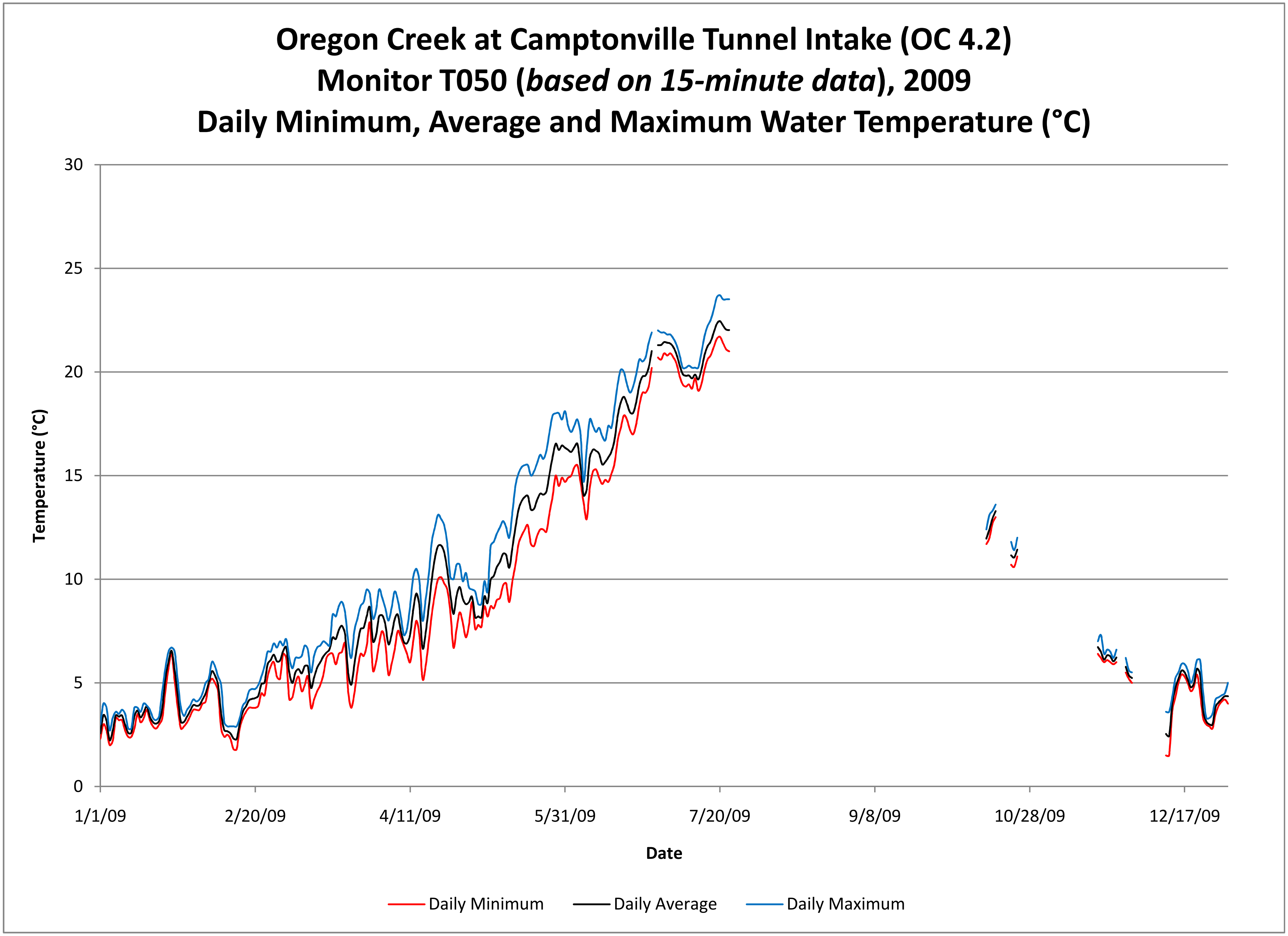

Oregon Creek above Log Cabin Diversion Dam (OC 4.3)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T040, CDEC OHD, Flow Gage 11409400 + 11409350
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
1600
1400
1200
1000
800
600
400
200
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

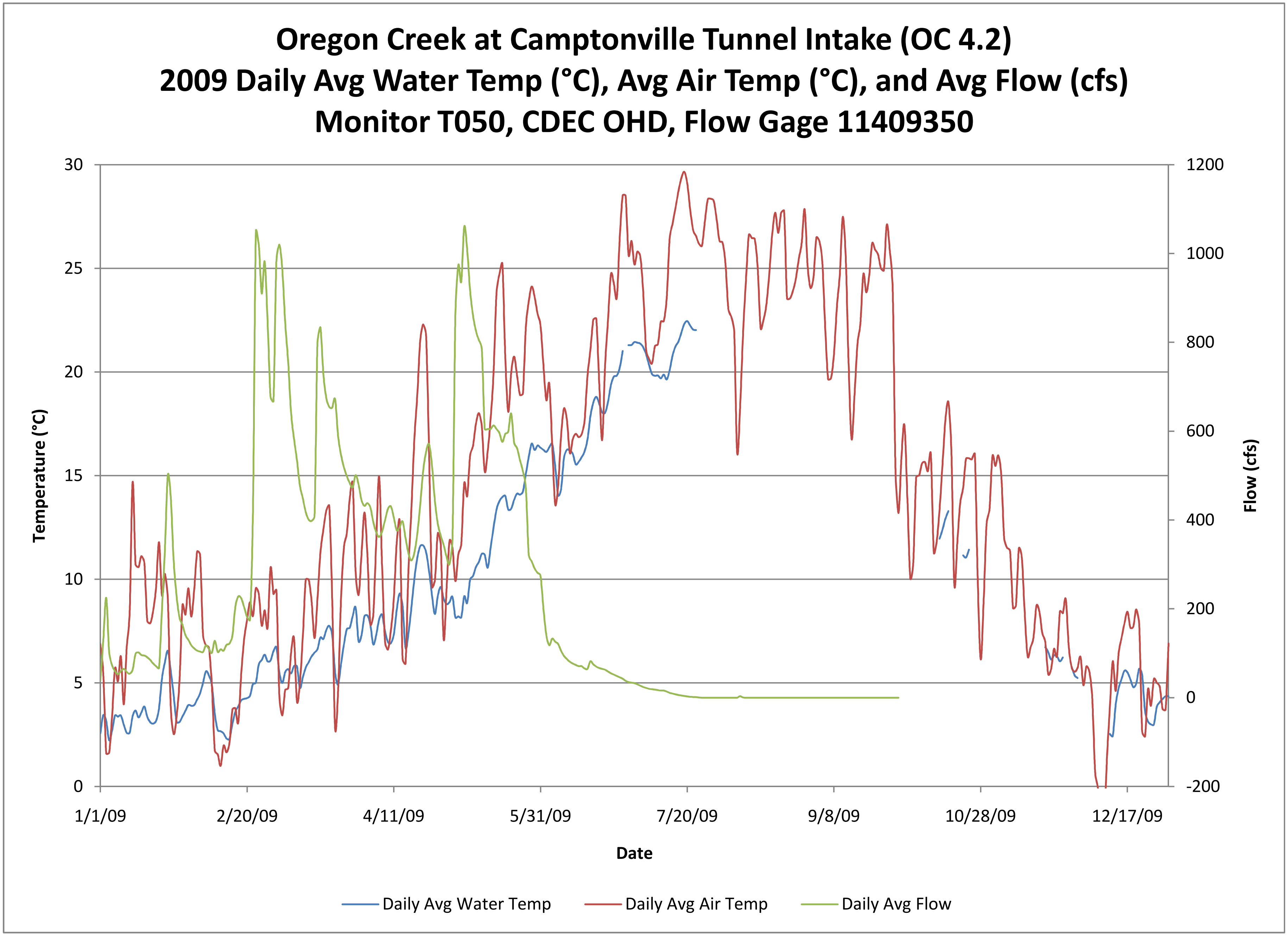

Oregon Creek above Log Cabin Diversion Dam (OC 4.3)
Monitor T040 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum

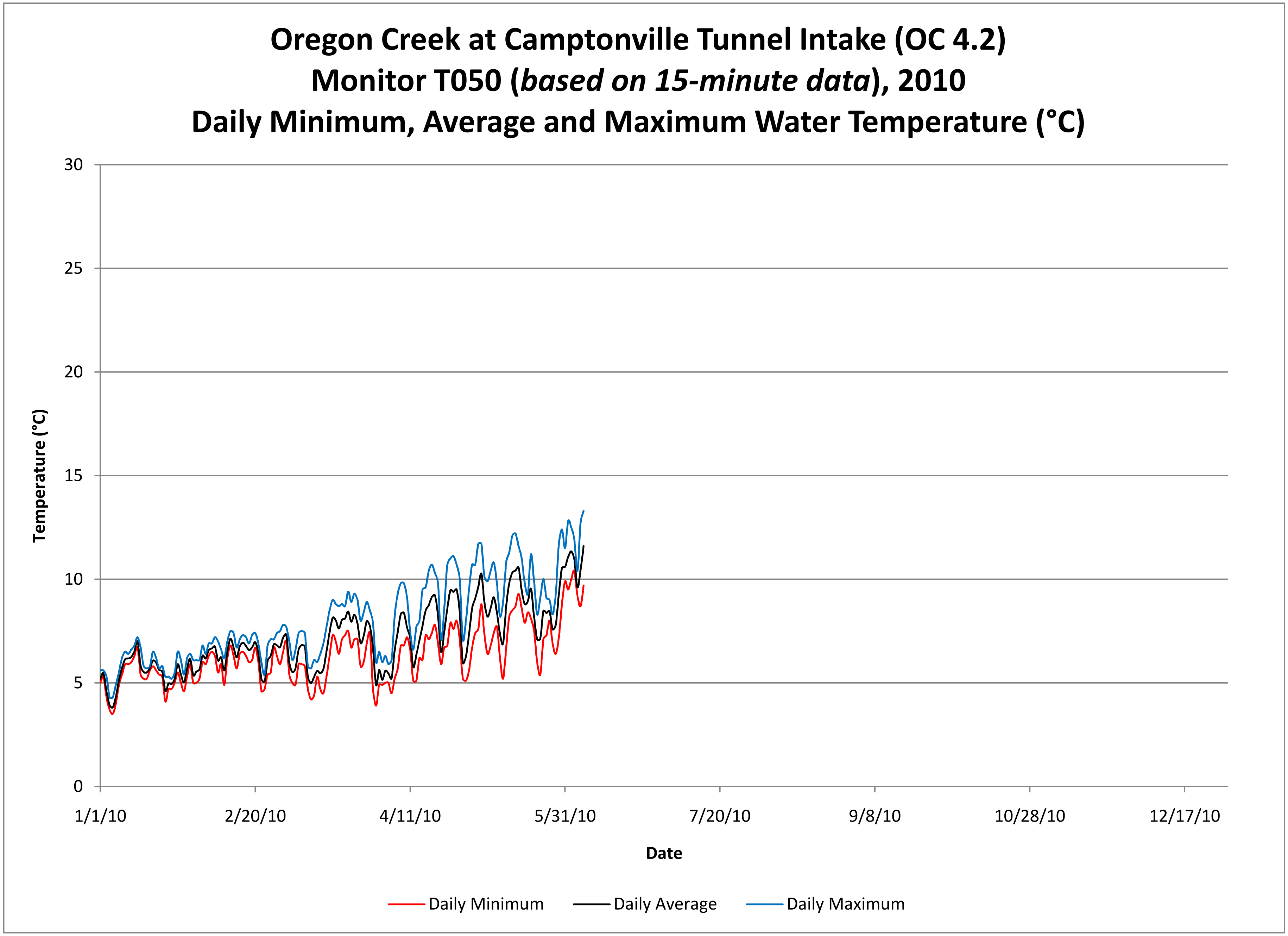

Oregon Creek above Log Cabin Diversion Dam (OC 4.3)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T040, CDEC OHD, Flow Gage 11409400 + 11409350
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
1200
1000
800
600
400
200
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

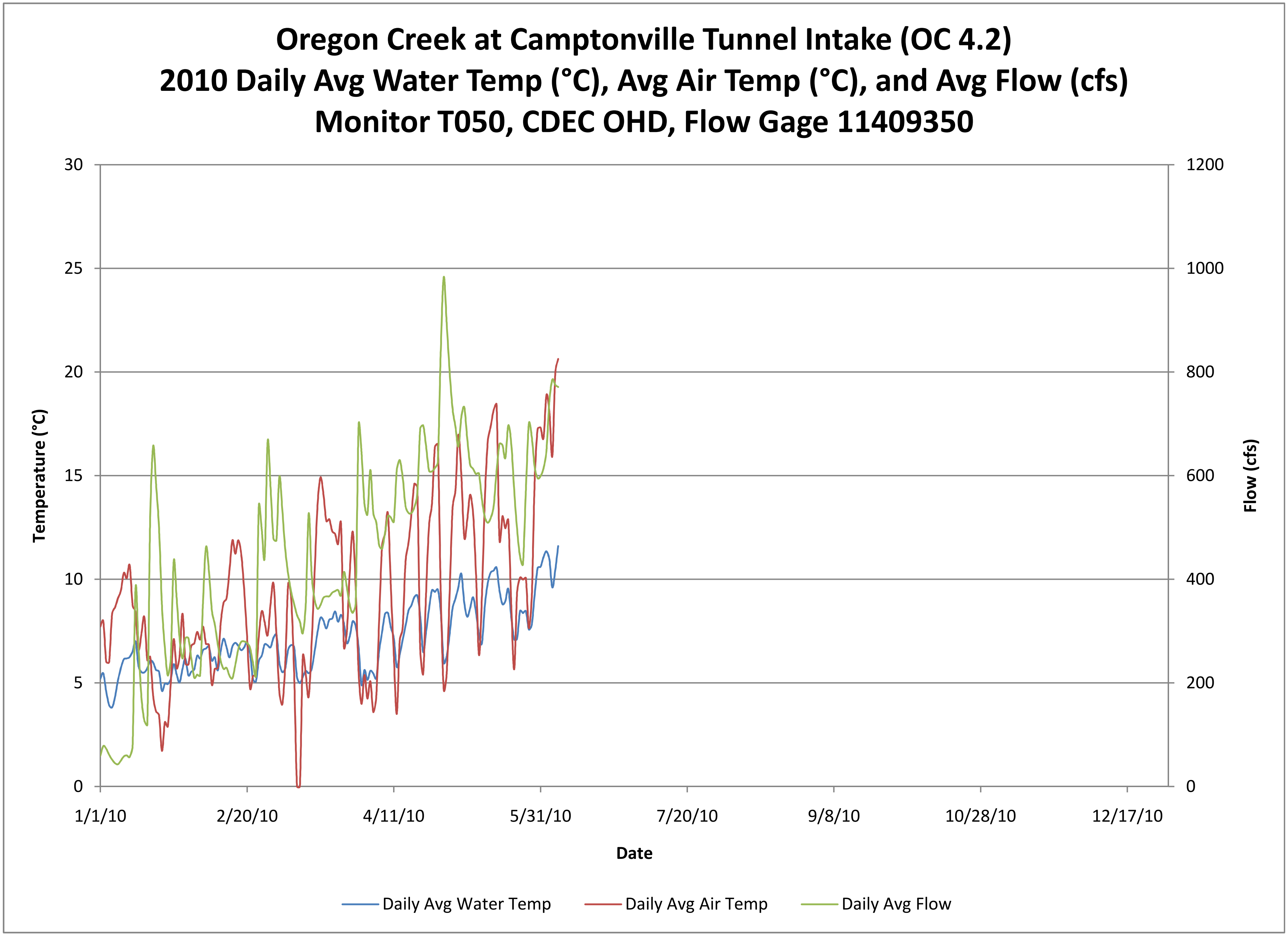

Oregon Creek at Camptonville Tunnel Intake (OC 4.2)
Monitor T050 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


Oregon Creek at Camptonville Tunnel Intake (OC 4.2)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T050, CDEC OHD, Flow Gage 11409350
Temperature (°C)
Flow (cfs)
Date
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Oregon Creek at Camptonville Tunnel Intake (OC 4.2)
Monitor T050 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Oregon Creek at Camptonville Tunnel Intake (OC 4.2)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T050, CDEC OHD, Flow Gage 11409350
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
1200
1000
800
600
400
200
0
-200
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Oregon Creek at Camptonville Tunnel Intake (OC 4.2)
Monitor T050 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum



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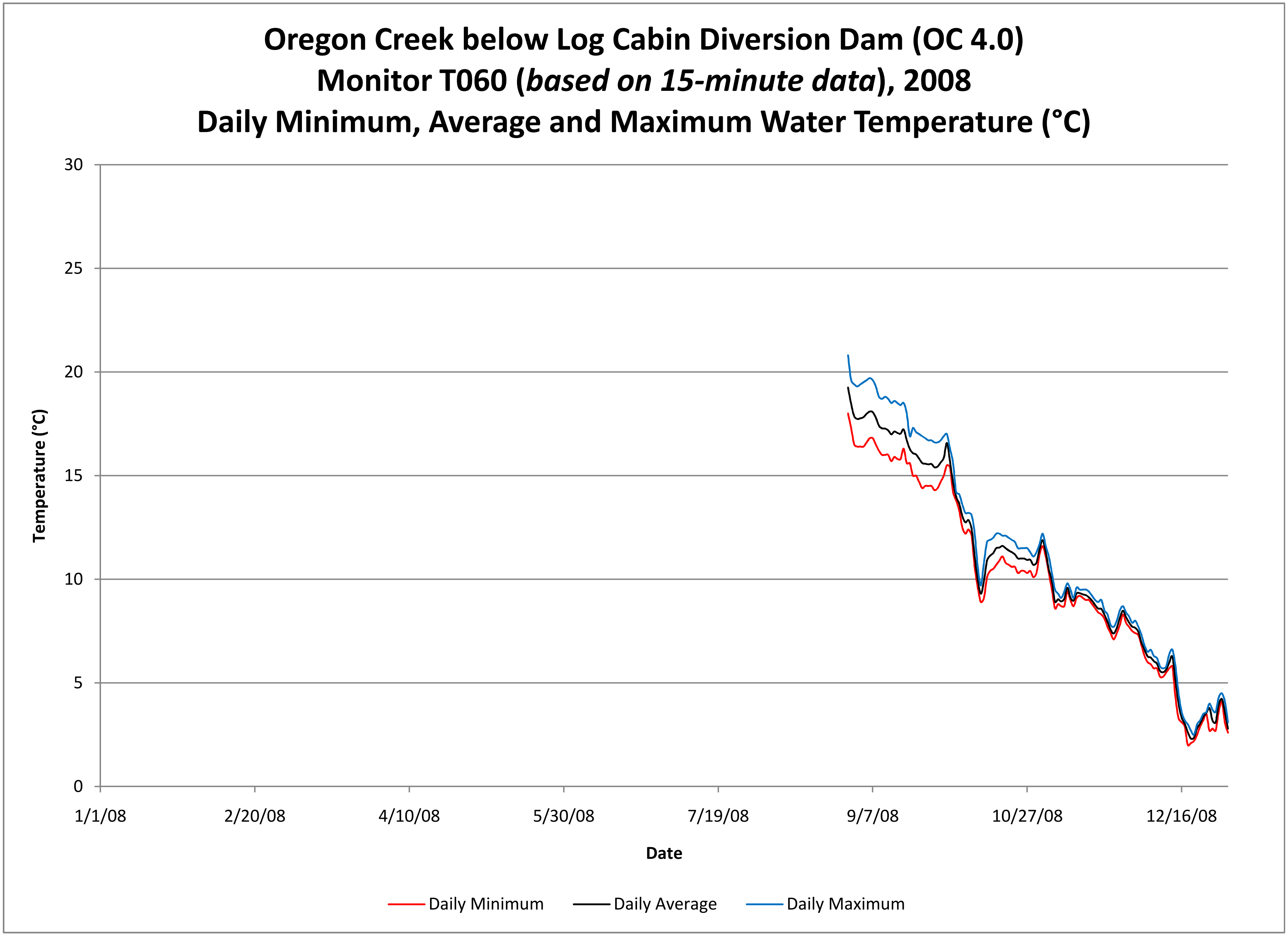
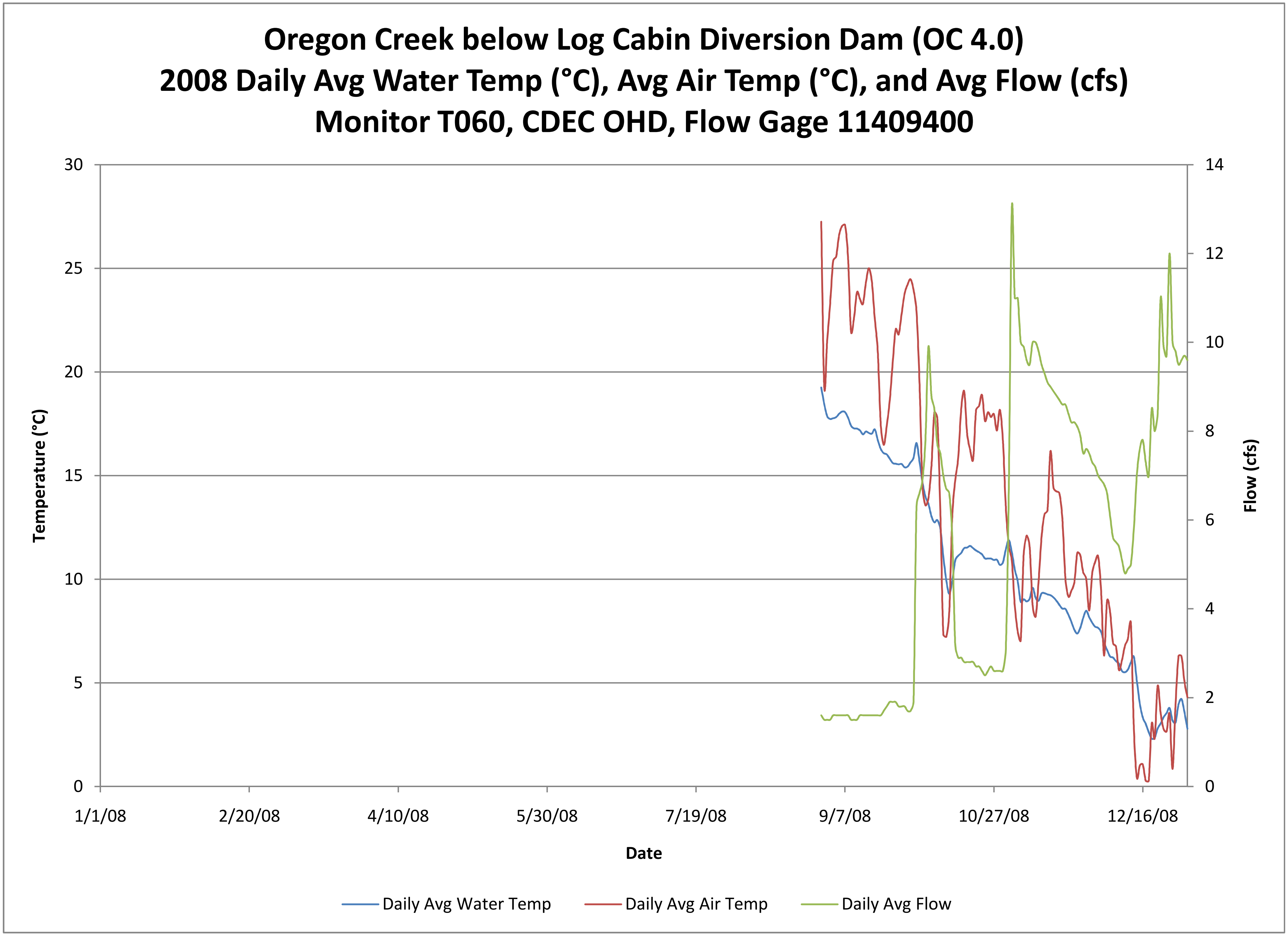
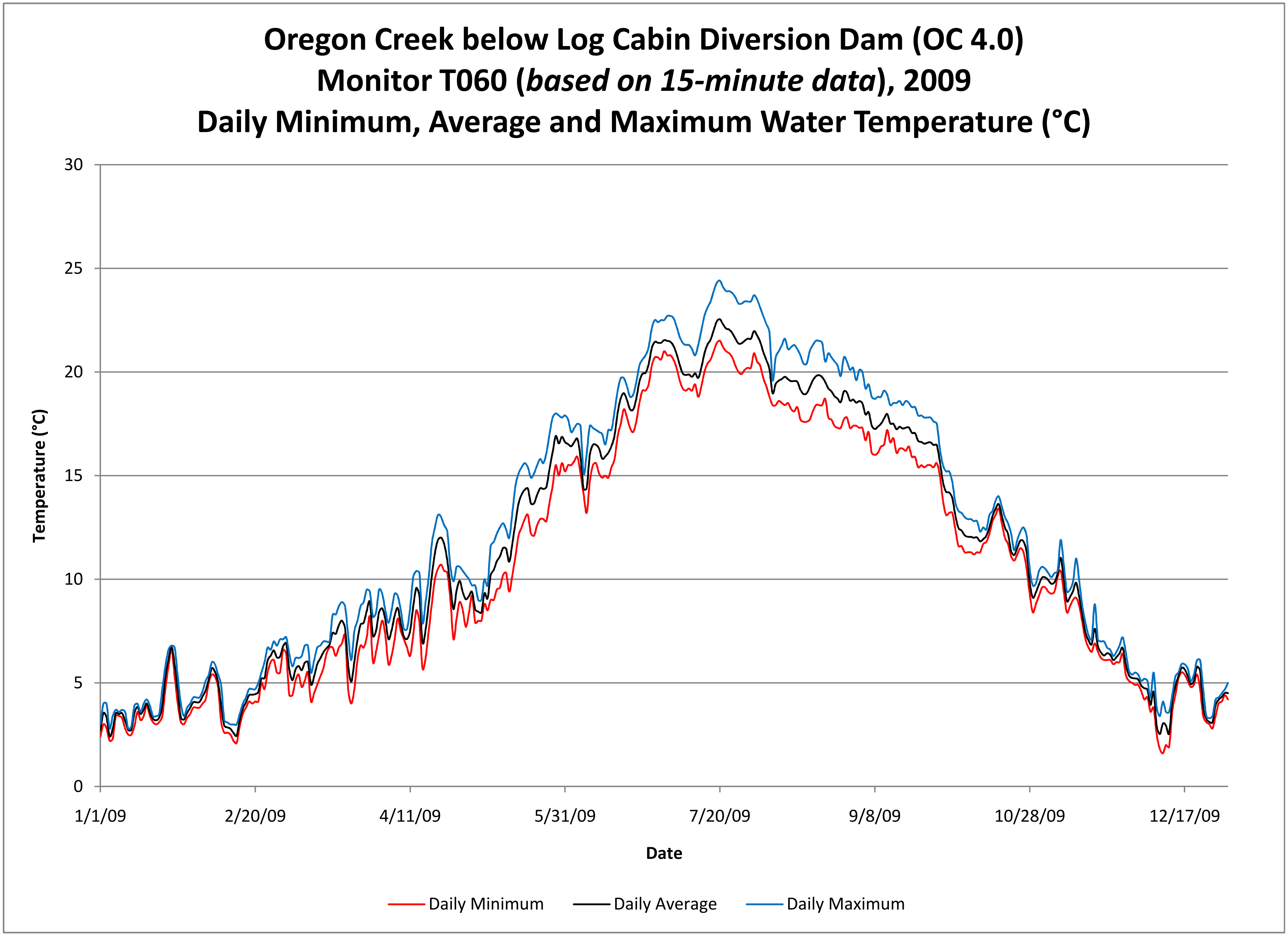

Oregon Creek below Log Cabin Diversion Dam (OC 4.0)
Monitor T060 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


Oregon Creek below Log Cabin Diversion Dam (OC 4.0)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T060, CDEC OHD, Flow Gage 11409400
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
14
12
10
8
6
4
2
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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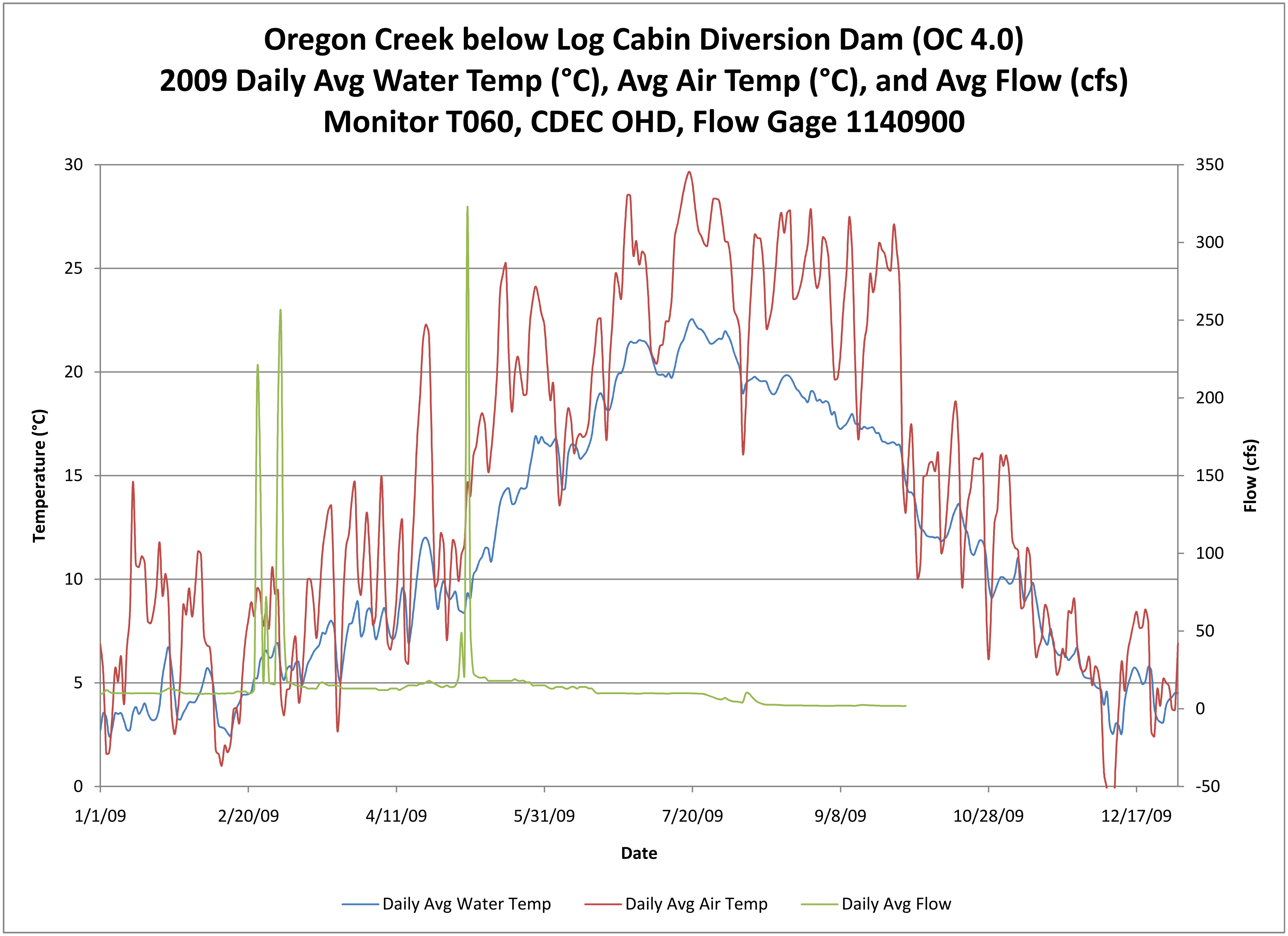
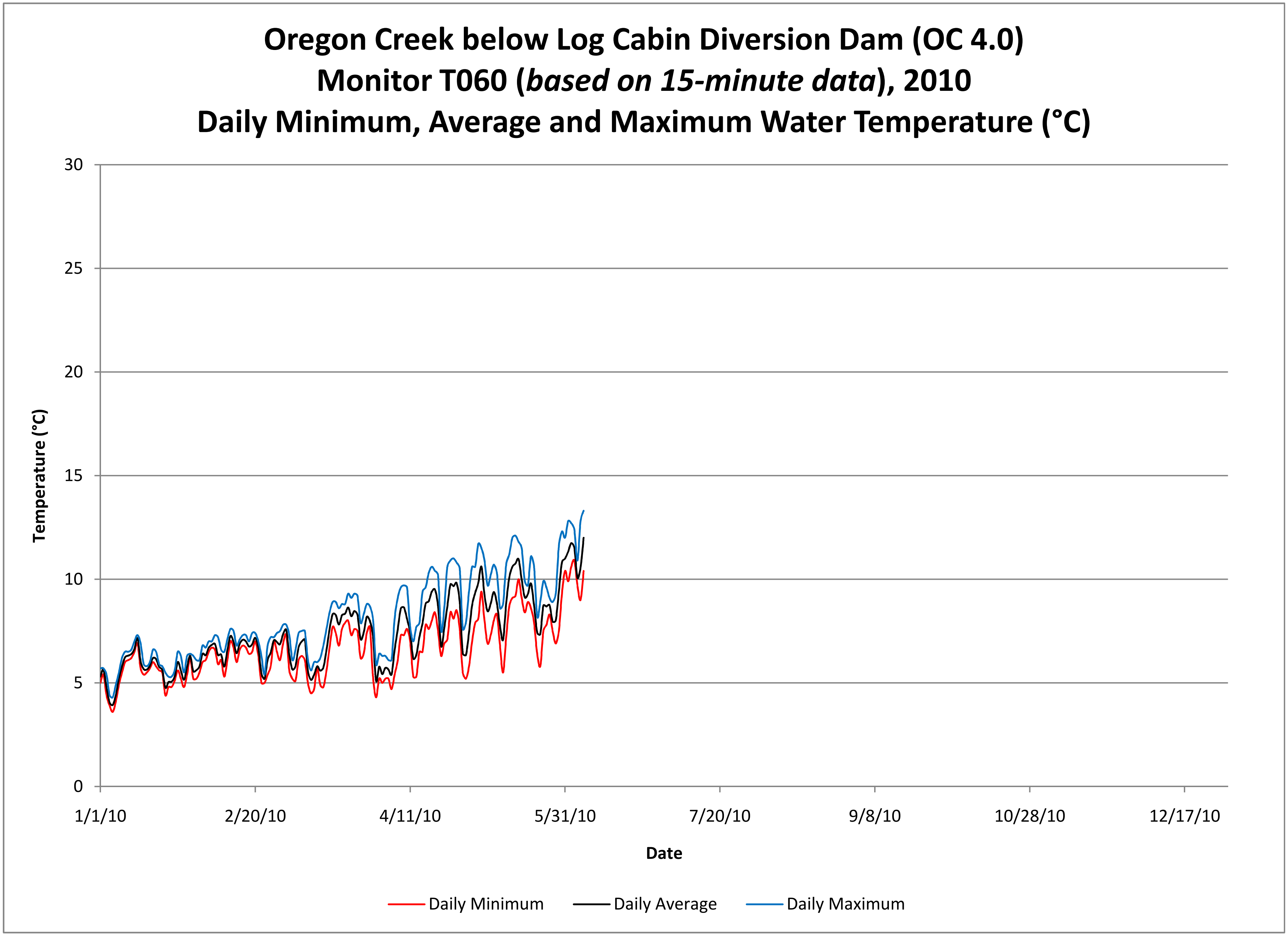

Oregon Creek below Log Cabin Diversion Dam (OC 4.0)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T060, CDEC OHD, Flow Gage 1140900
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
350
300
250
200
150
100
50
0
-50
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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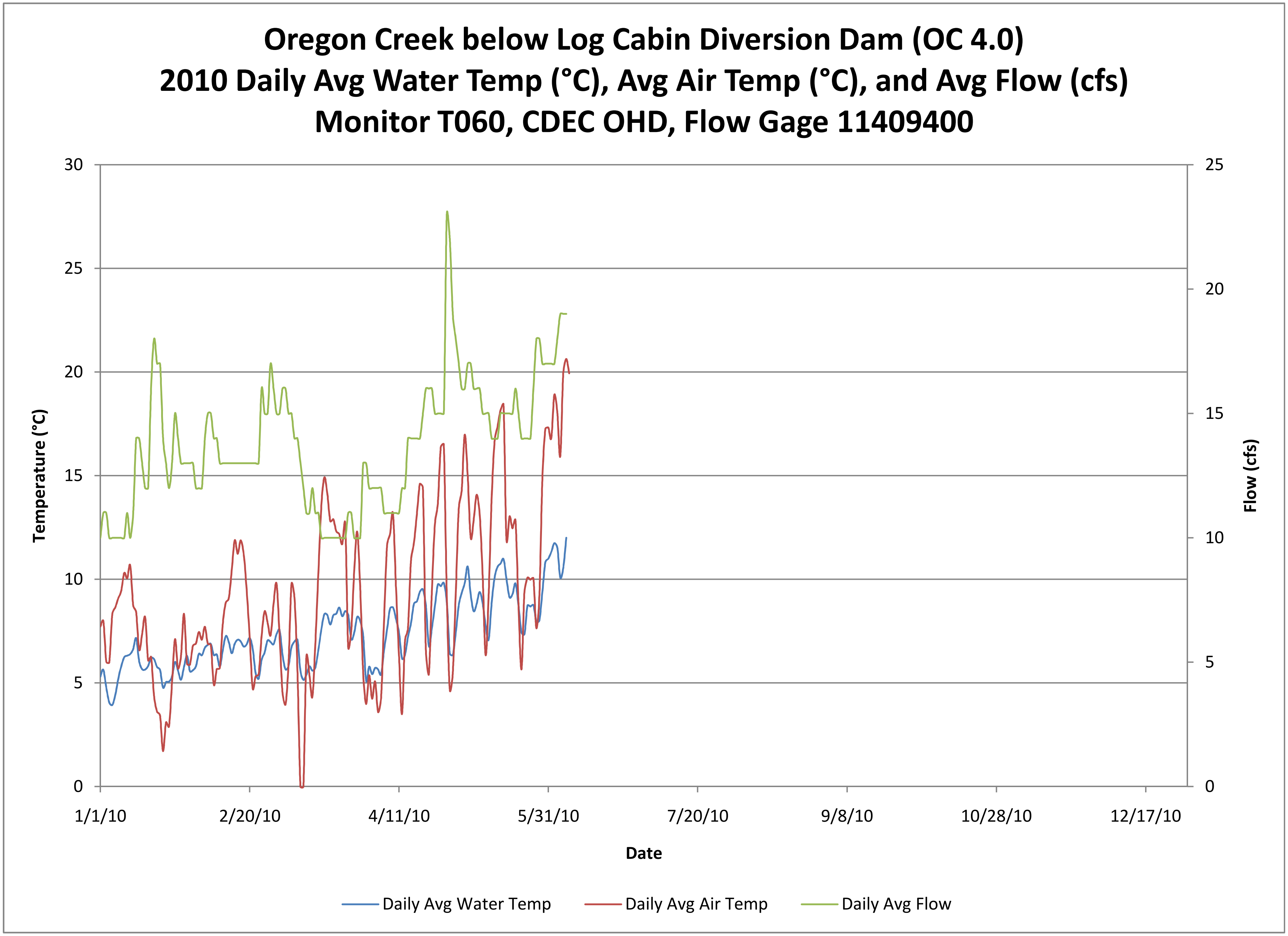
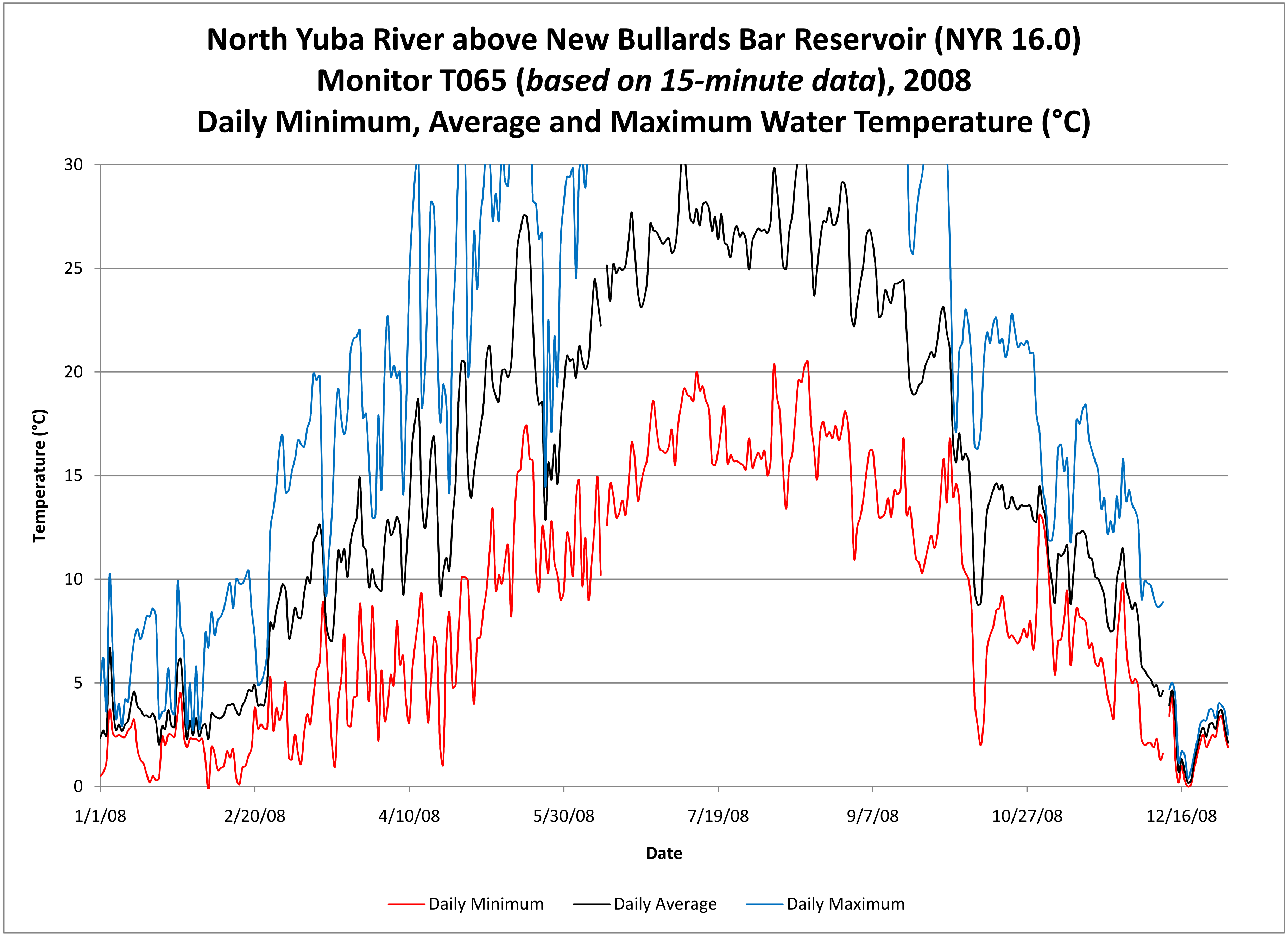
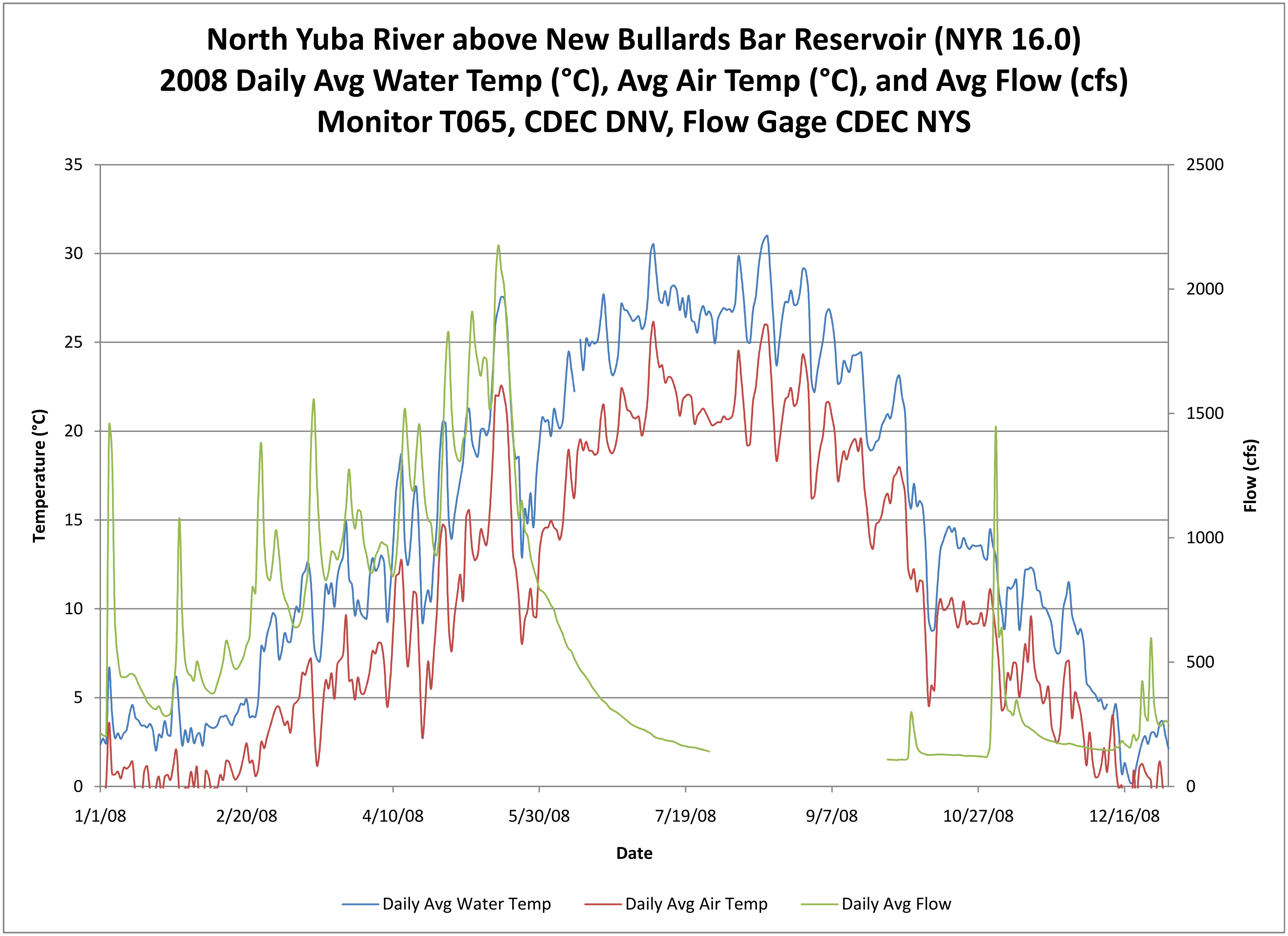
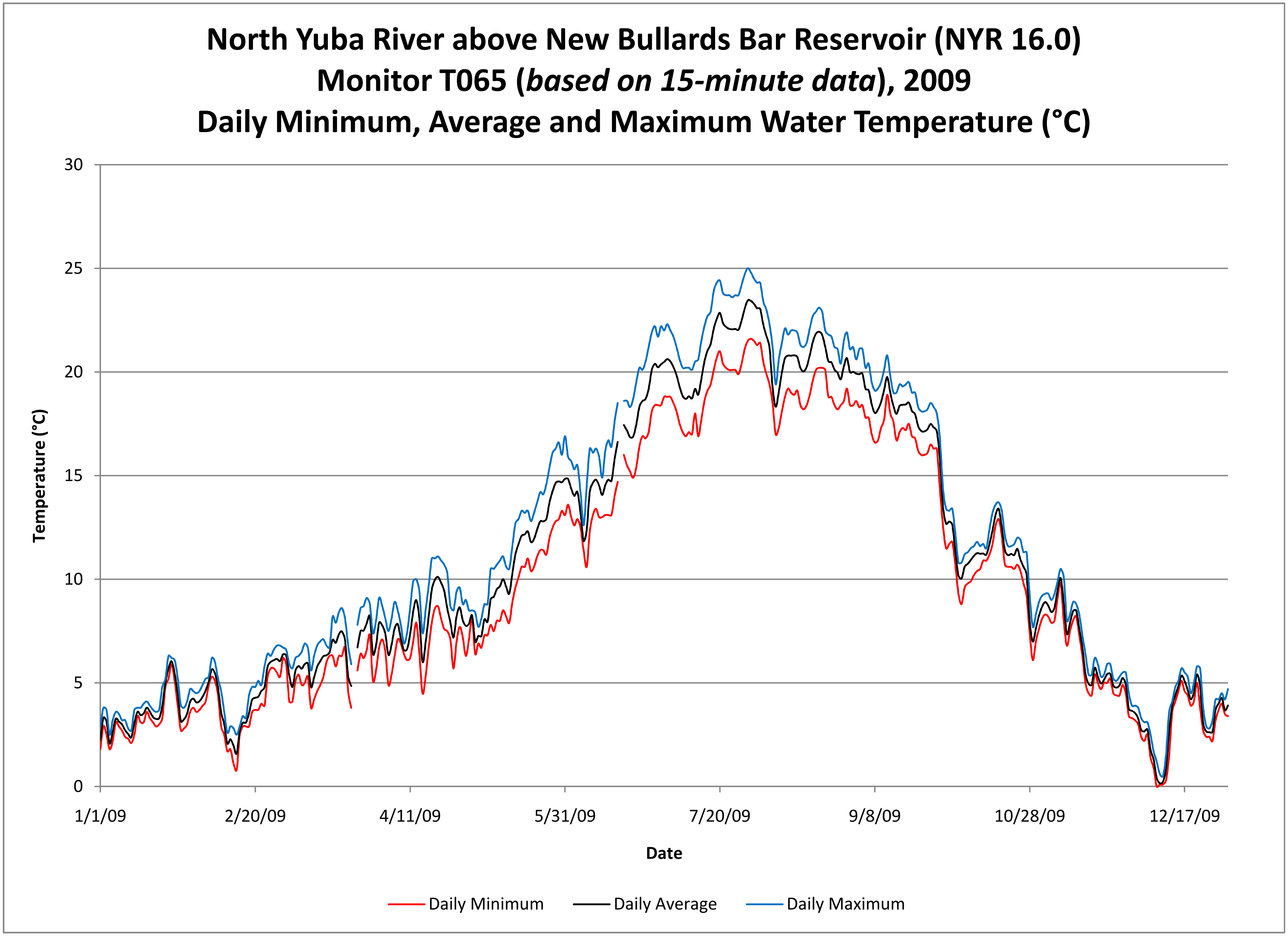

Oregon Creek below Log Cabin Diversion Dam (OC 4.0)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T060, CDEC OHD, Flow Gage 11409400
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


North Yuba River above New Bullards Bar Reservoir (NYR 16.0)
Monitor T065 (based on 15-minute data), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


North Yuba River above New Bullards Bar Reservoir (NYR 16.0)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T065, CDEC DNV, Flow Gage CDEC NYS
Temperature (°C)
0
5
10
15
20
25
30
35
Flow (cfs)
0
500
1000
1500
2000
2500
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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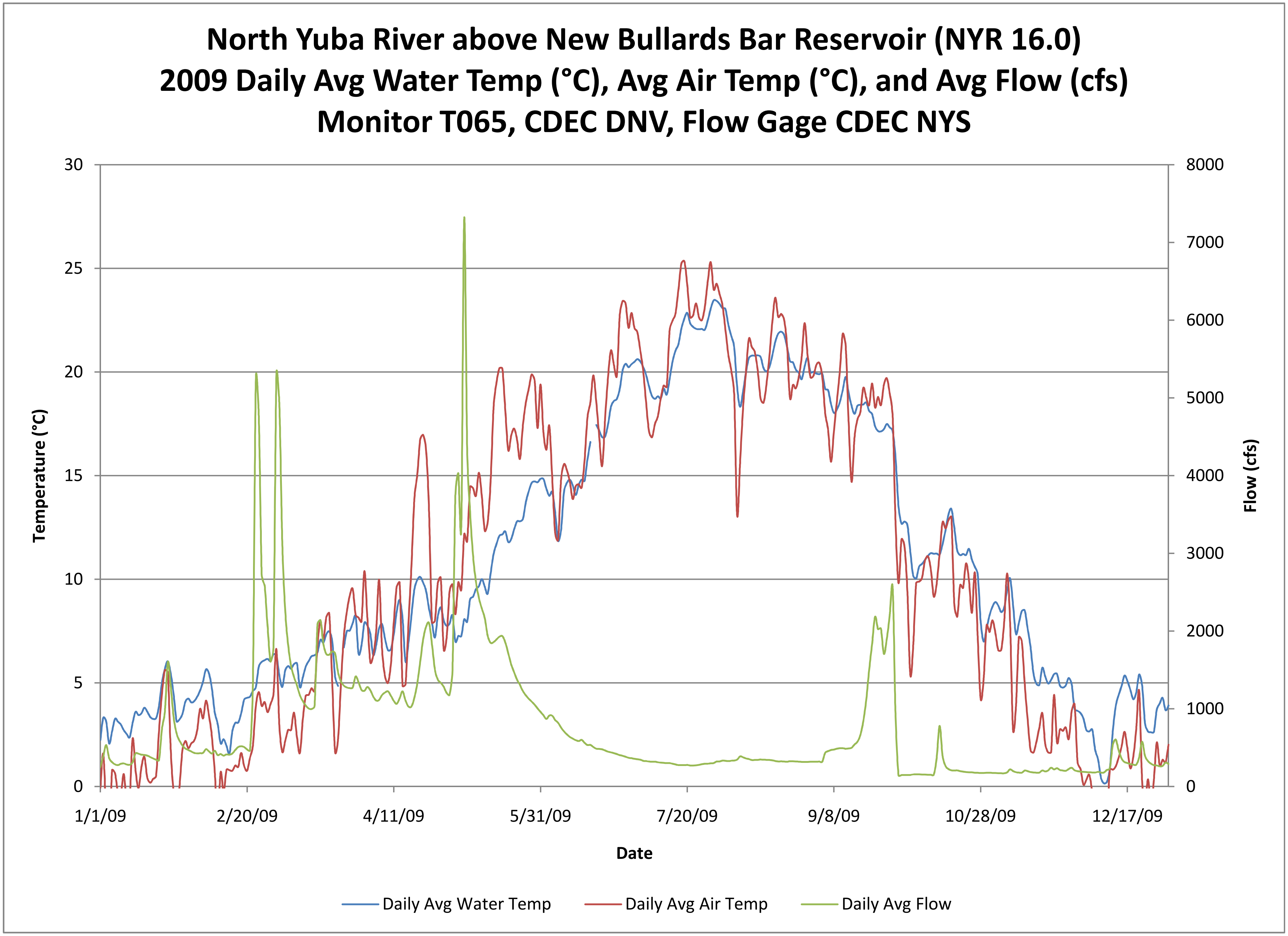
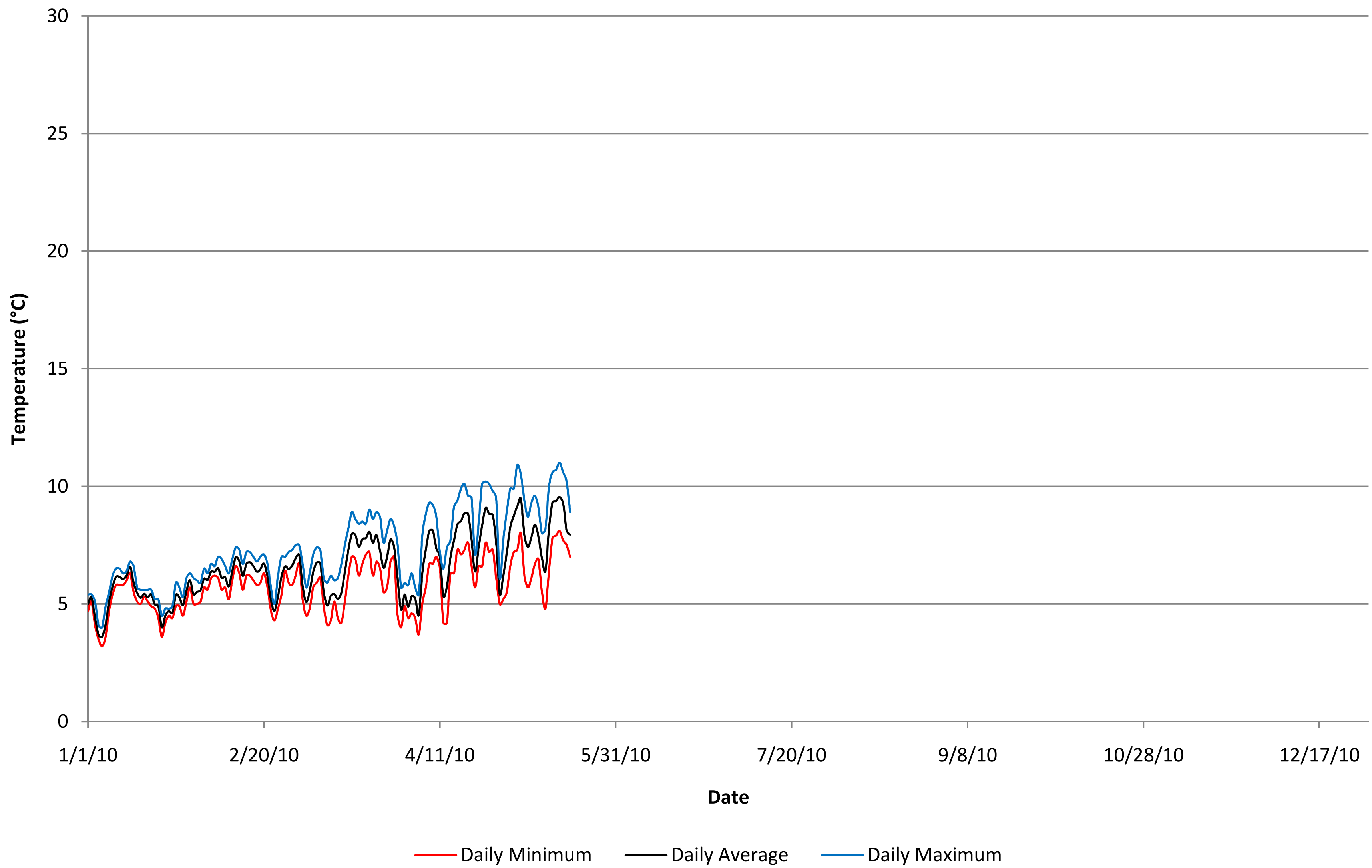
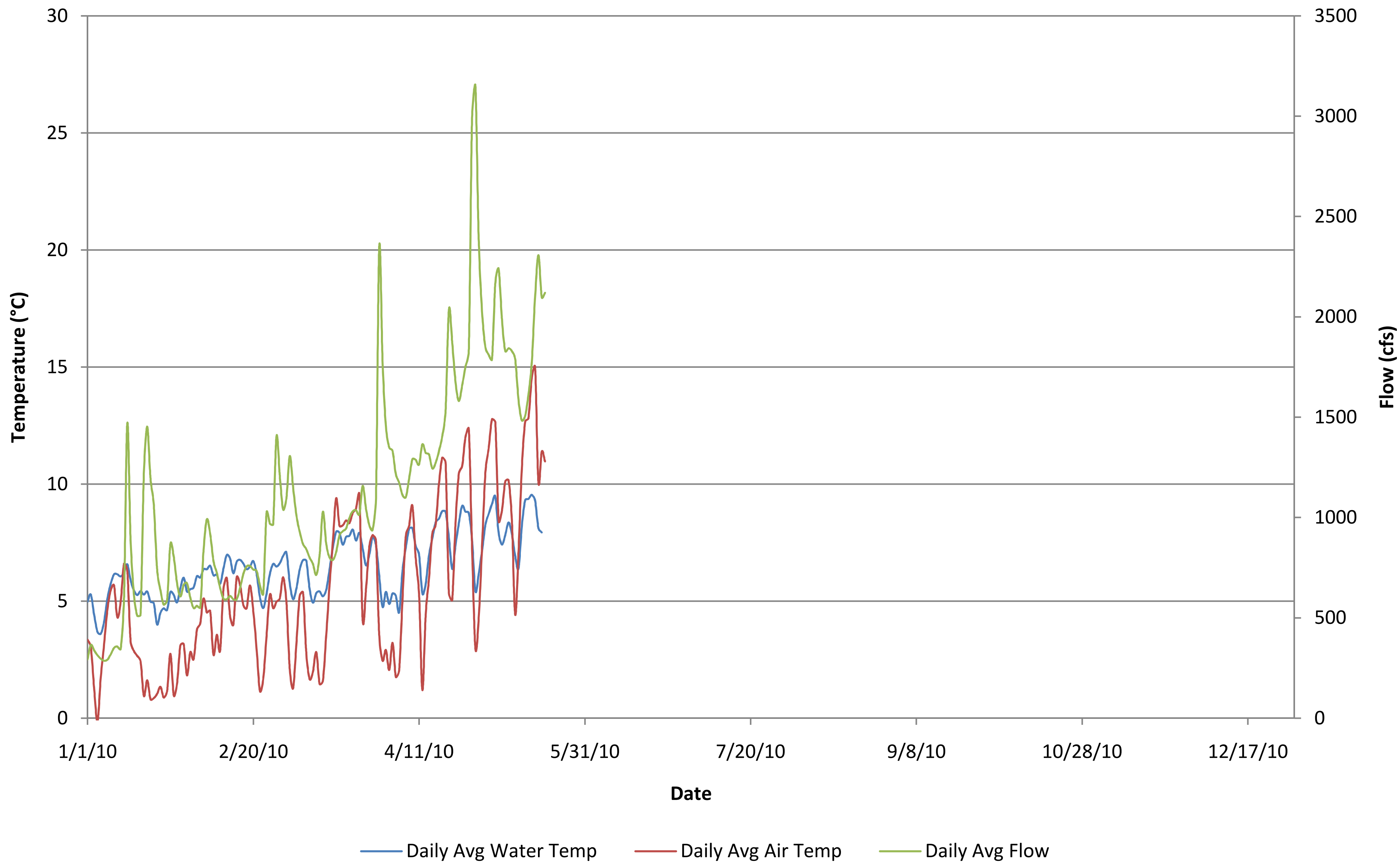
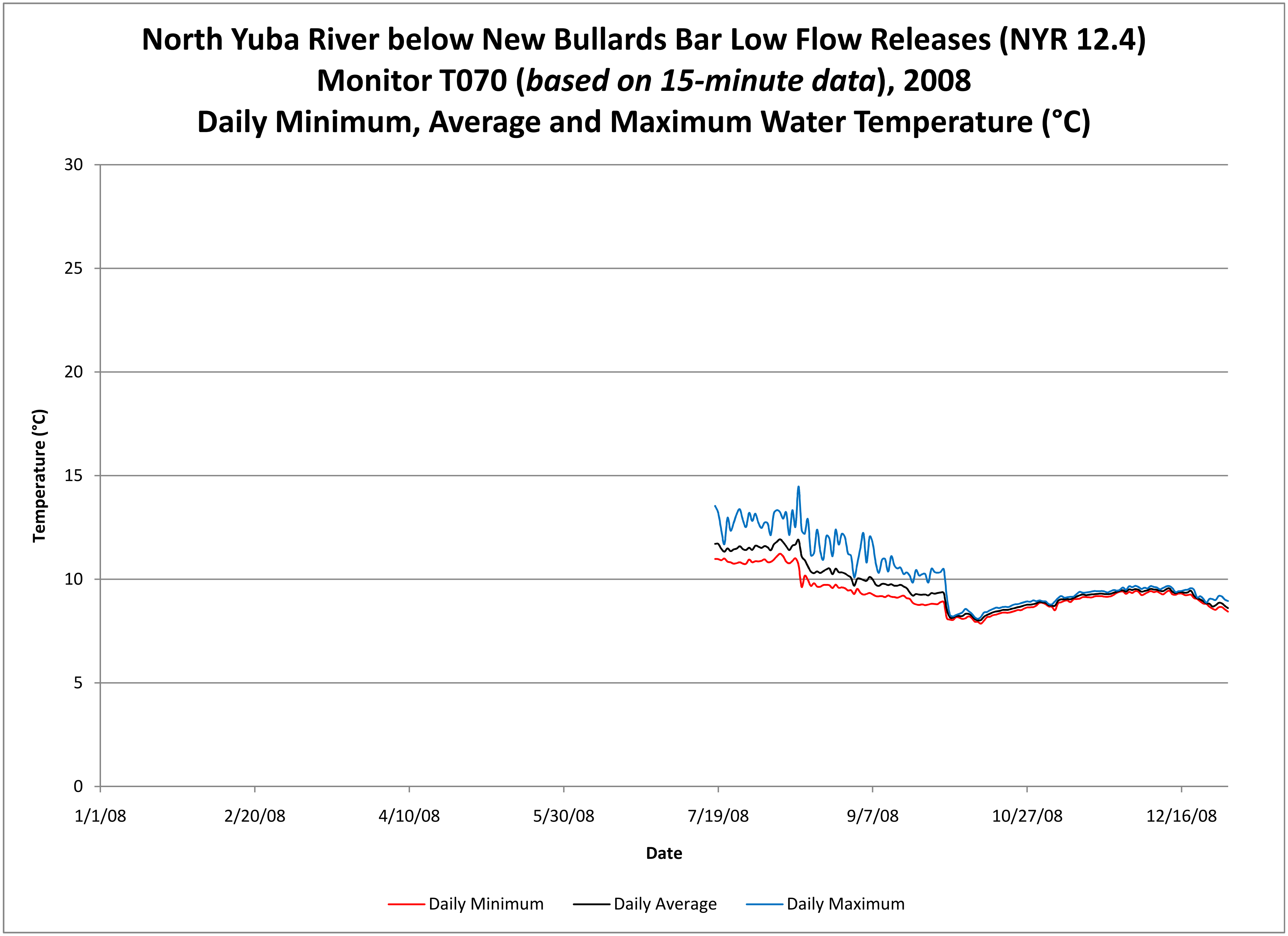

North Yuba River above New Bullards Bar Reservoir (NYR 16.0)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T065, CDEC DNV, Flow Gage CDEC NYS
Temperature (°C)
0
5
10
15
20
25
30
Flow (cfs)
0
1000
2000
3000
4000
5000
6000
7000
8000
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

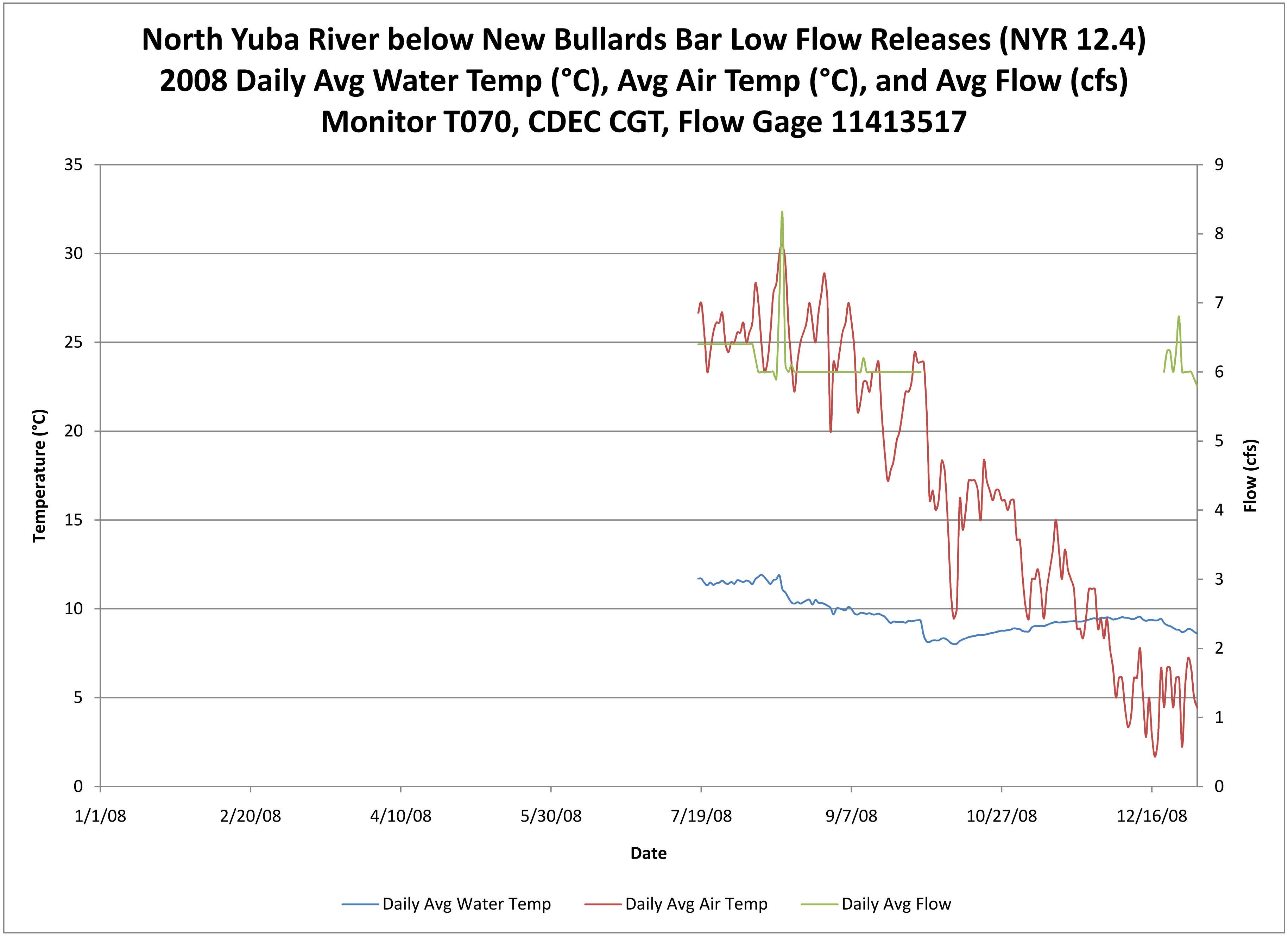
**North Yuba River above New Bullards Bar Reservoir (NYR 16.0)
Monitor T065 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)**



**North Yuba River above New Bullards Bar Reservoir (NYR 16.0)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T0605 CDEC DNV, Flow Gage CDEC NYS**




North Yuba River below New Bullards Bar Low Flow Releases (NYR 12.4)
Monitor T070 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum



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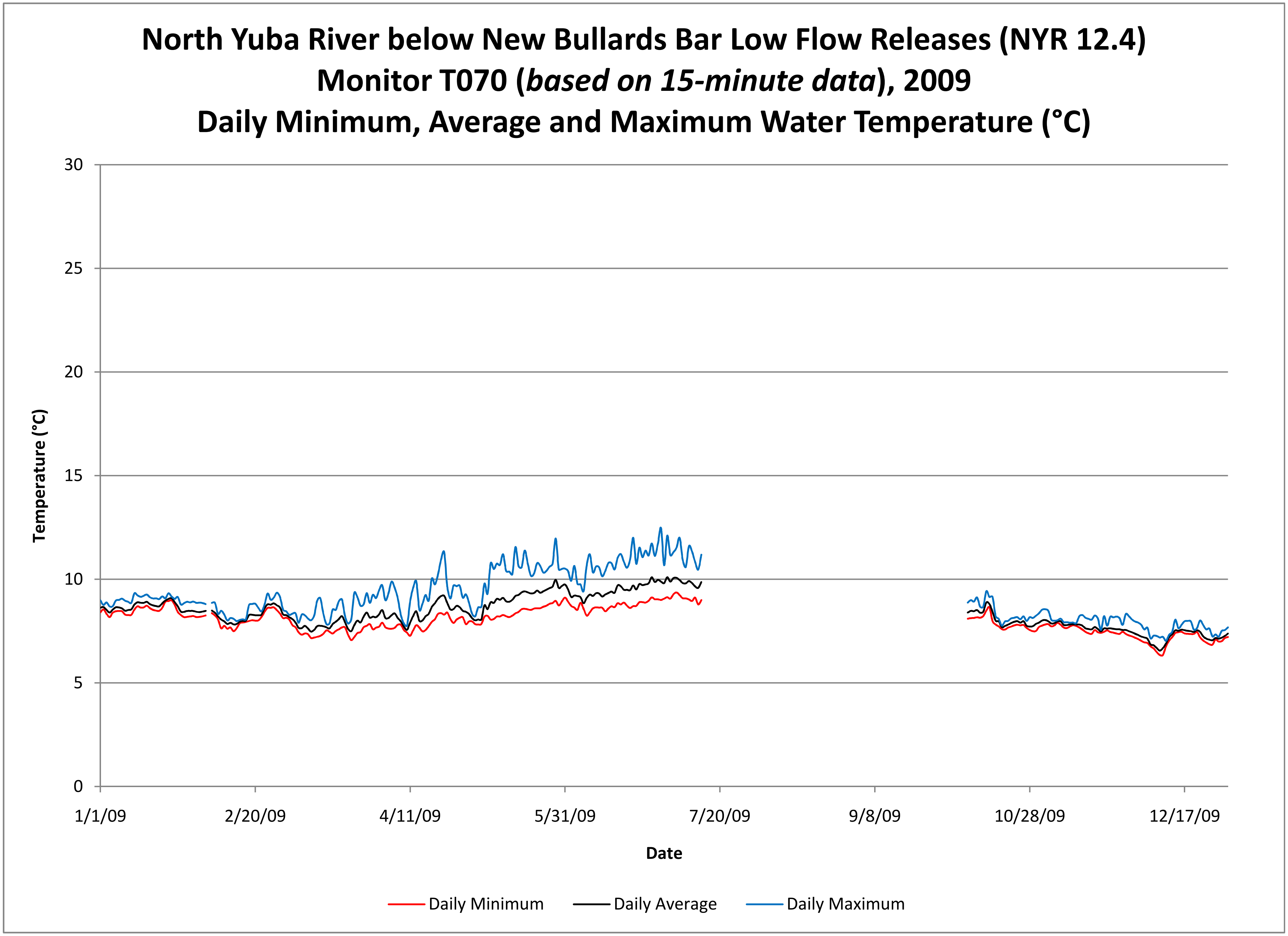
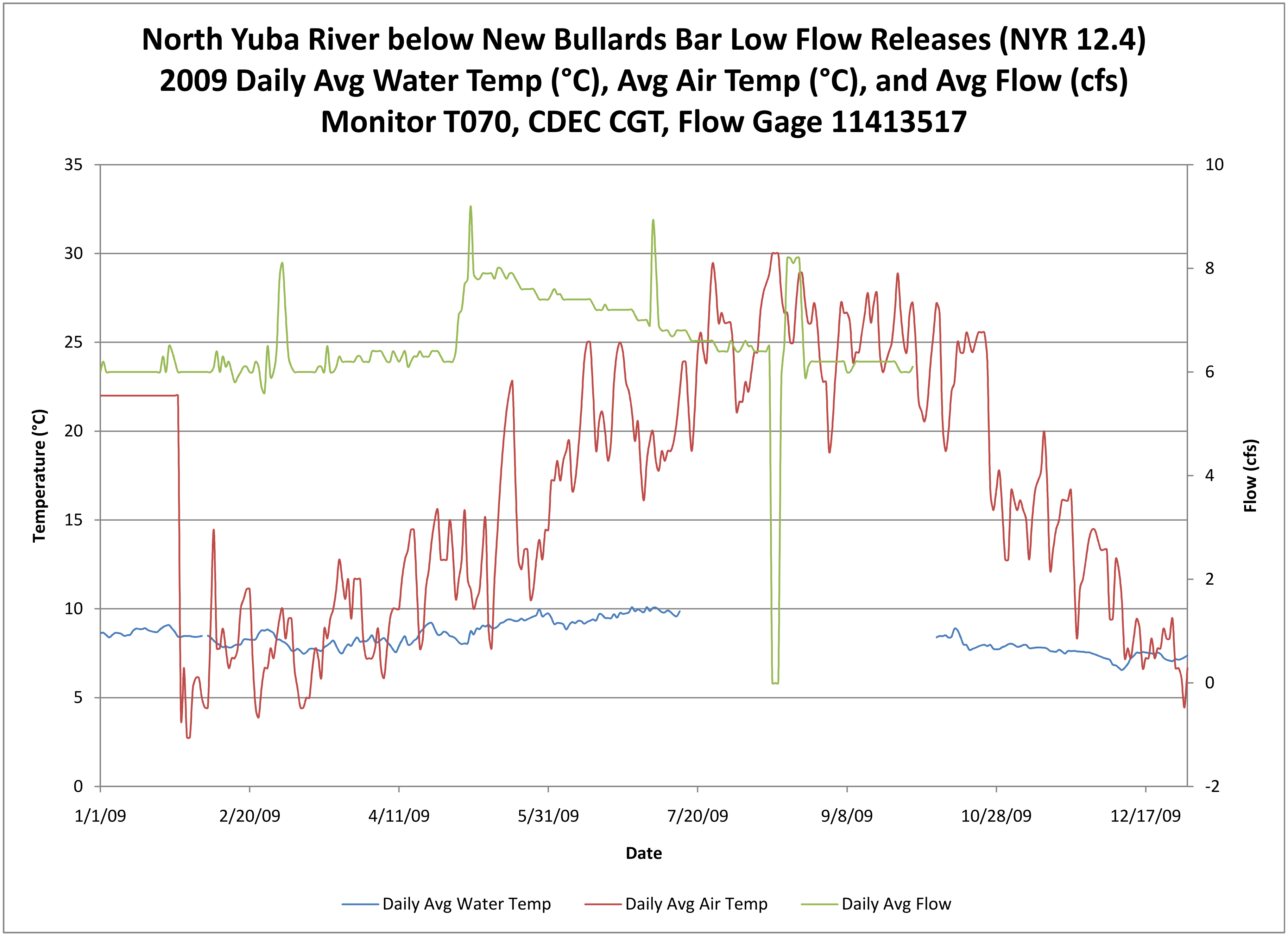
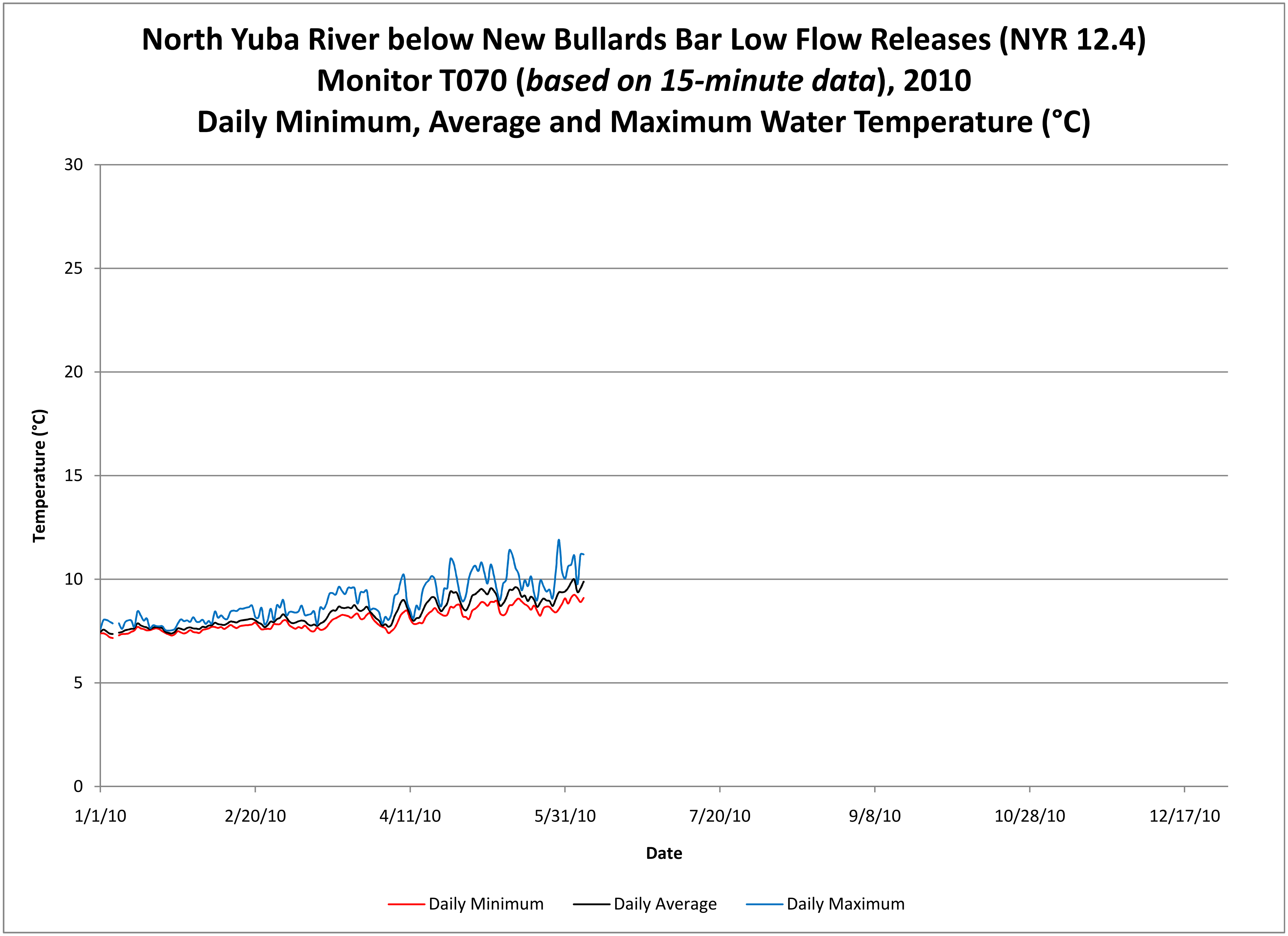
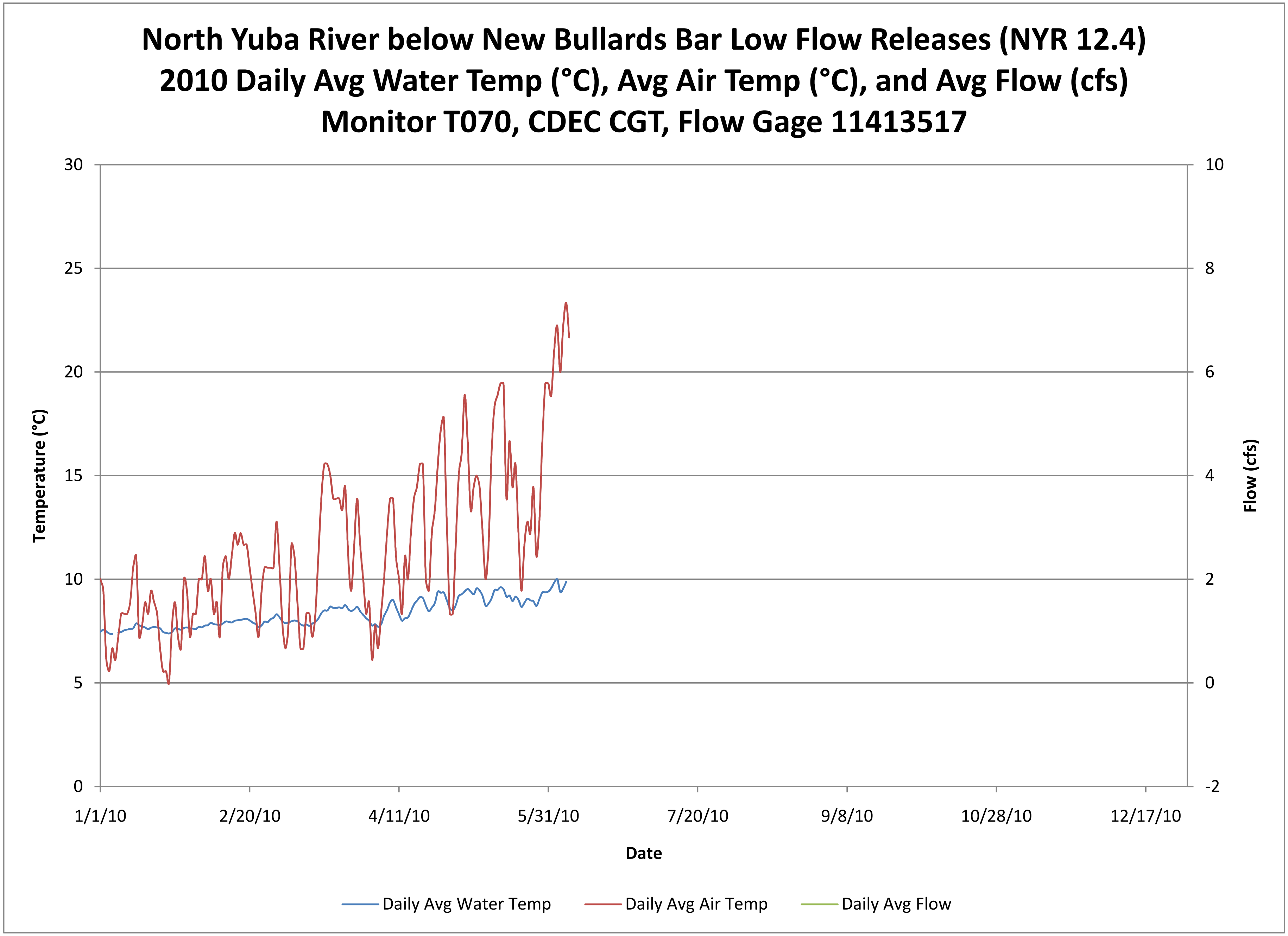
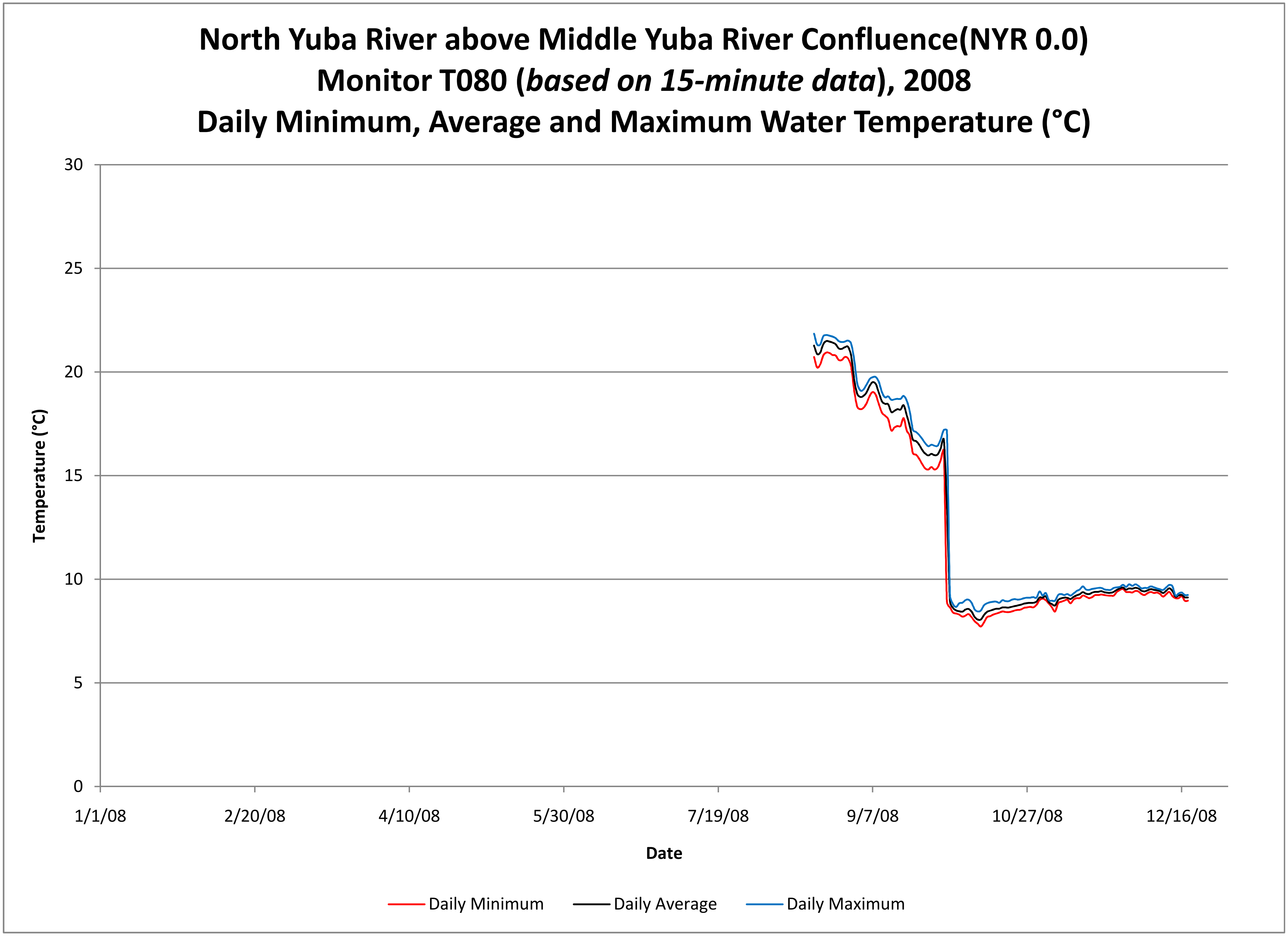
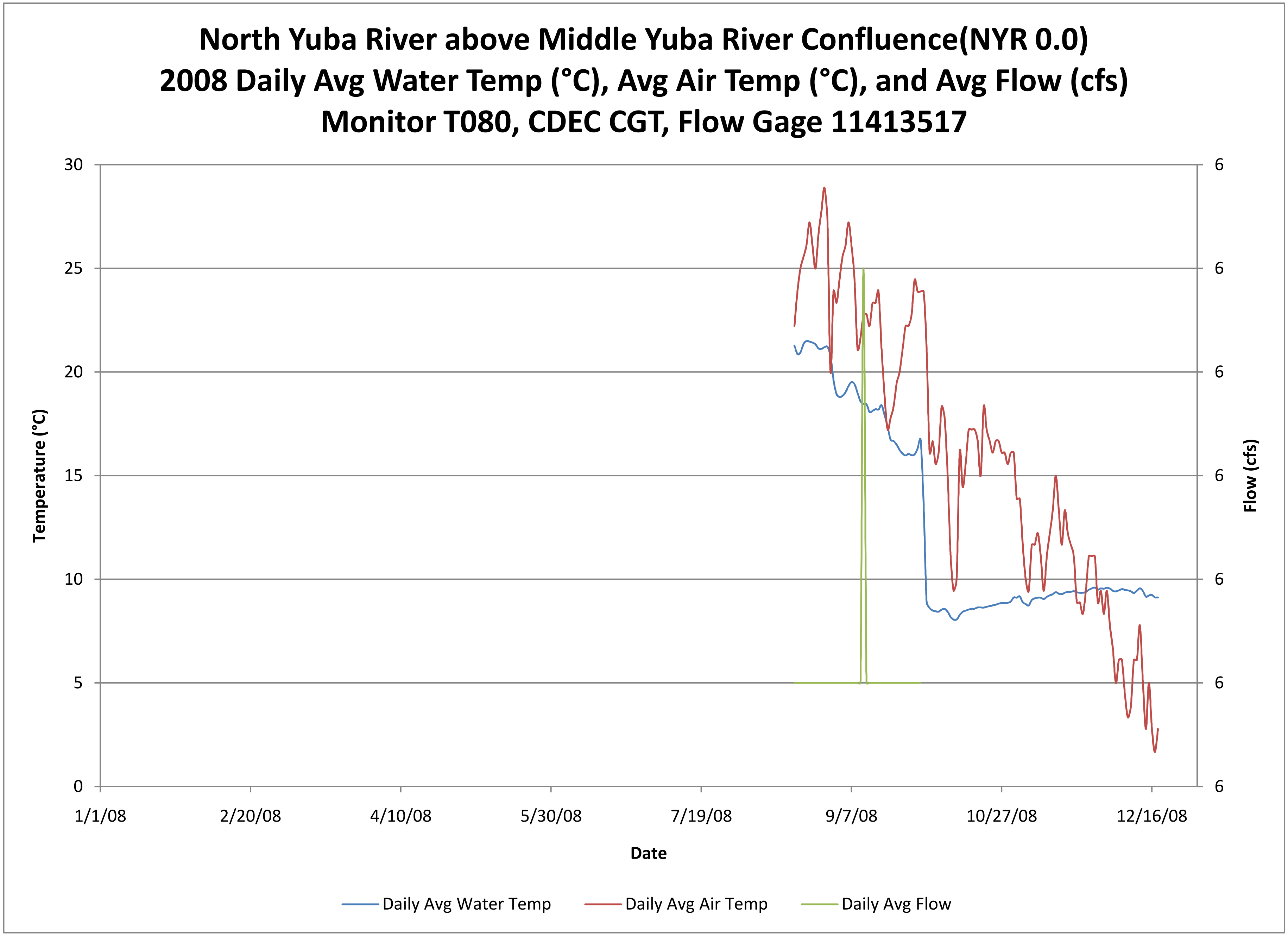

North Yuba River below New Bullards Bar Low Flow Releases (NYR 12.4)
Monitor T070 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum

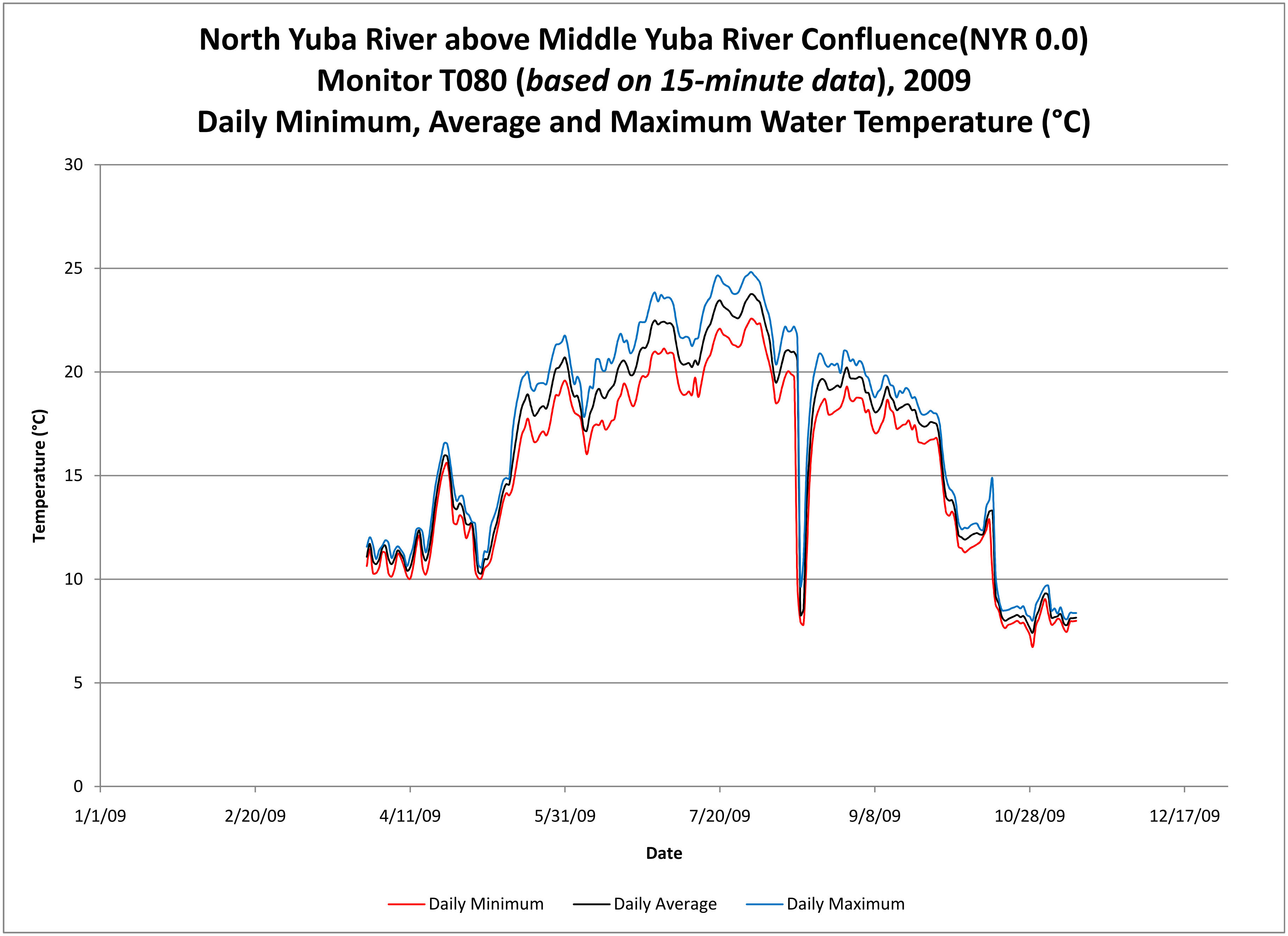

North Yuba River below New Bullards Bar Low Flow Releases (NYR 12.4)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T070, CDEC CGT, Flow Gage 11413517
Temperature (°C)
Flow (cfs)
Date
0
5
10
15
20
25
30
35
-2
0
2
4
6
8
10
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

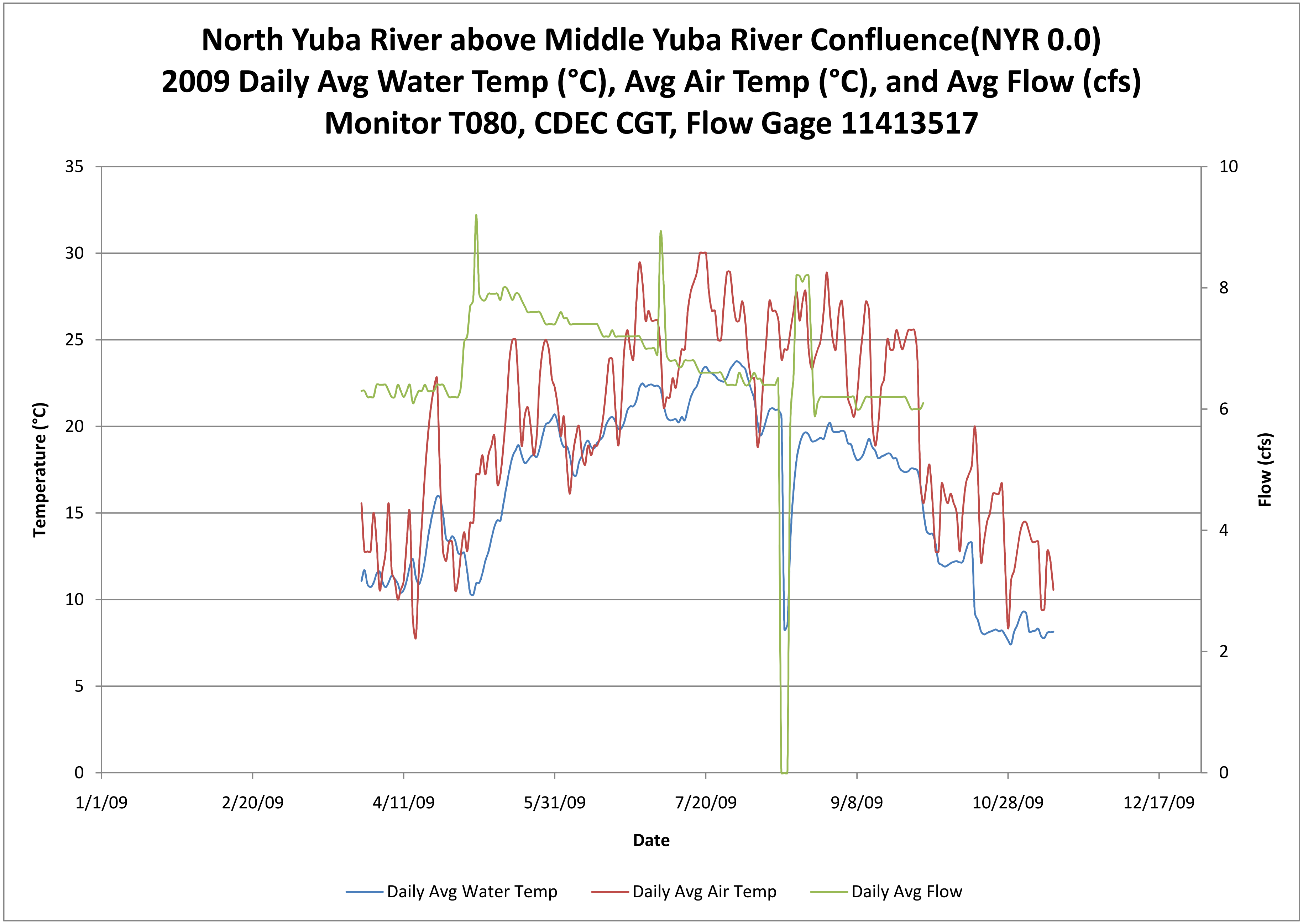

North Yuba River below New Bullards Bar Low Flow Releases (NYR 12.4)
Monitor T070 (based on 15-minute data), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum

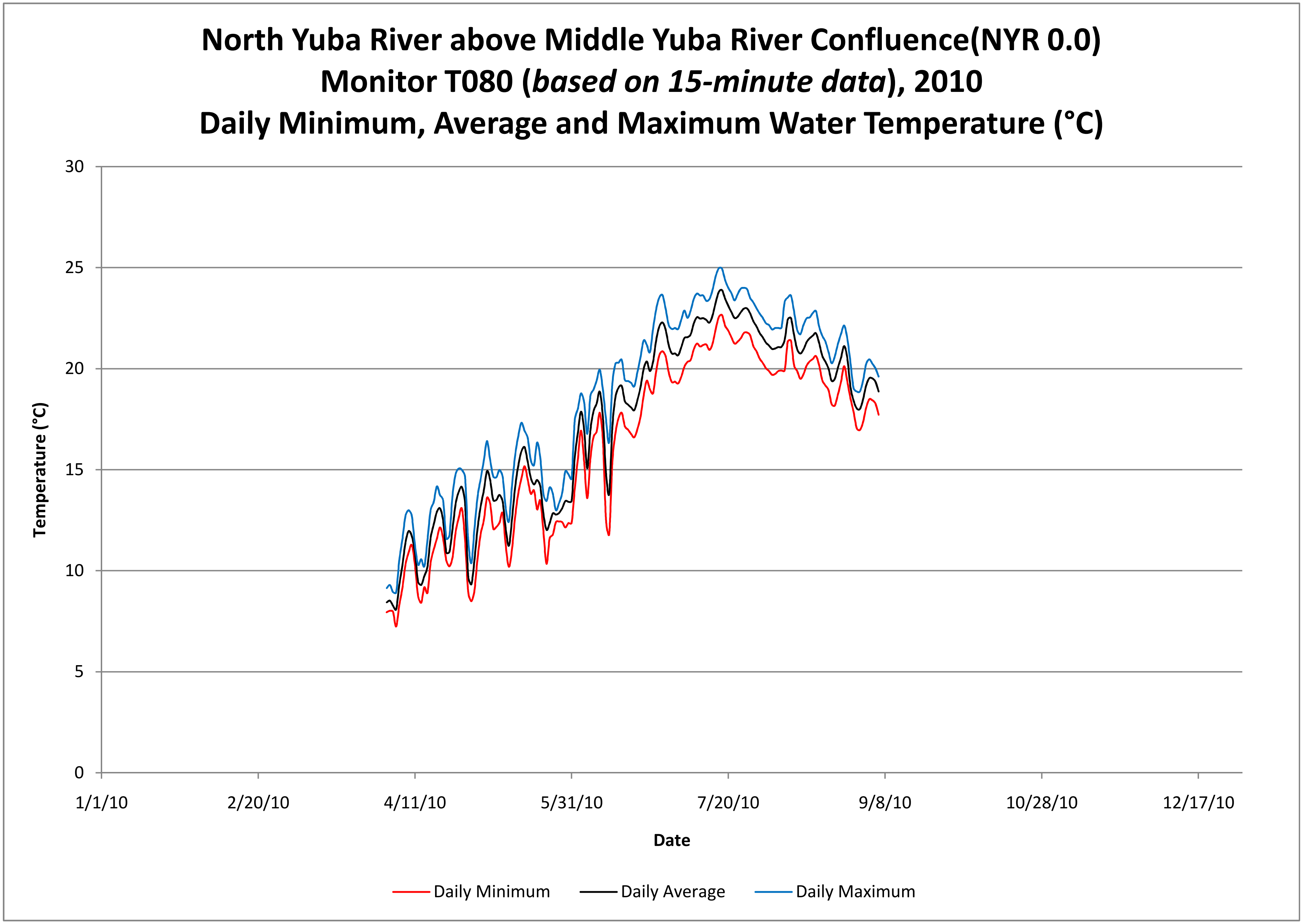

North Yuba River below New Bullards Bar Low Flow Releases (NYR 12.4)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T070, CDEC CGT, Flow Gage 11413517
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
10
8
6
4
2
0
-2
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


North Yuba River above Middle Yuba River Confluence(NYR 0.0)
Monitor T080 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


North Yuba River above Middle Yuba River Confluence(NYR 0.0)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T080, CDEC CGT, Flow Gage 11413517
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
6
6
6
6
6
6
6
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


North Yuba River above Middle Yuba River Confluence(NYR 0.0)
Monitor T080 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


North Yuba River above Middle Yuba River Confluence(NYR 0.0)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T080, CDEC CGT, Flow Gage 11413517
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
10
8
6
4
2
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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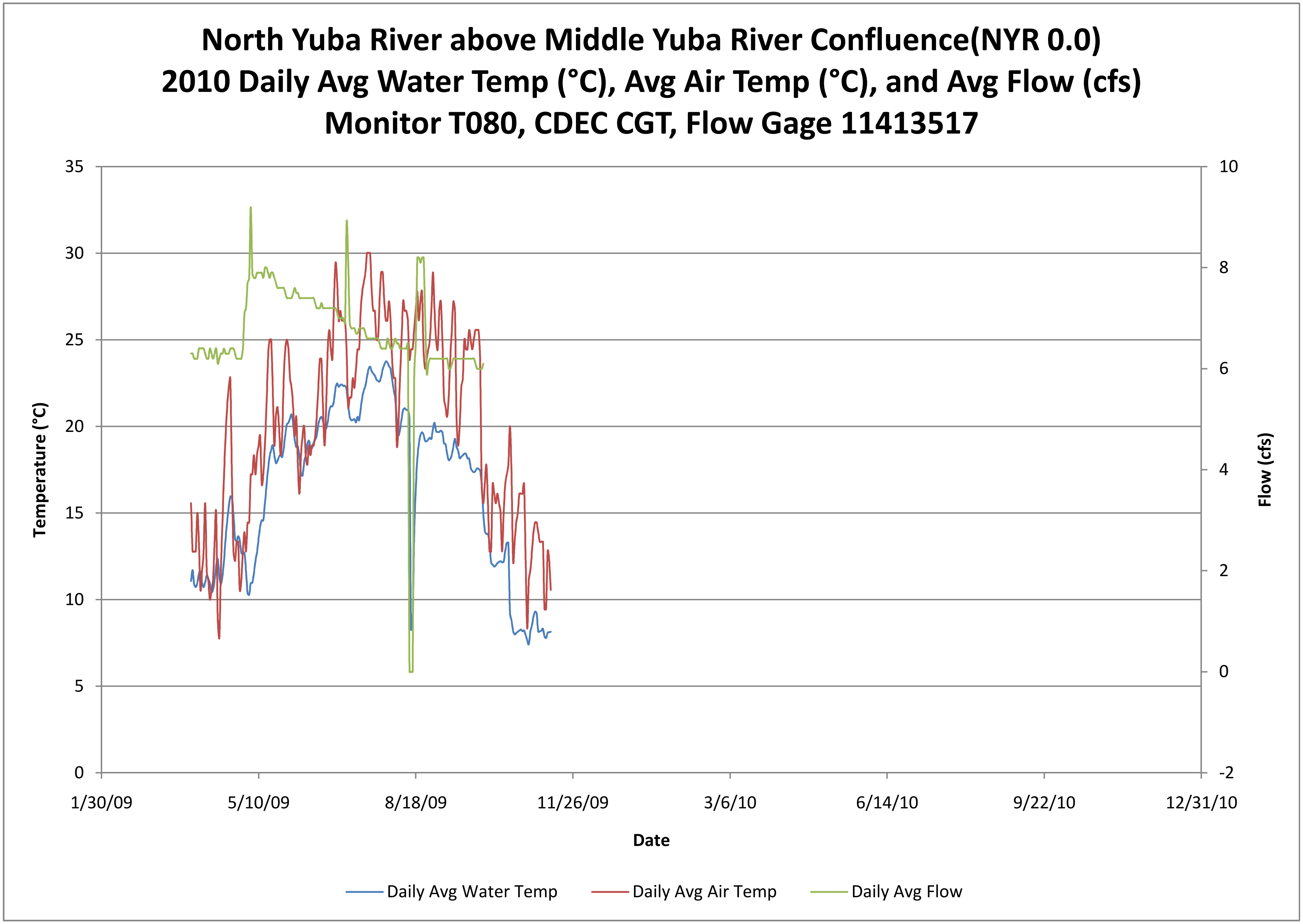
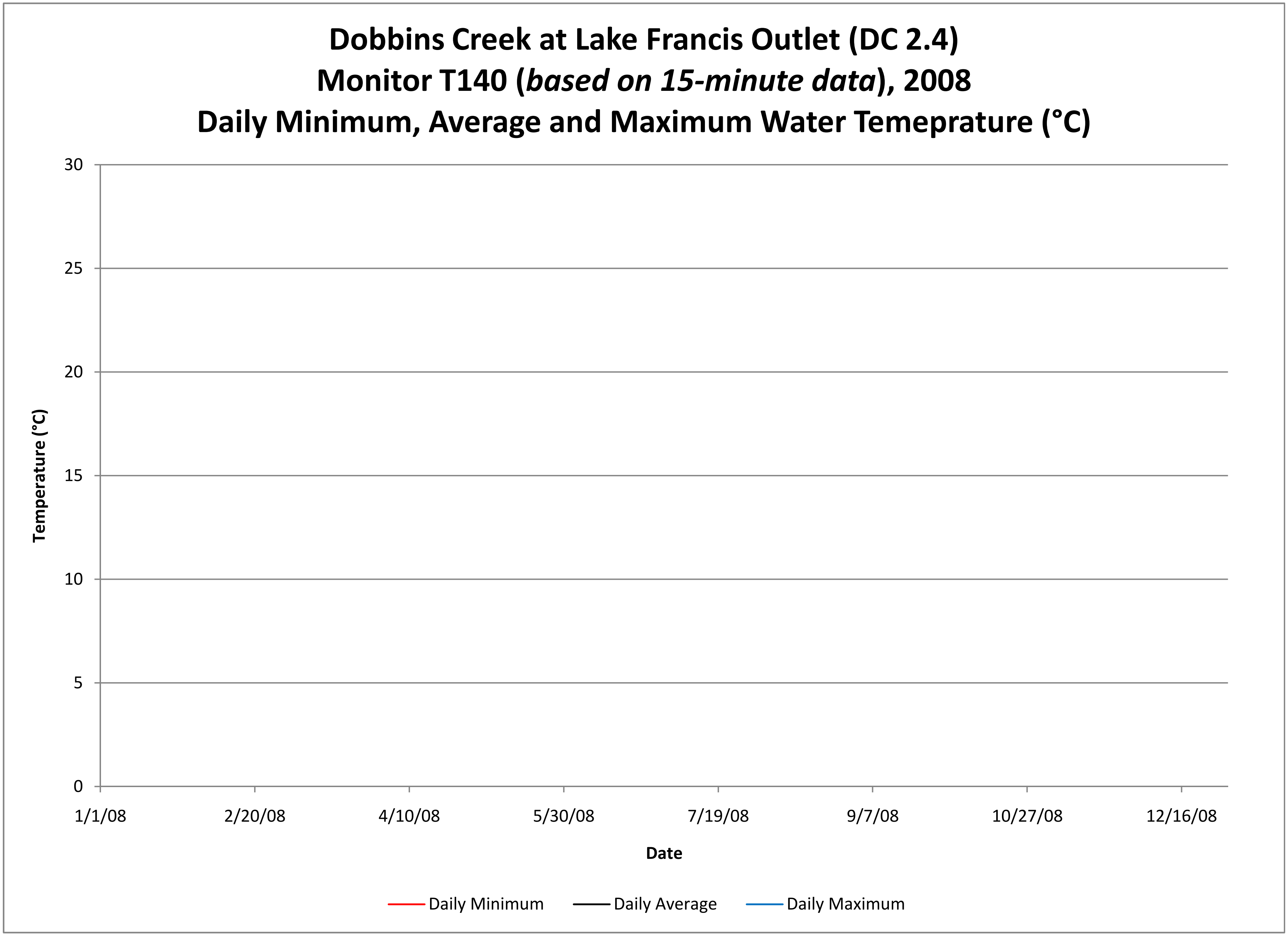

North Yuba River above Middle Yuba River Confluence(NYR 0.0)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T080, CDEC CGT, Flow Gage 11413517
Temperature (°C)
0
5
10
15
20
25
30
35
Flow (cfs)
-2
0
2
4
6
8
10
1/30/09
5/10/09
8/18/09
11/26/09
3/6/10
6/14/10
9/22/10
12/31/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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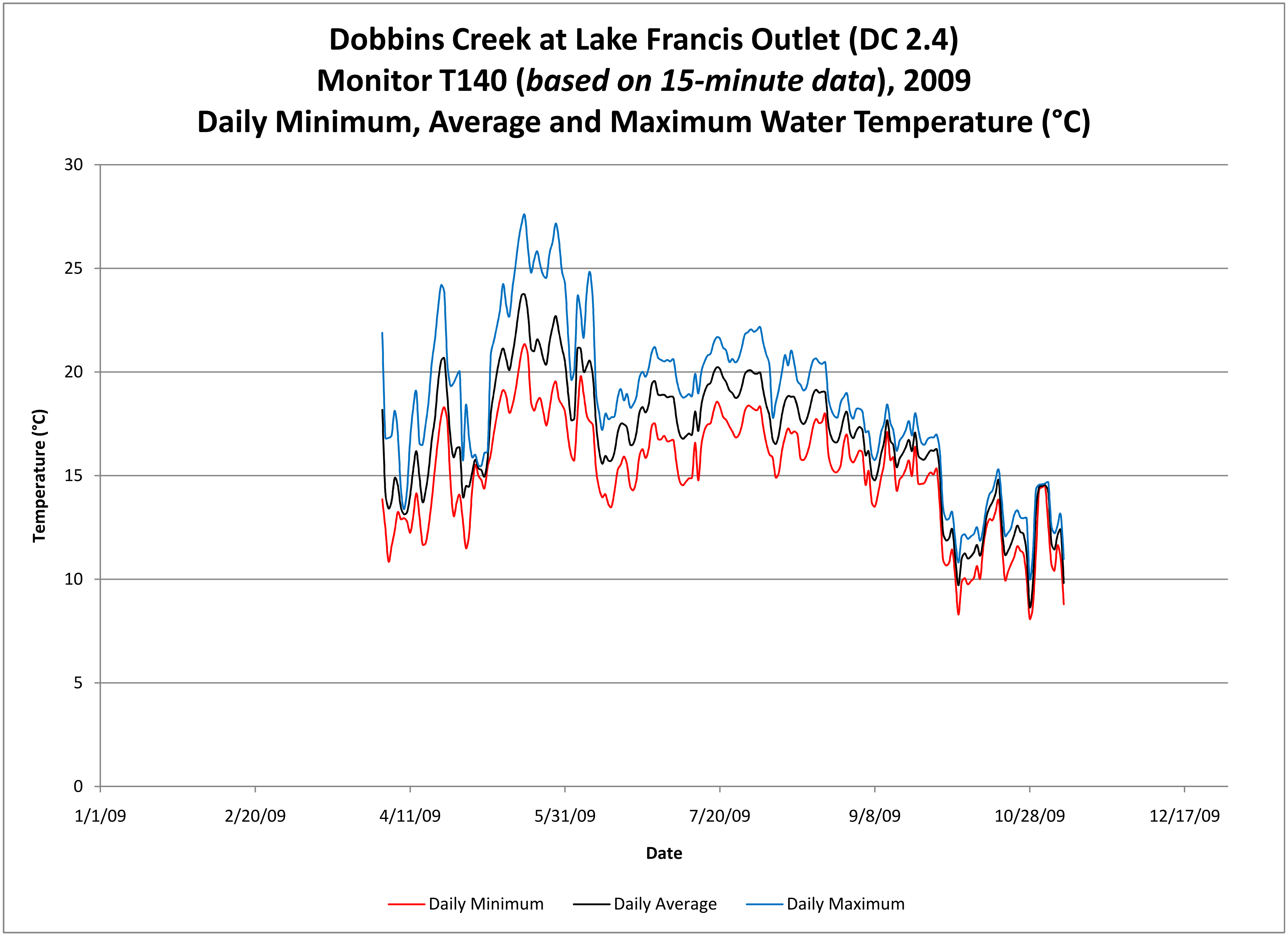
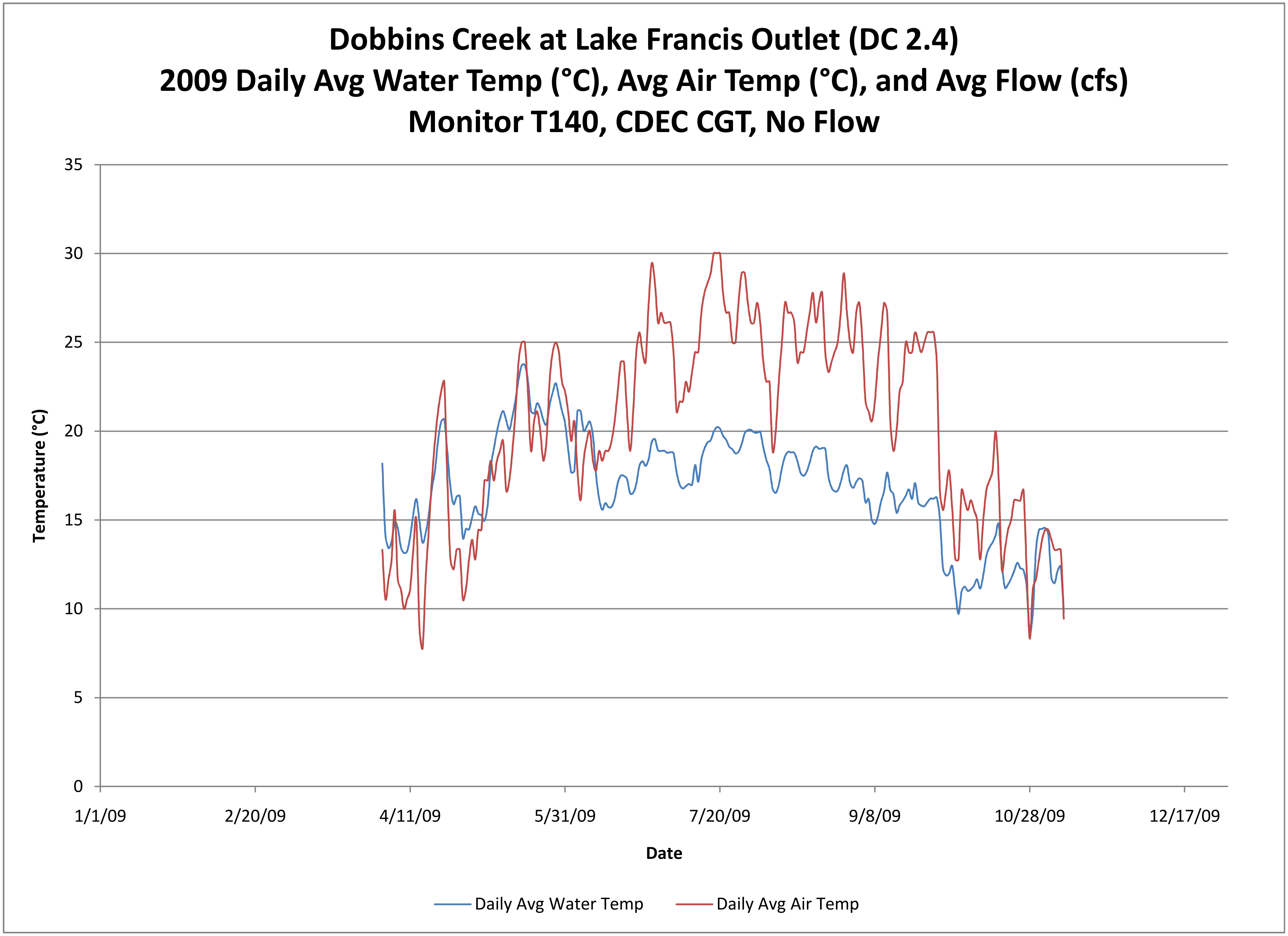

Dobbins Creek at Lake Francis Outlet (DC 2.4)
Monitor T140 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum



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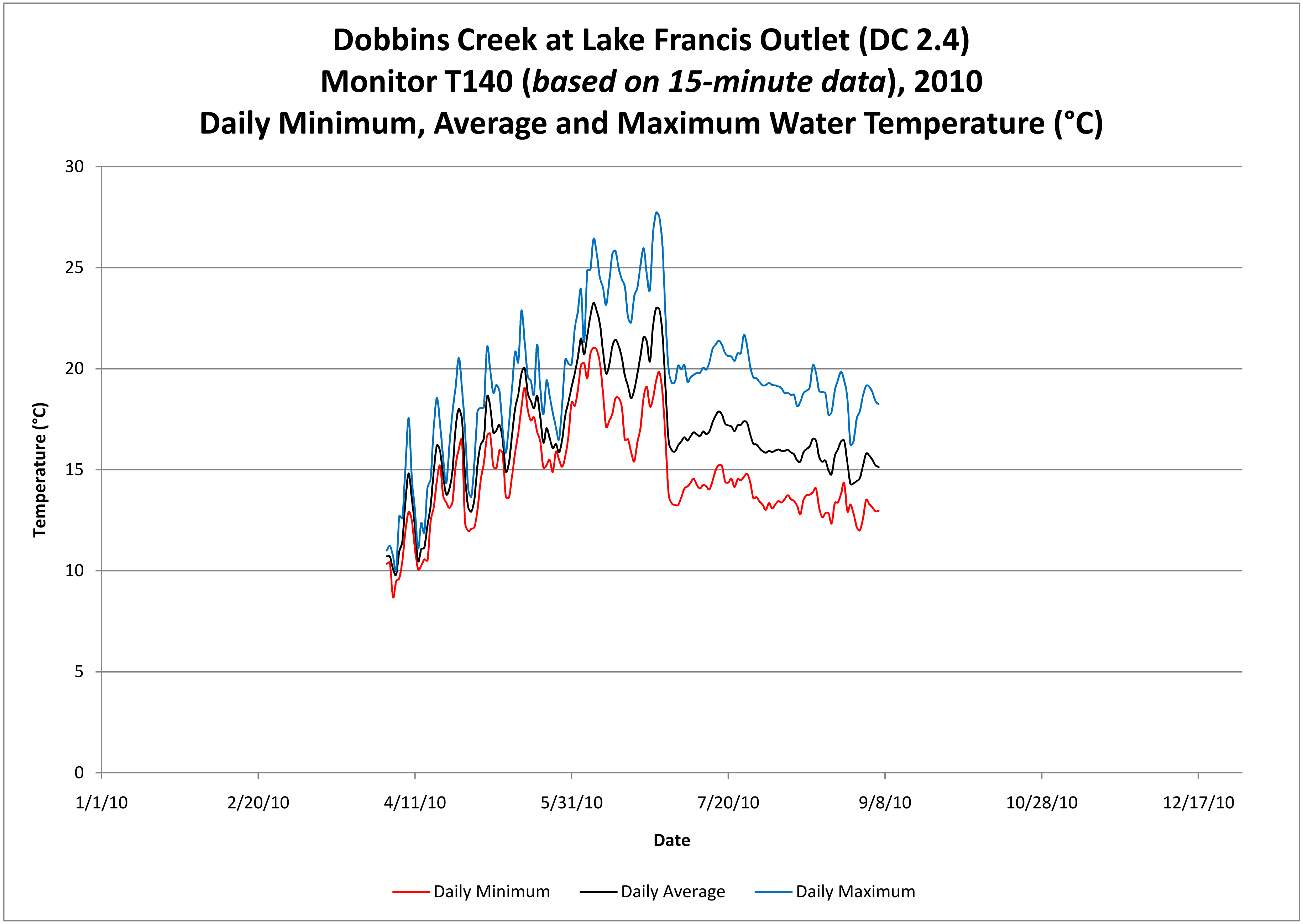
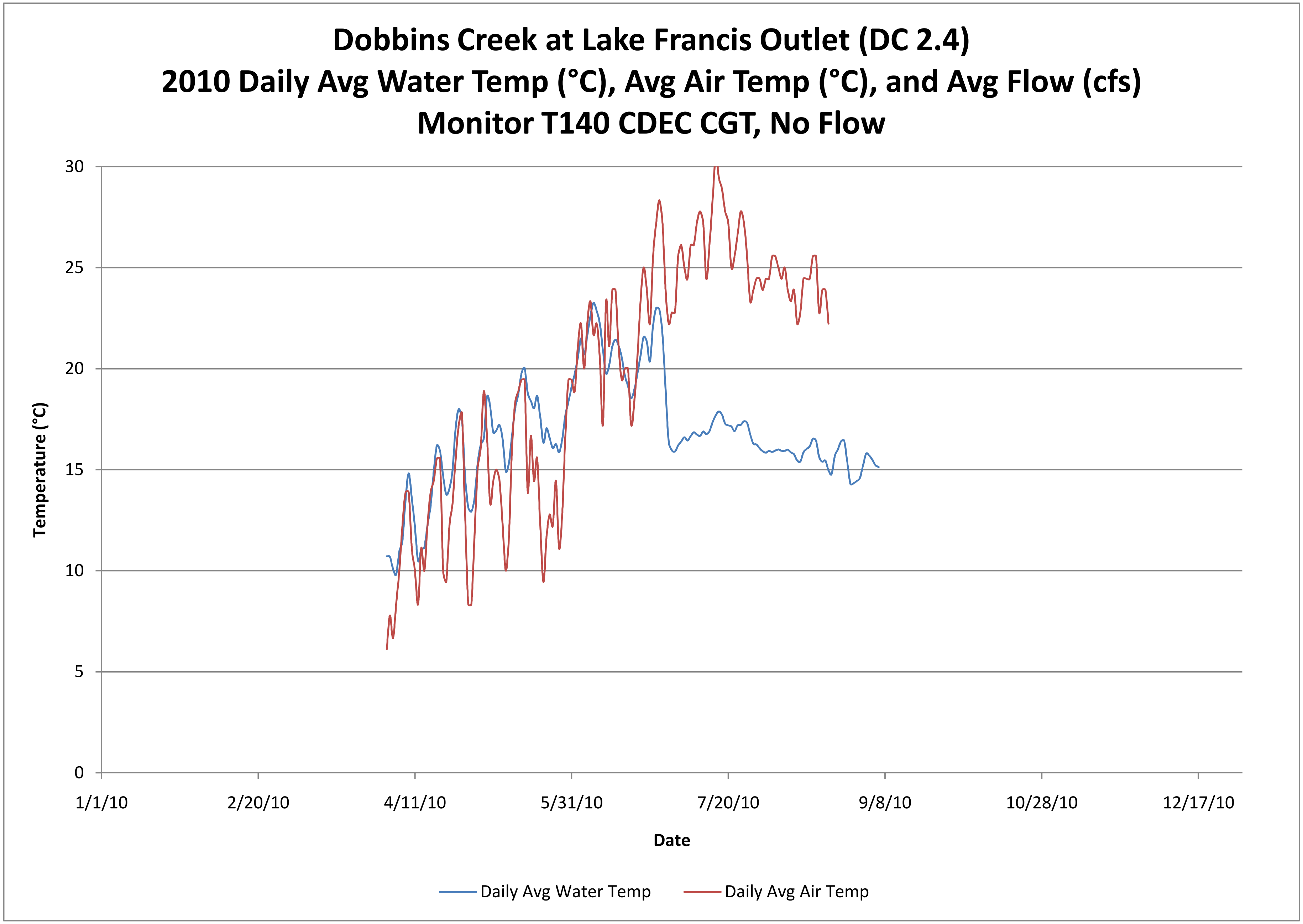

Dobbins Creek at Lake Francis Outlet (DC 2.4)
Monitor T140 (based on 15-minute data), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum



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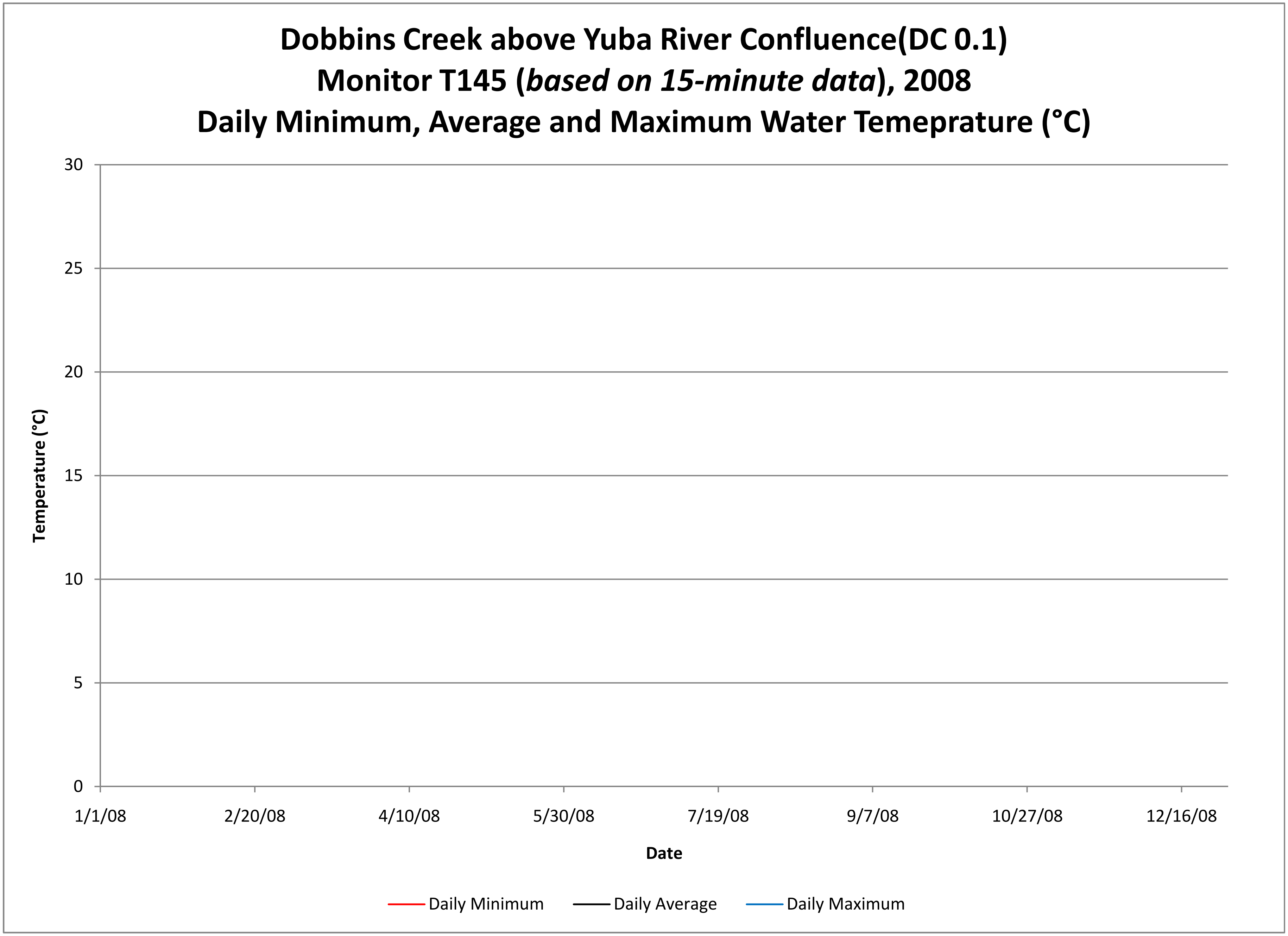

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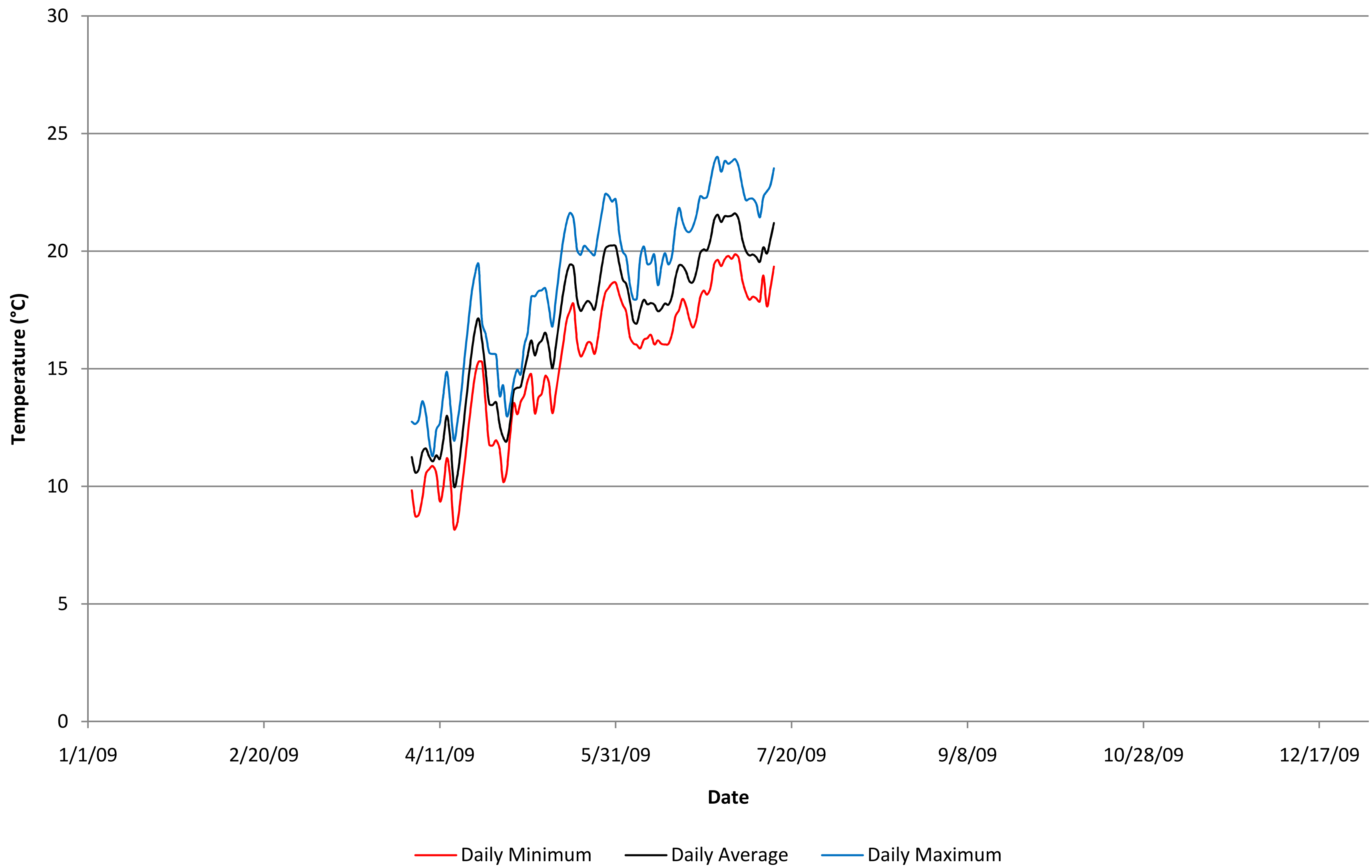
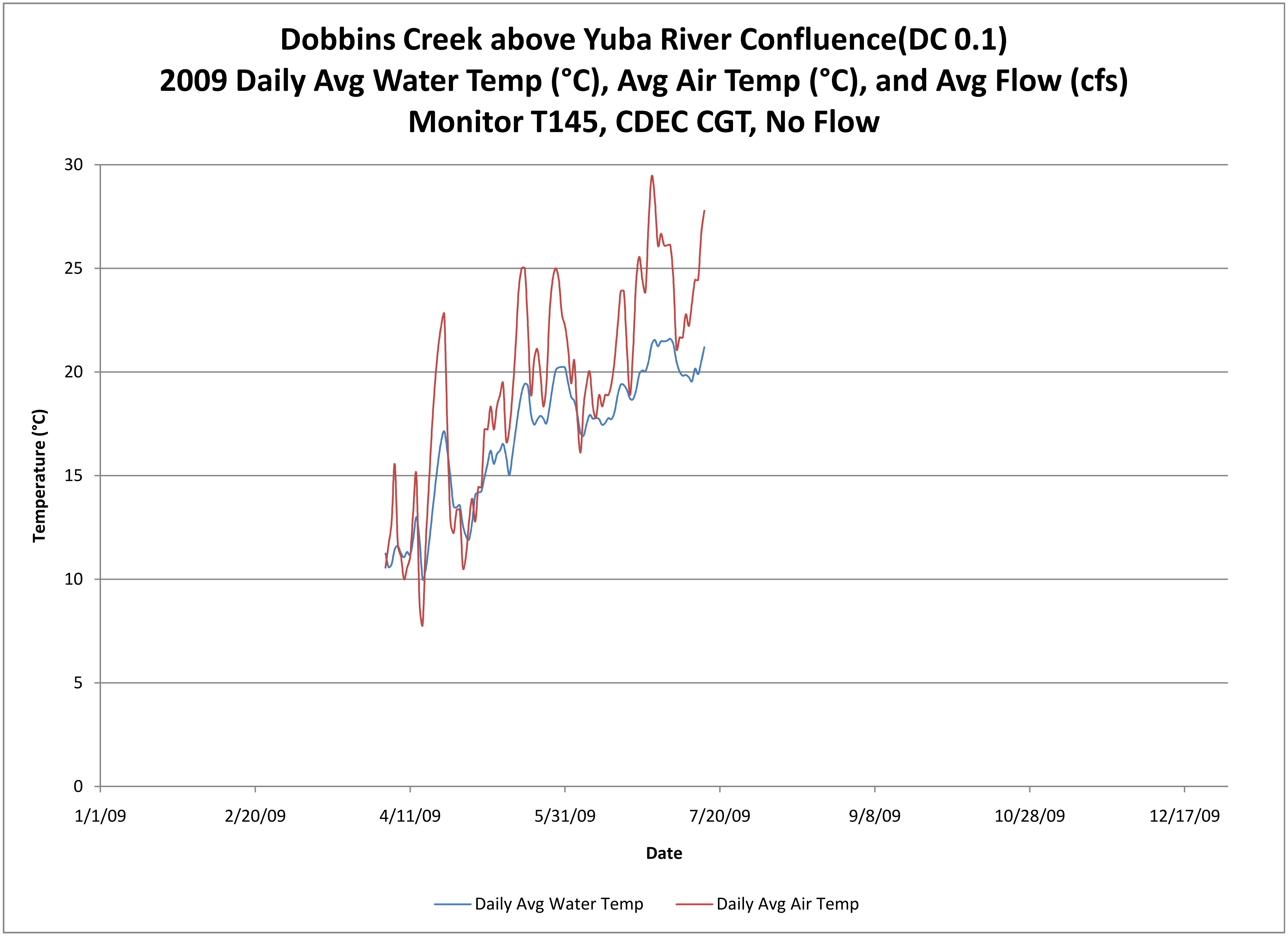
Dobbins Creek above Yuba River Confluence(DC 0.1)
Monitor T145 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)





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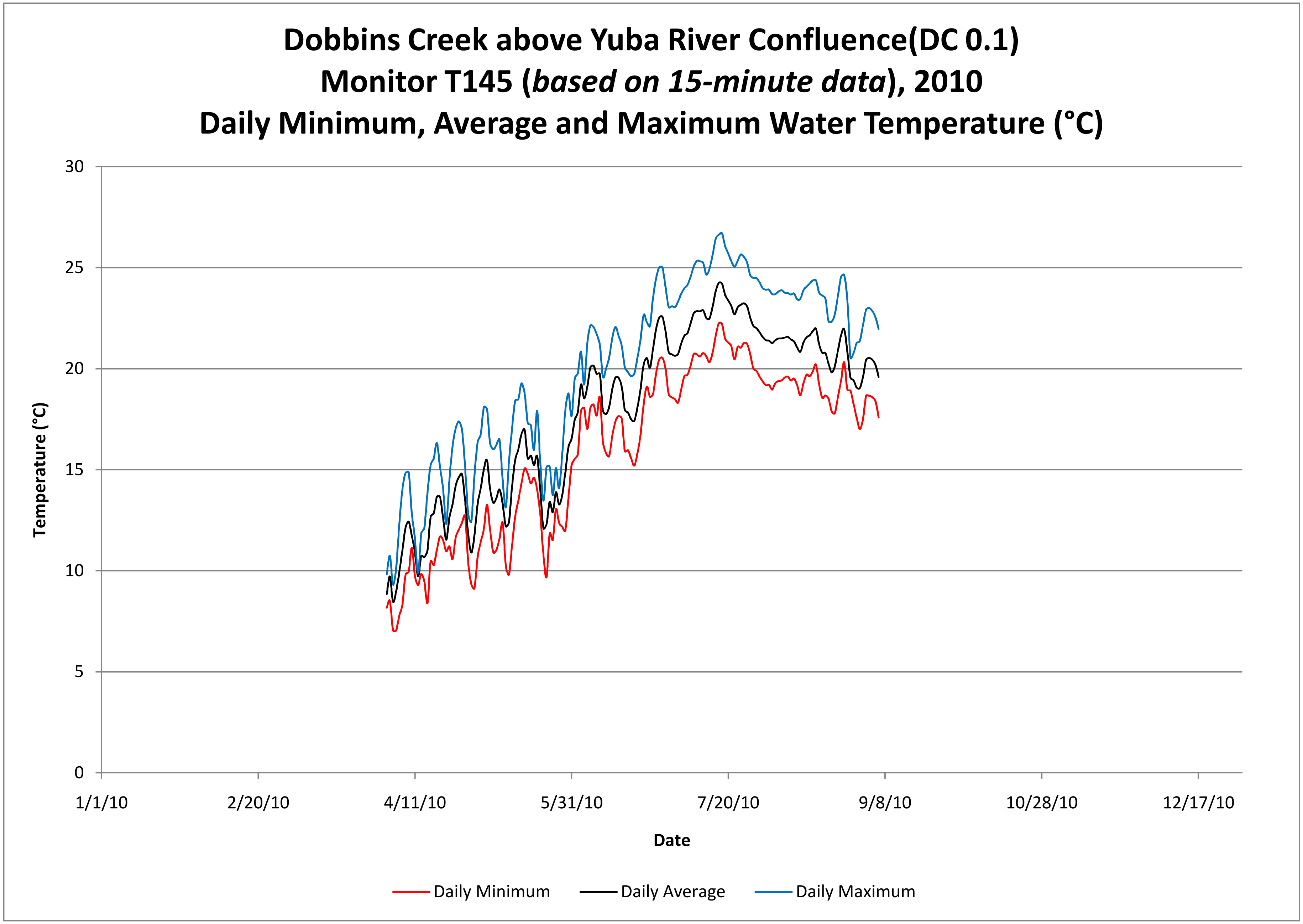

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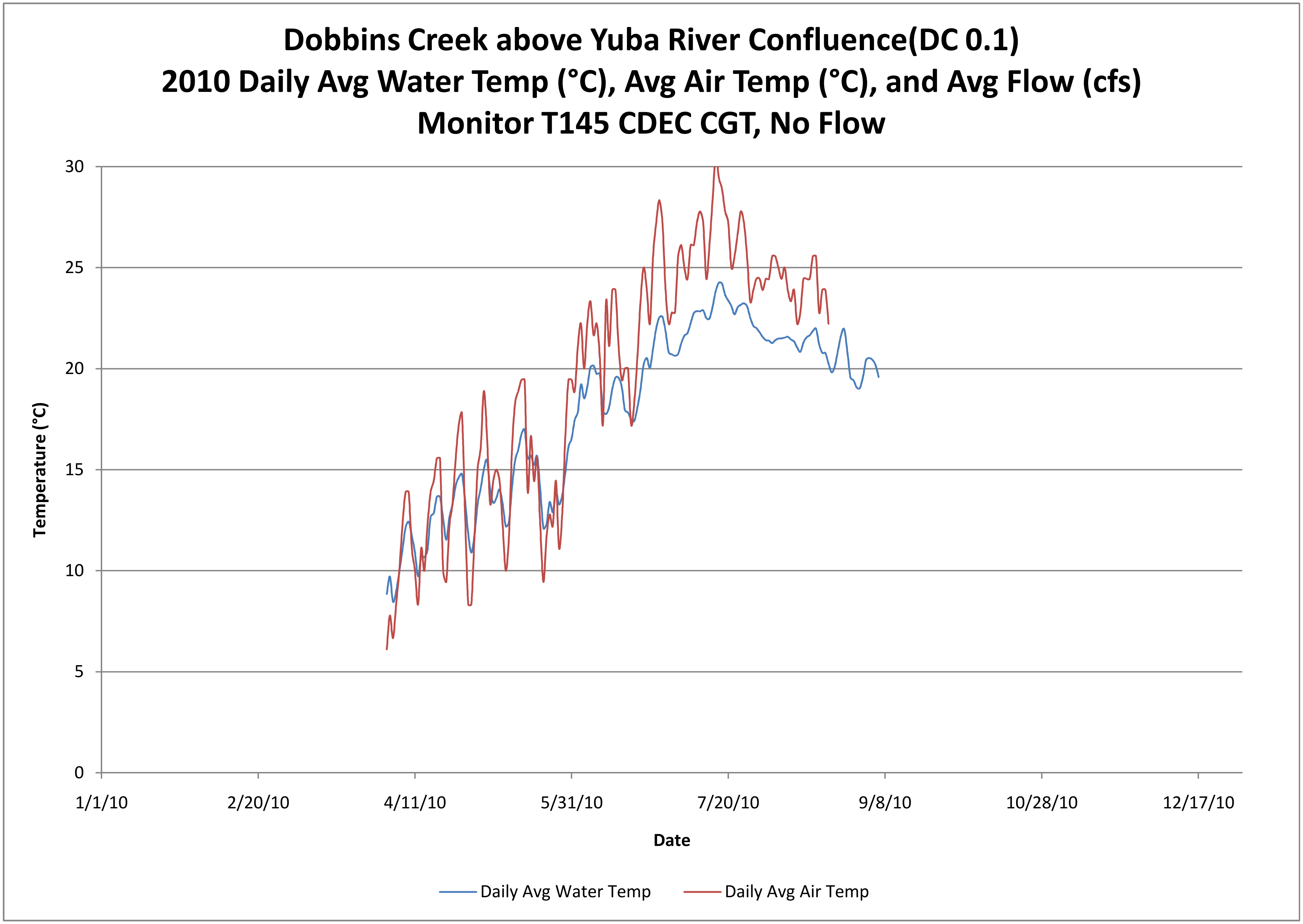
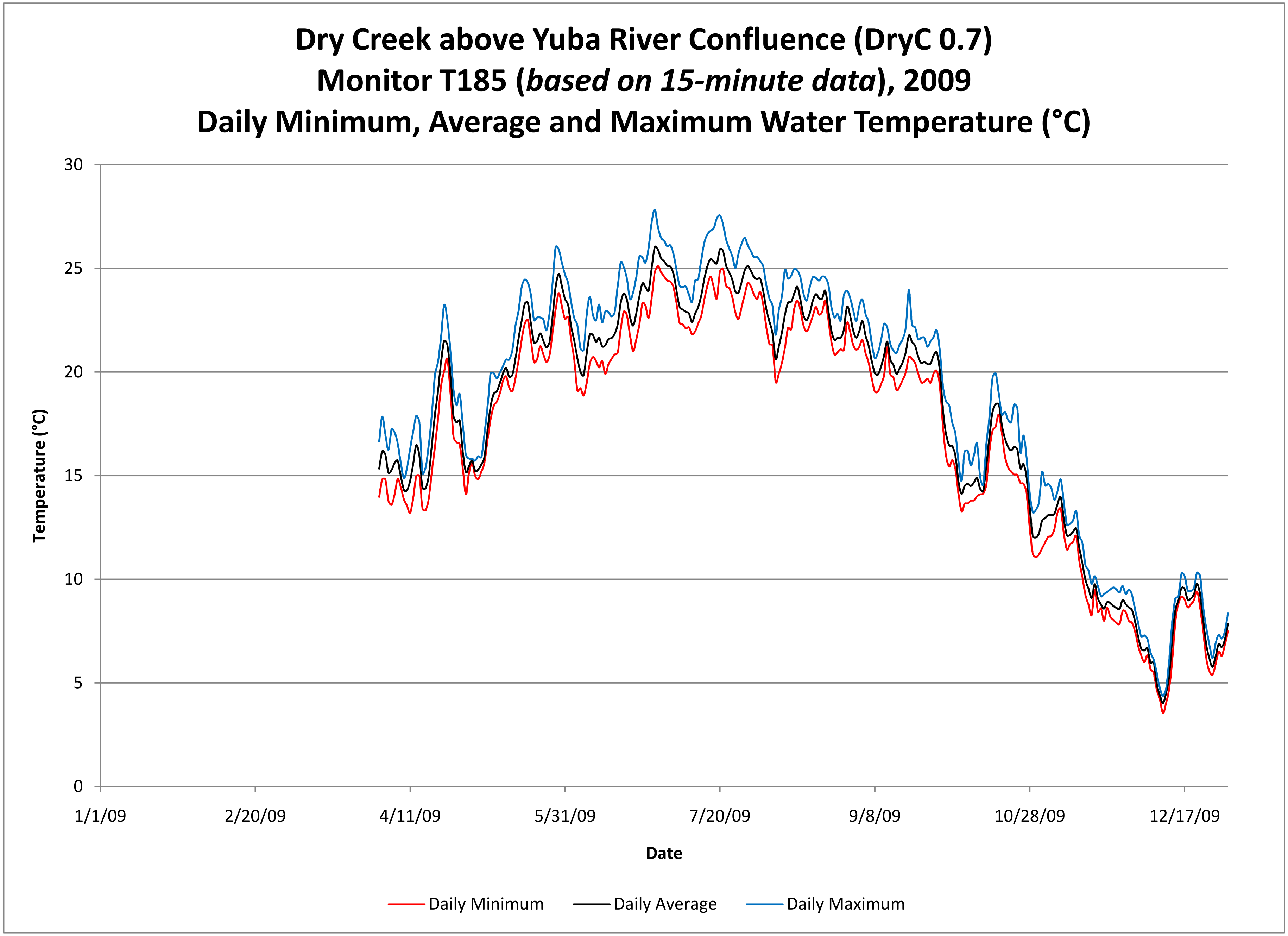
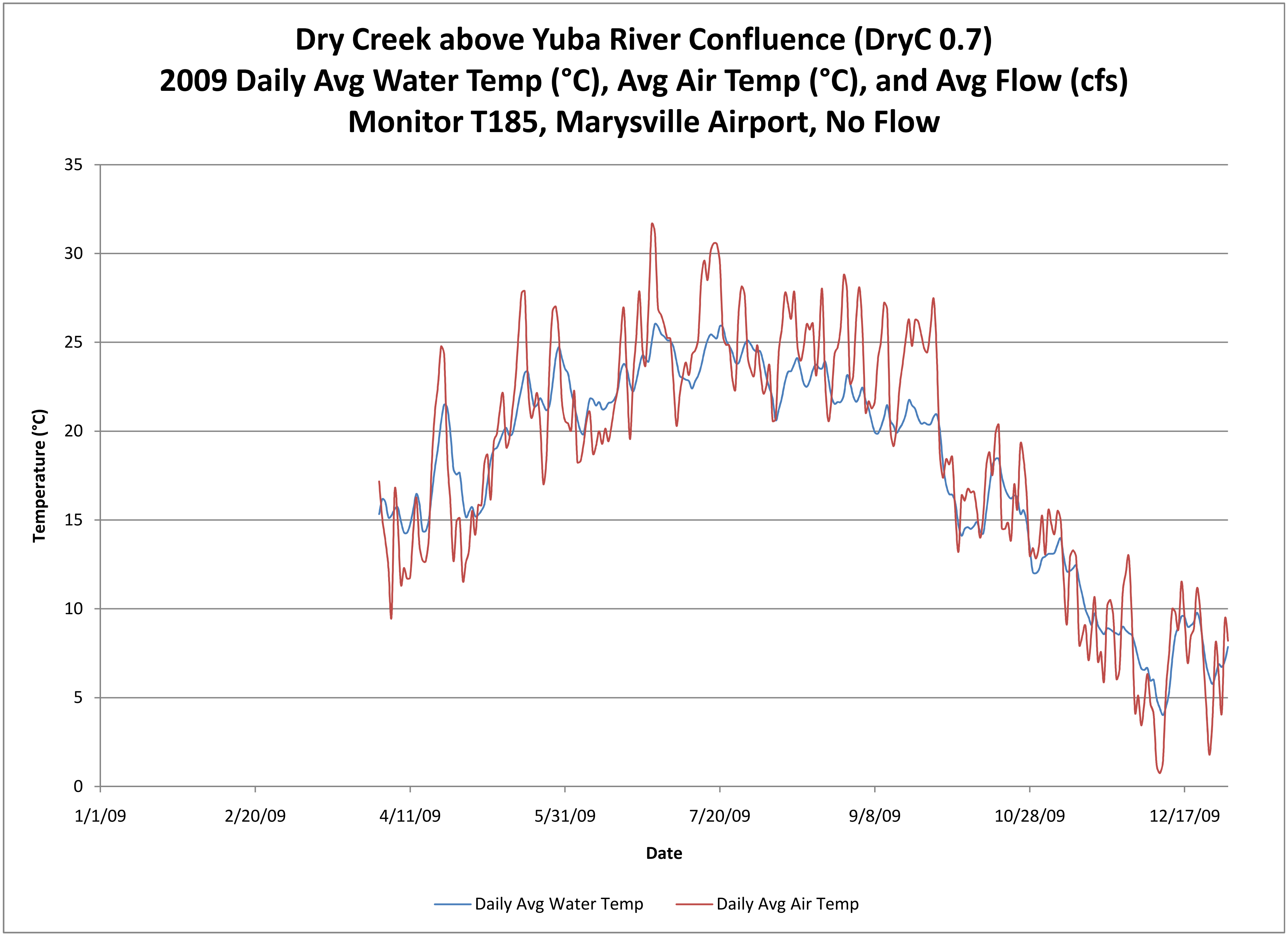
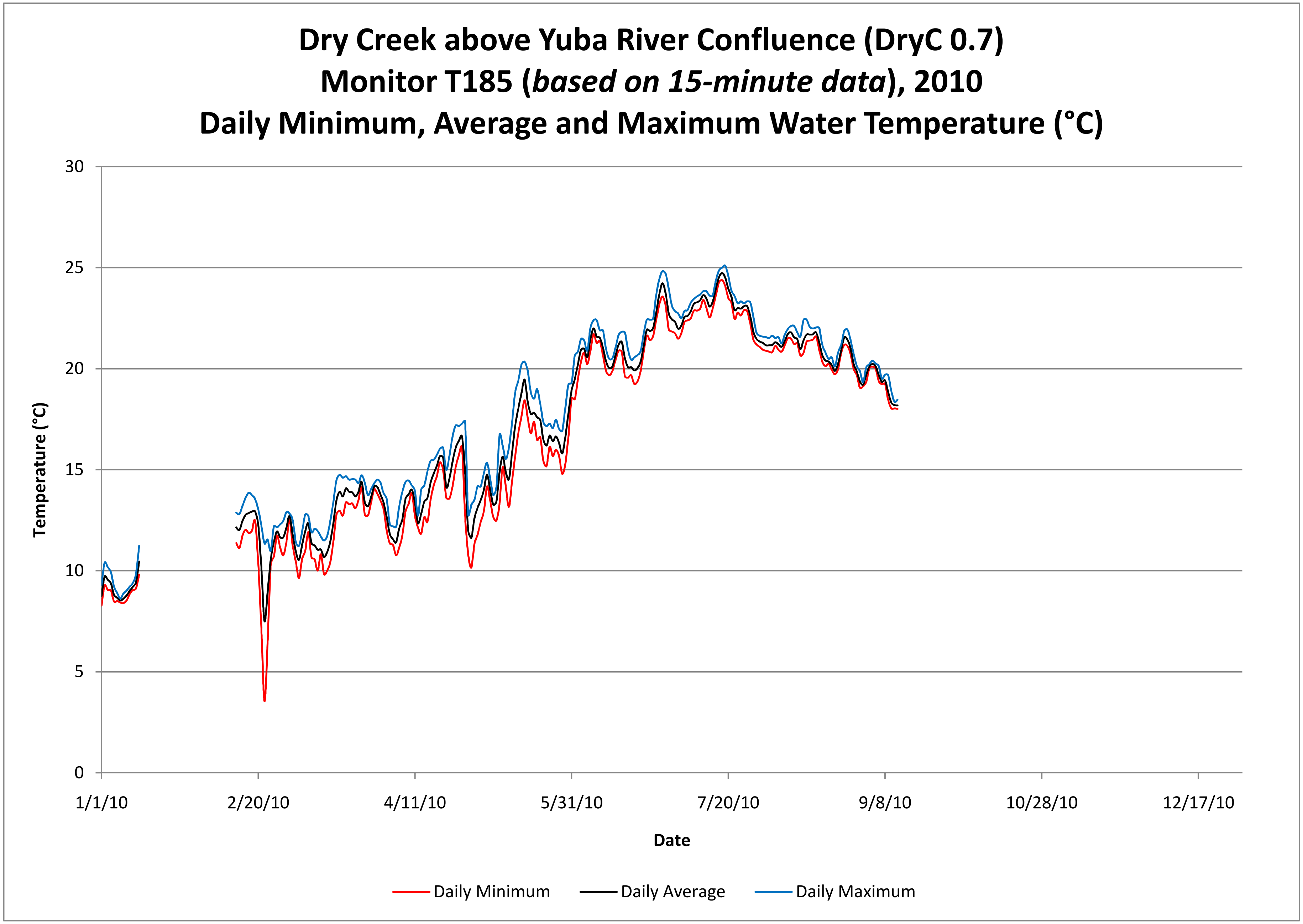

Dobbins Creek above Yuba River Confluence(DC 0.1)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T145 CDEC CGT, No Flow
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp


Dry Creek above Yuba River Confluence (DryC 0.7)
Monitor T185 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Dry Creek above Yuba River Confluence (DryC 0.7)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T185, Marysville Airport, No Flow
Temperature (°C)
35
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp



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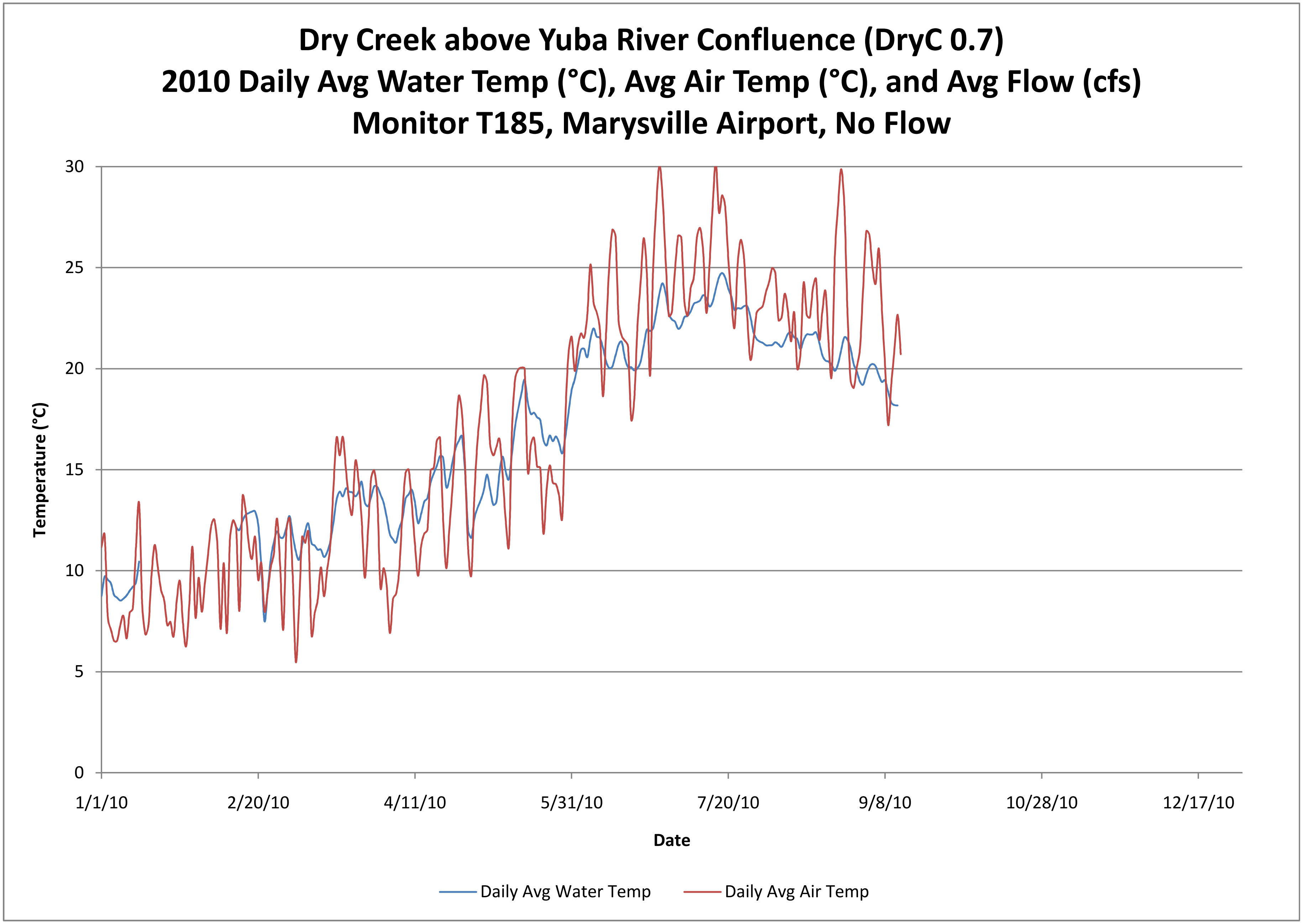
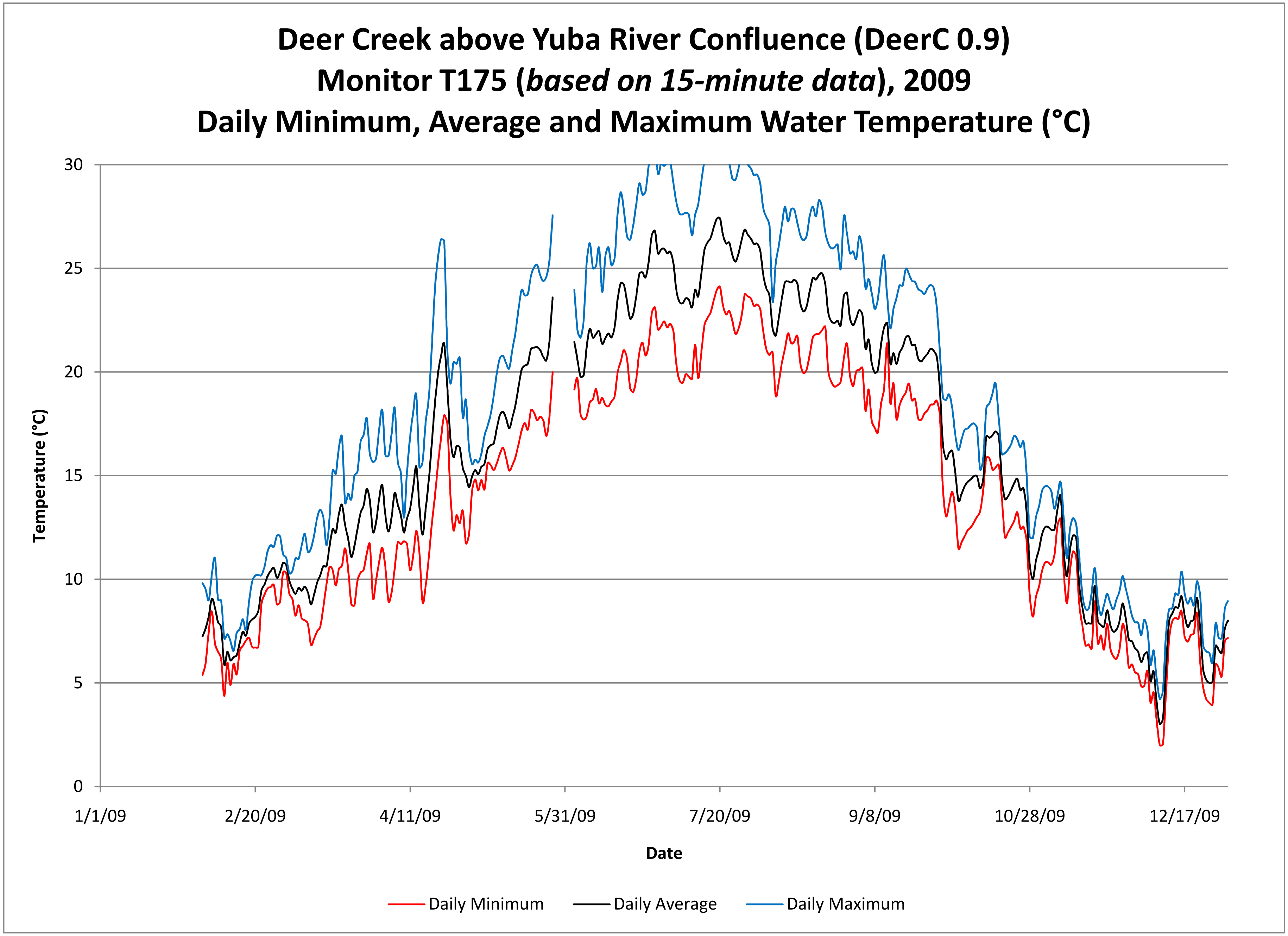
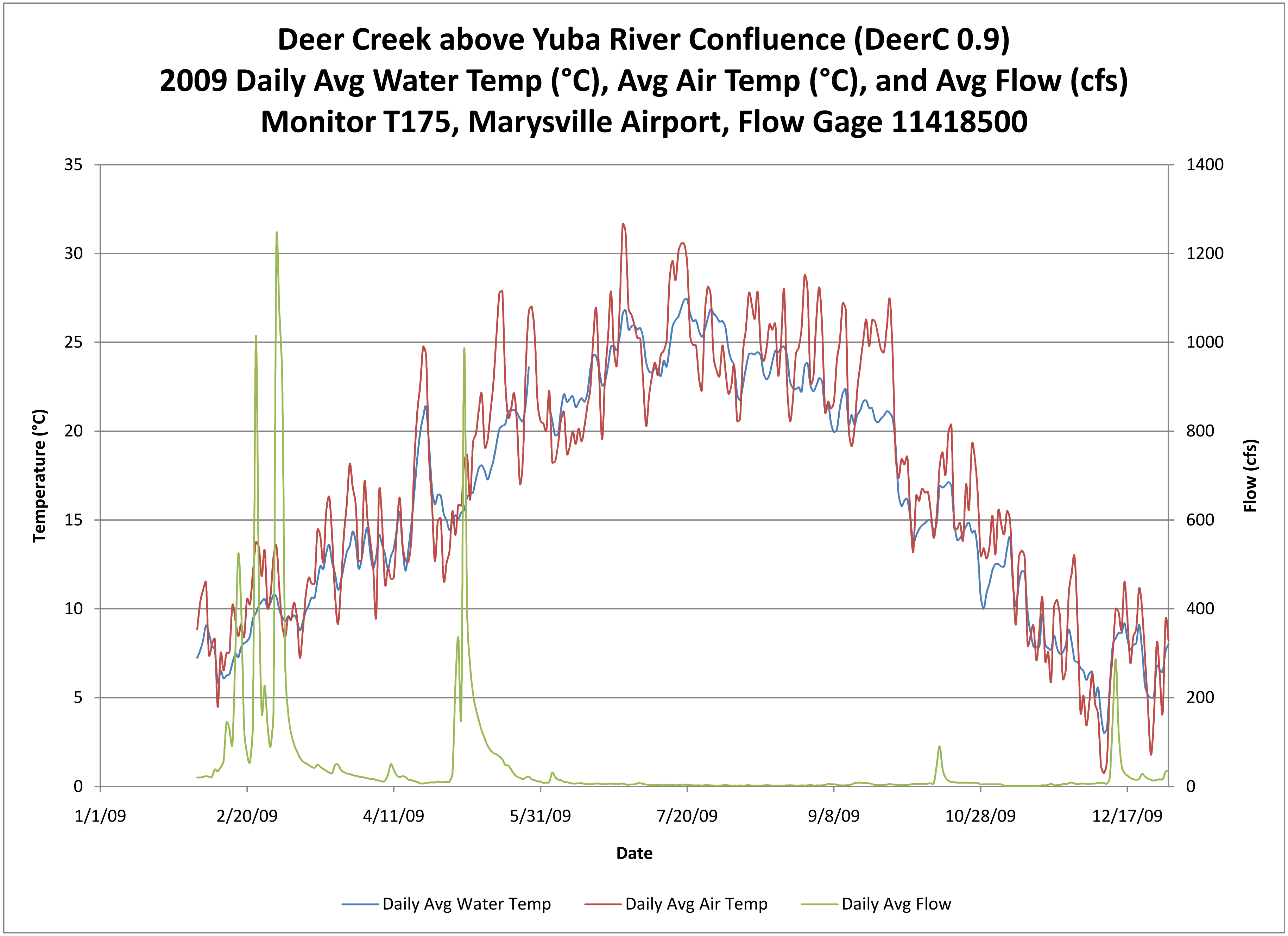
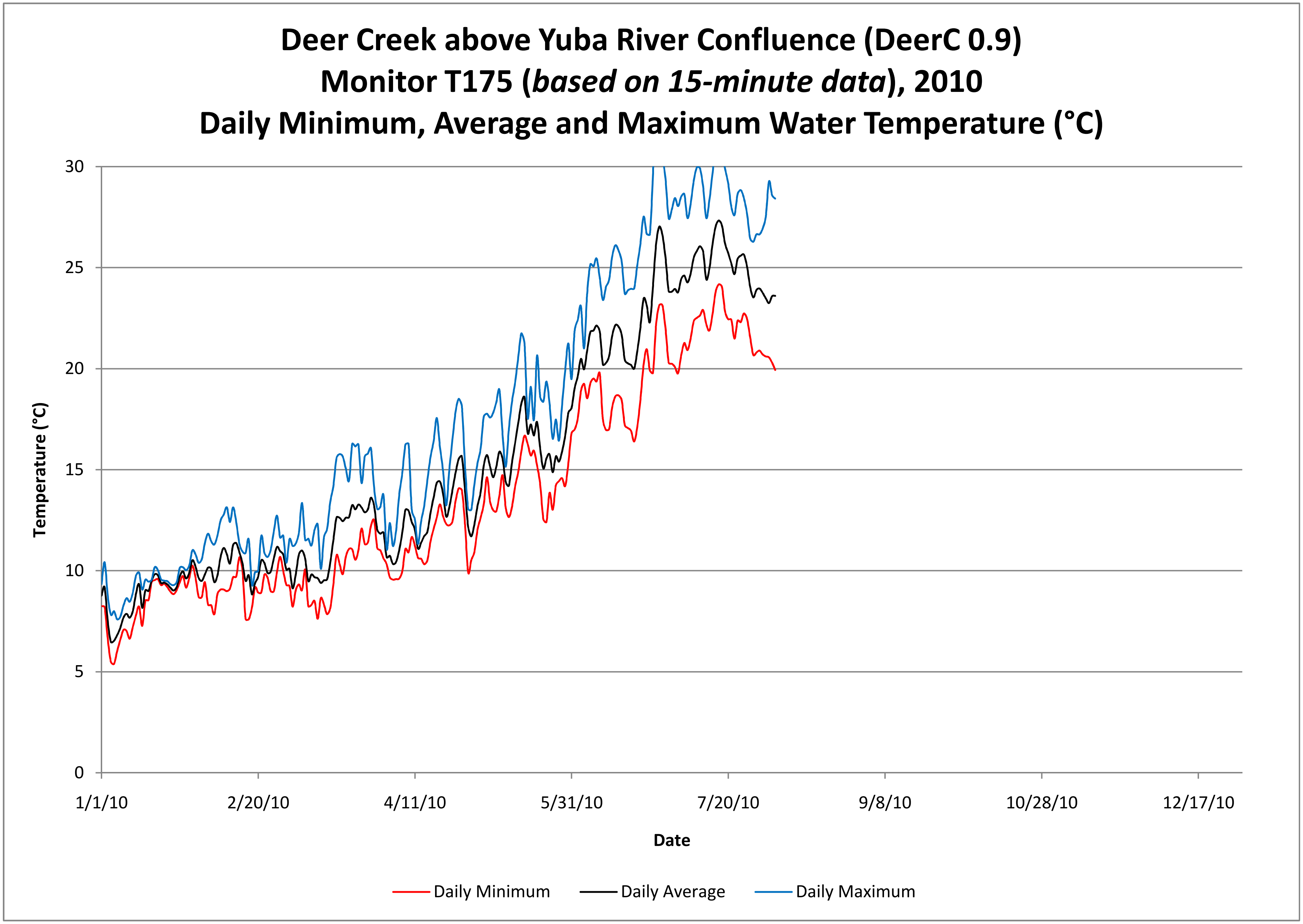

Dry Creek above Yuba River Confluence (DryC 0.7)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T185, Marysville Airport, No Flow
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp


Deer Creek above Yuba River Confluence (DeerC 0.9)
Monitor T175 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Deer Creek above Yuba River Confluence (DeerC 0.9)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T175, Marysville Airport, Flow Gage 11418500
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
1400
1200
1000
800
600
400
200
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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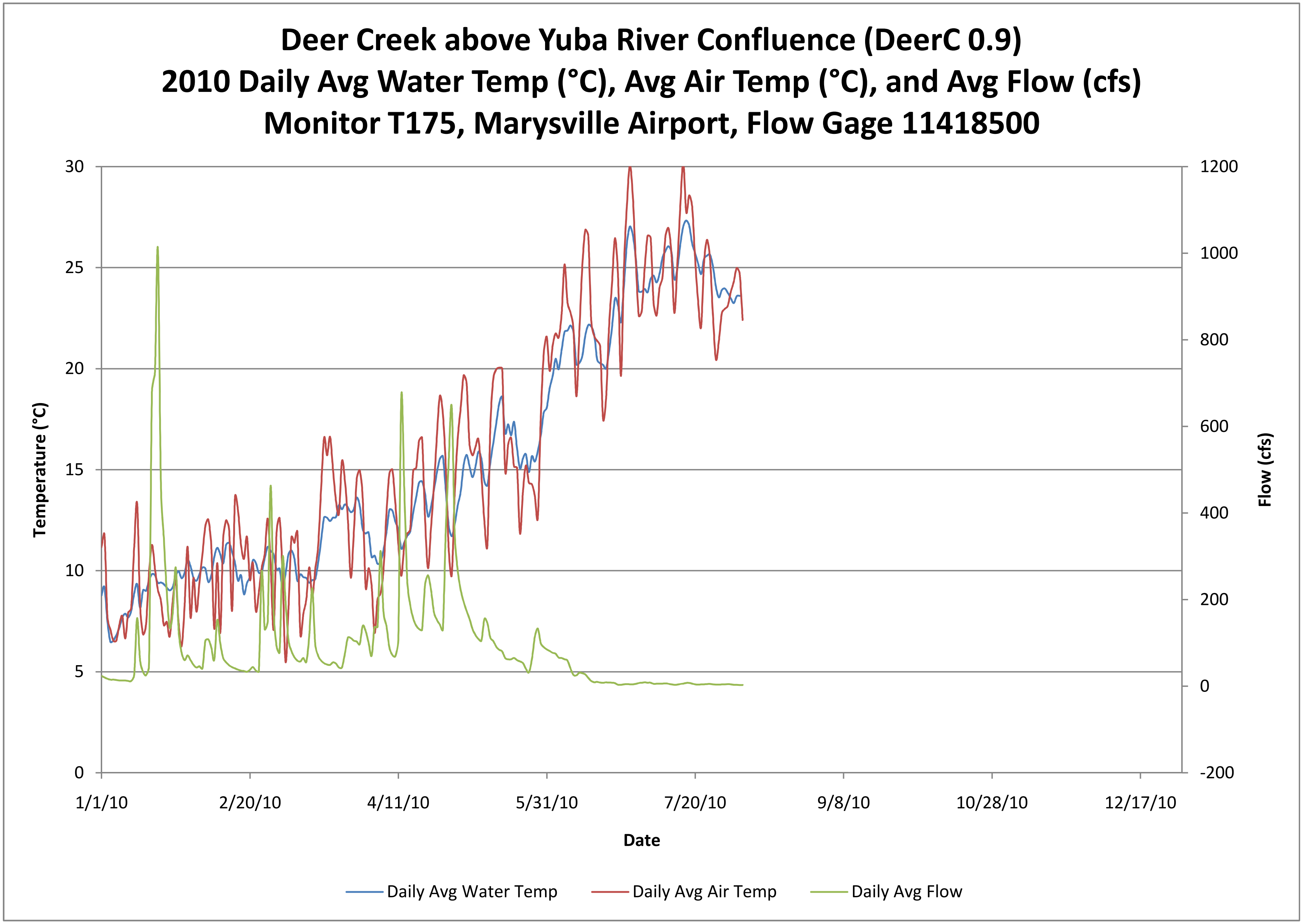

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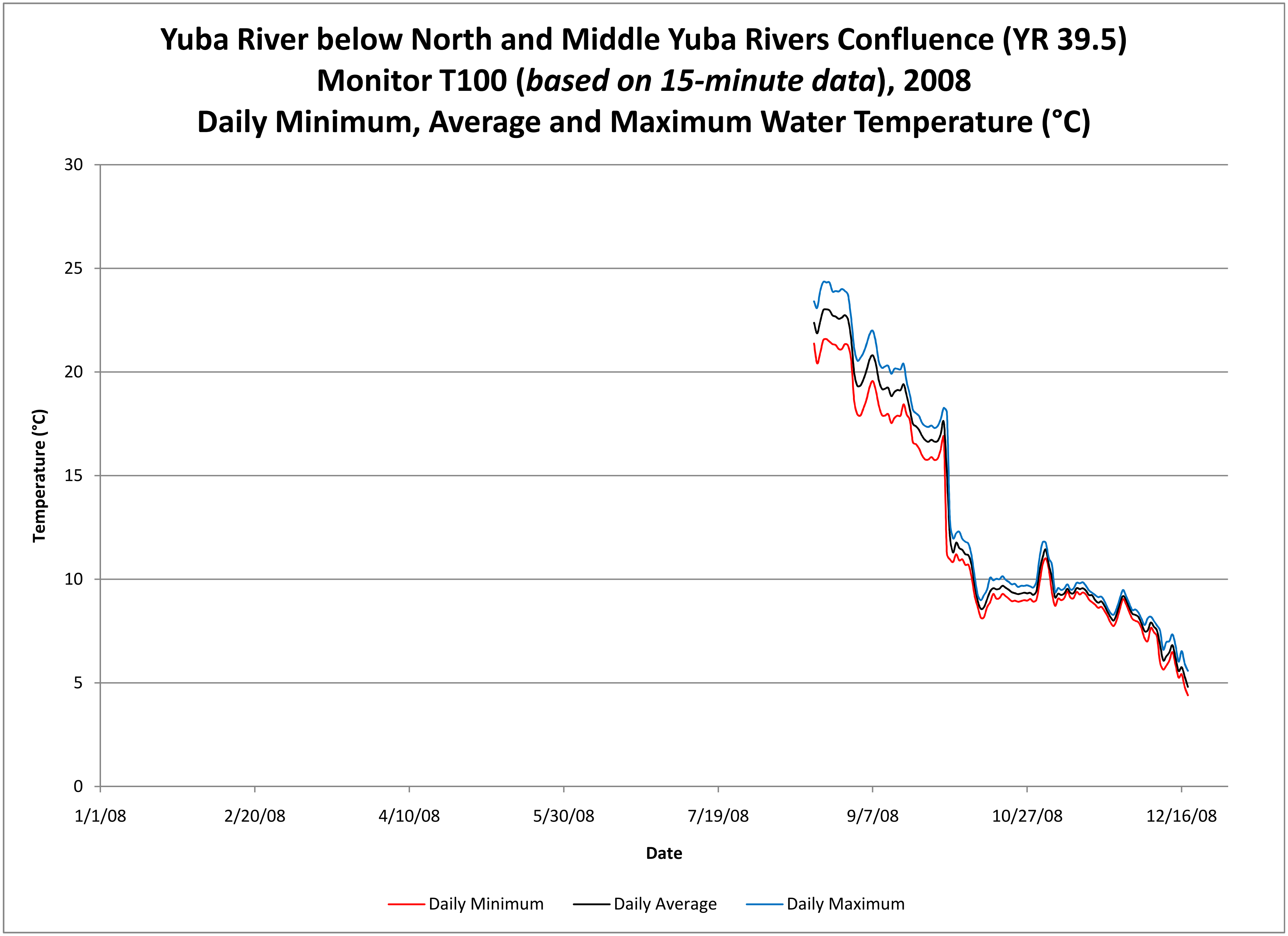
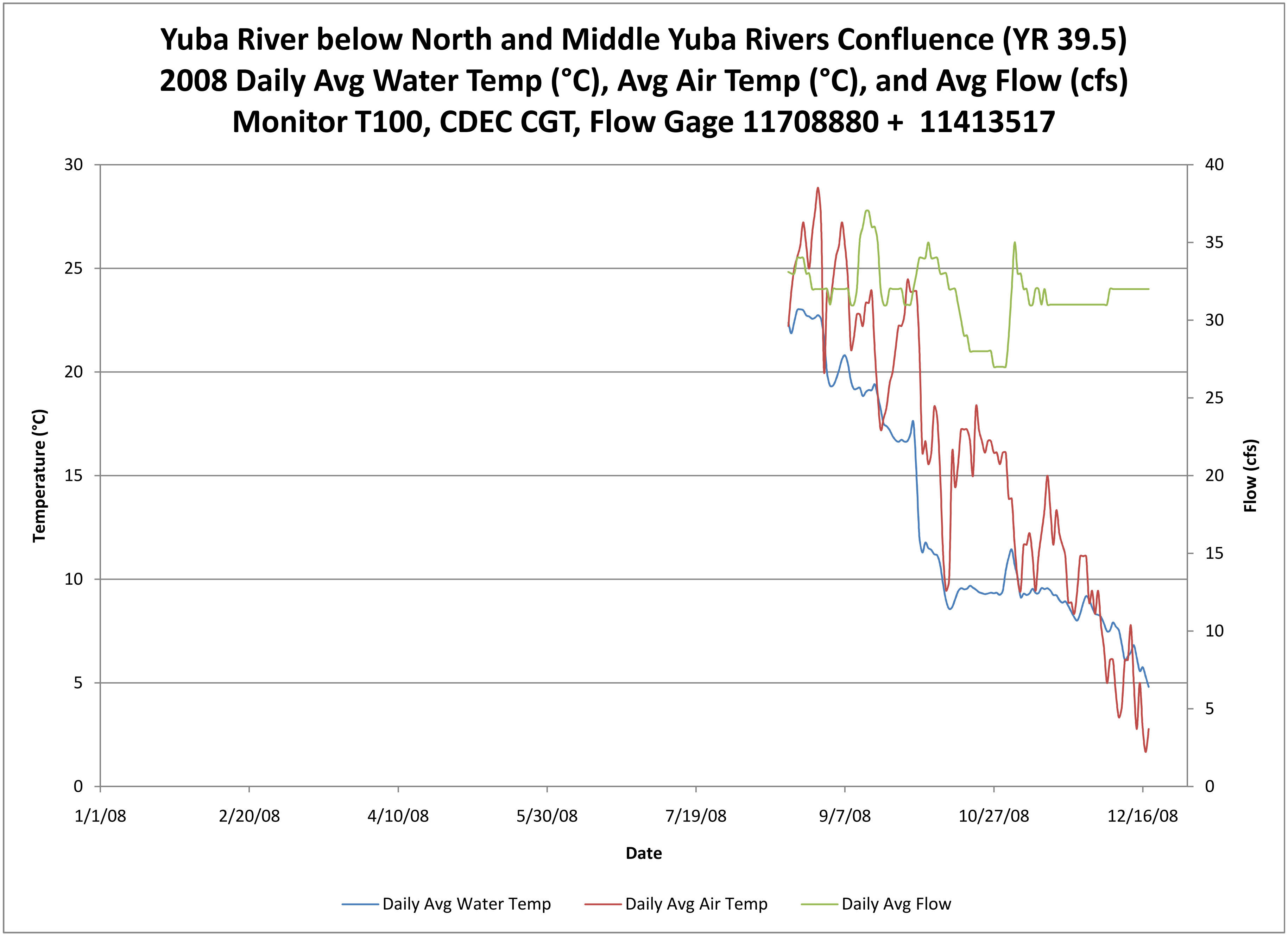
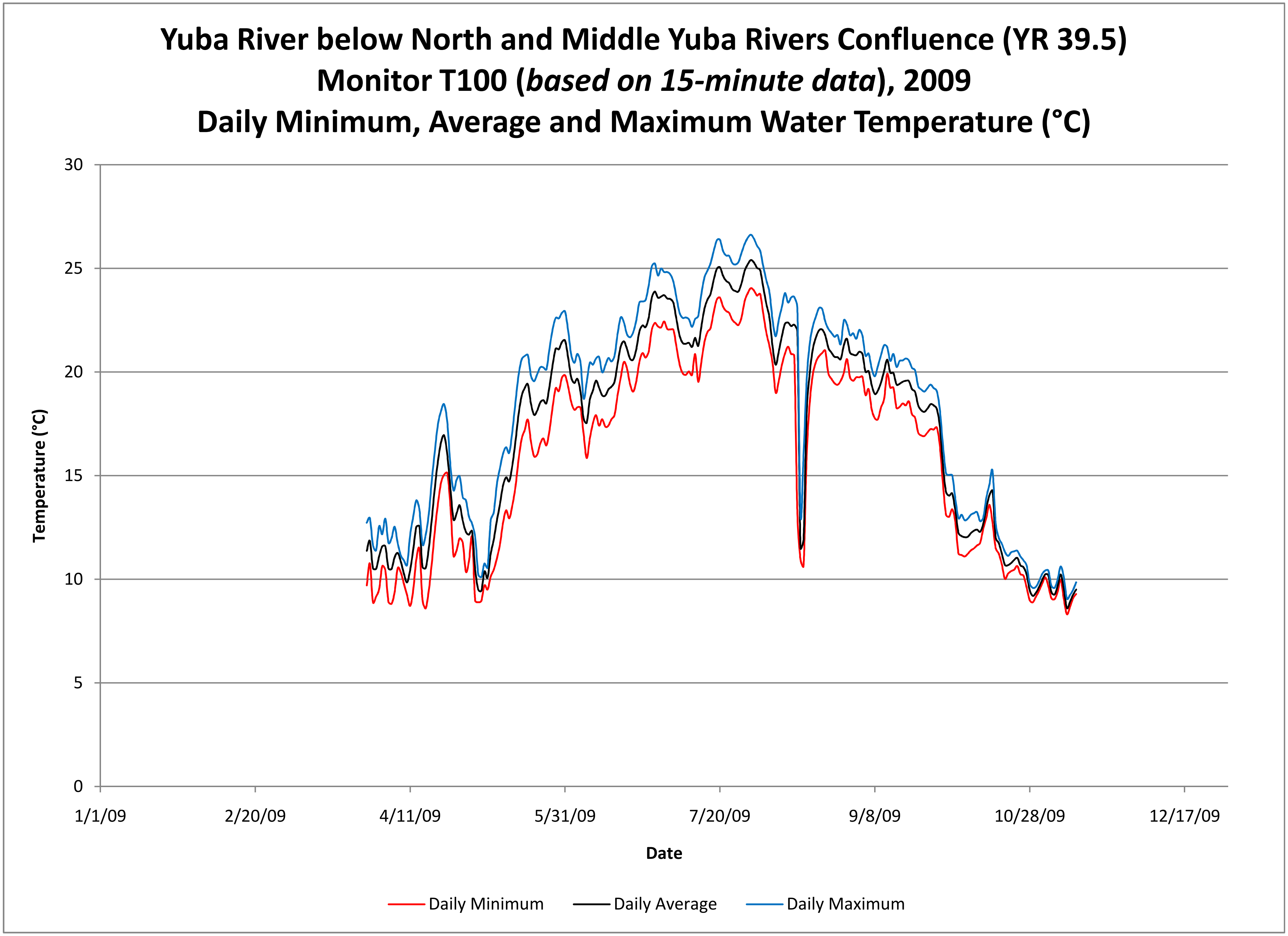
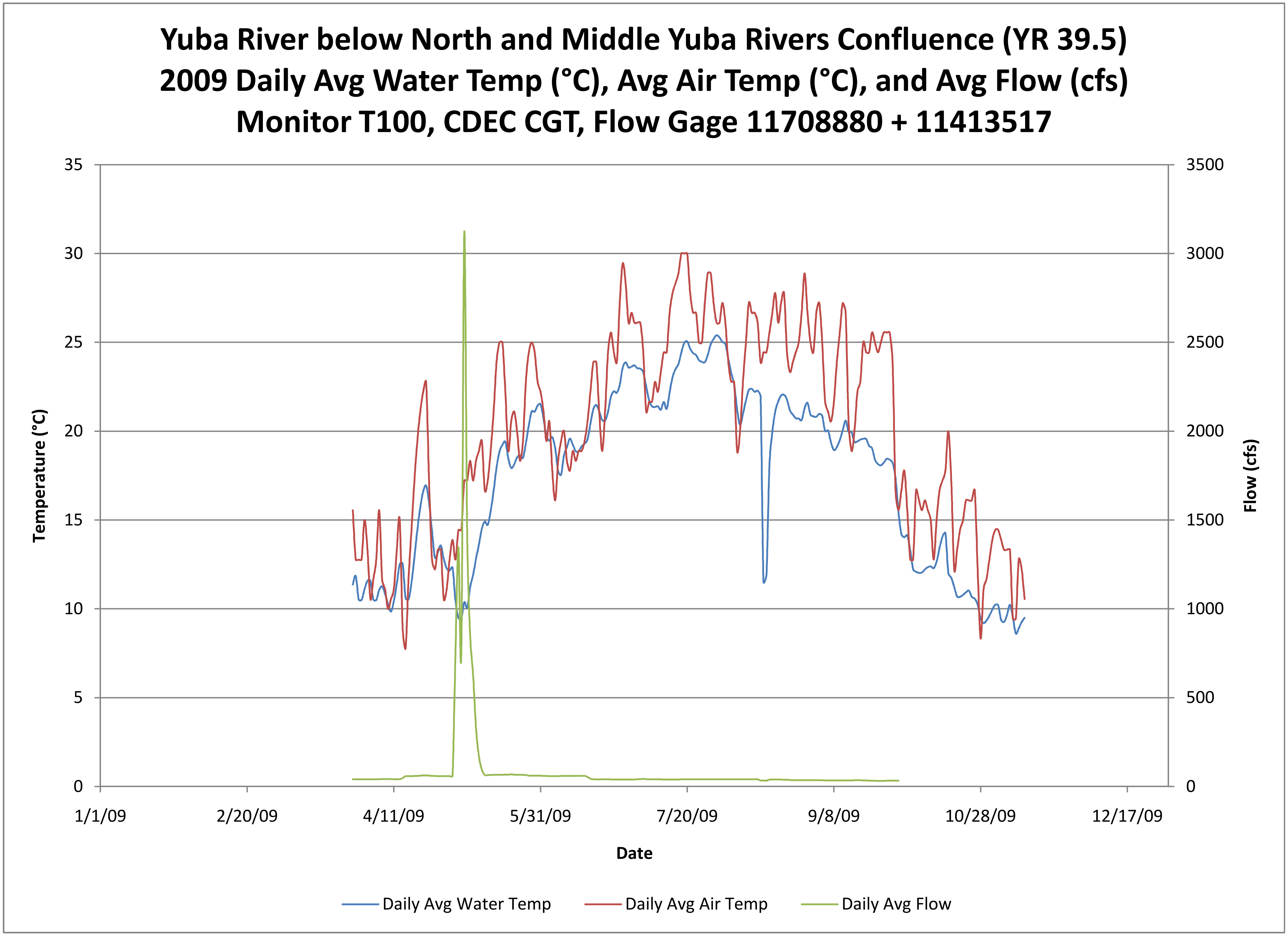
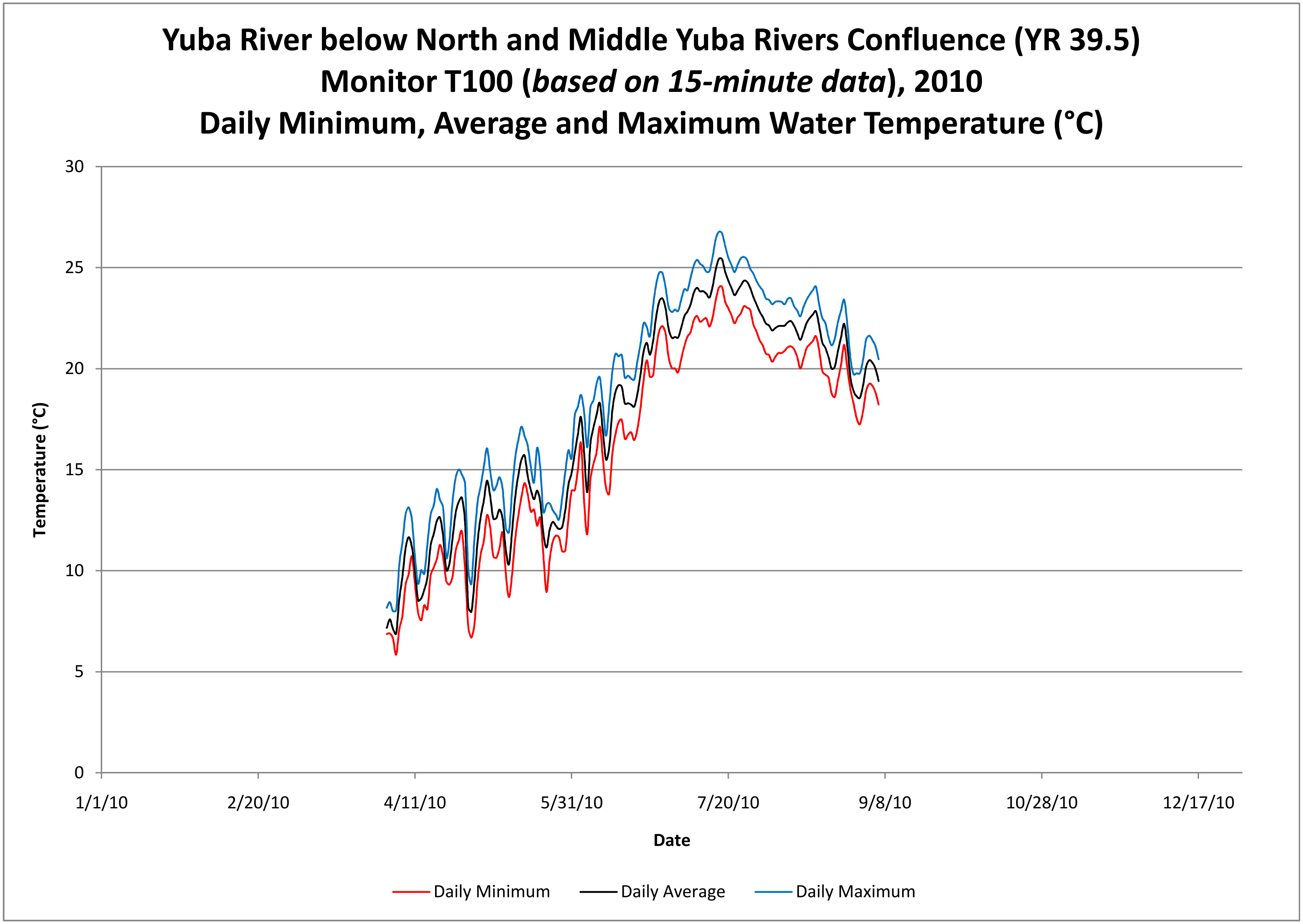
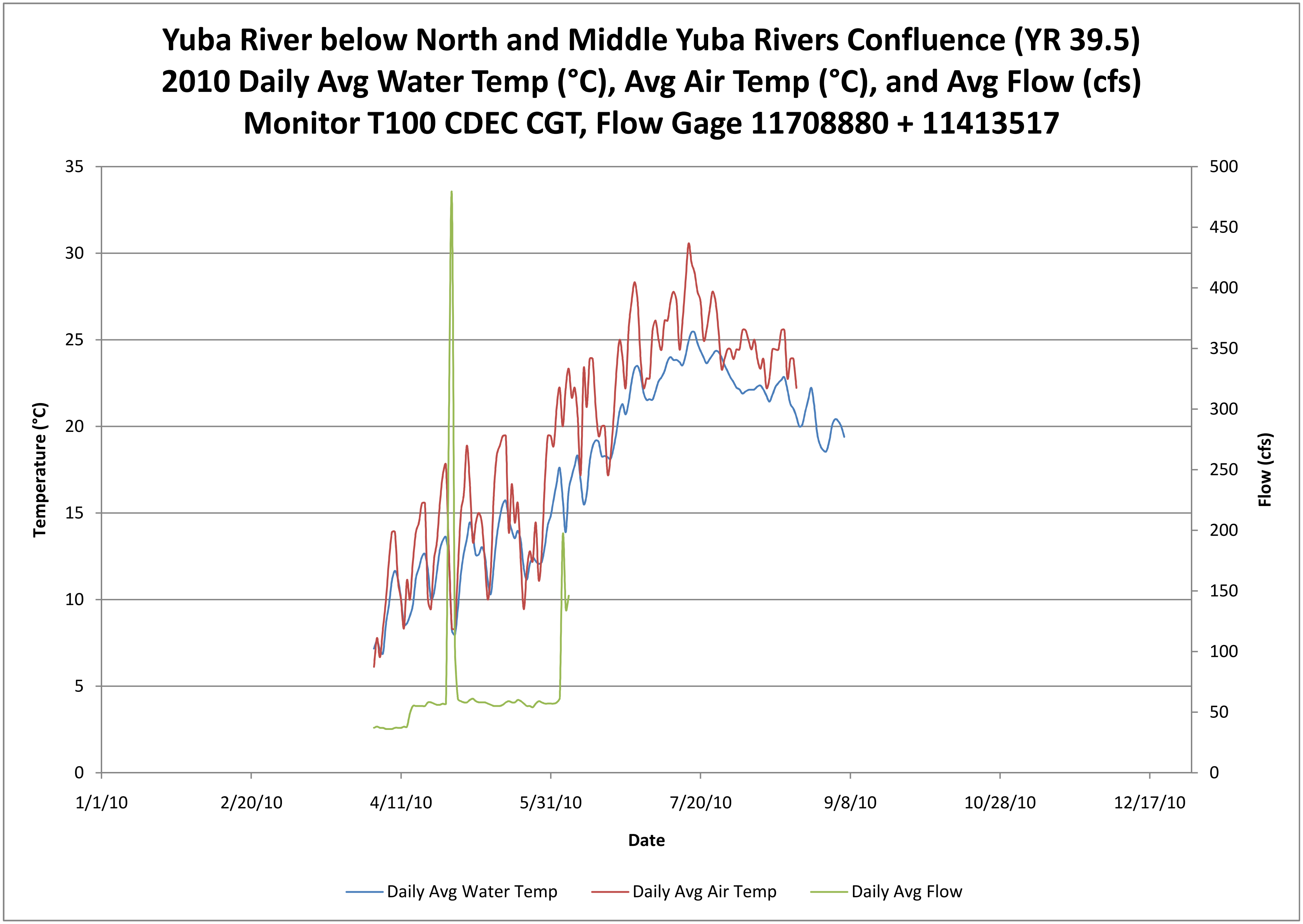

Yuba River below North and Middle Yuba Rivers Confluence (YR 39.5)
Monitor T100 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum

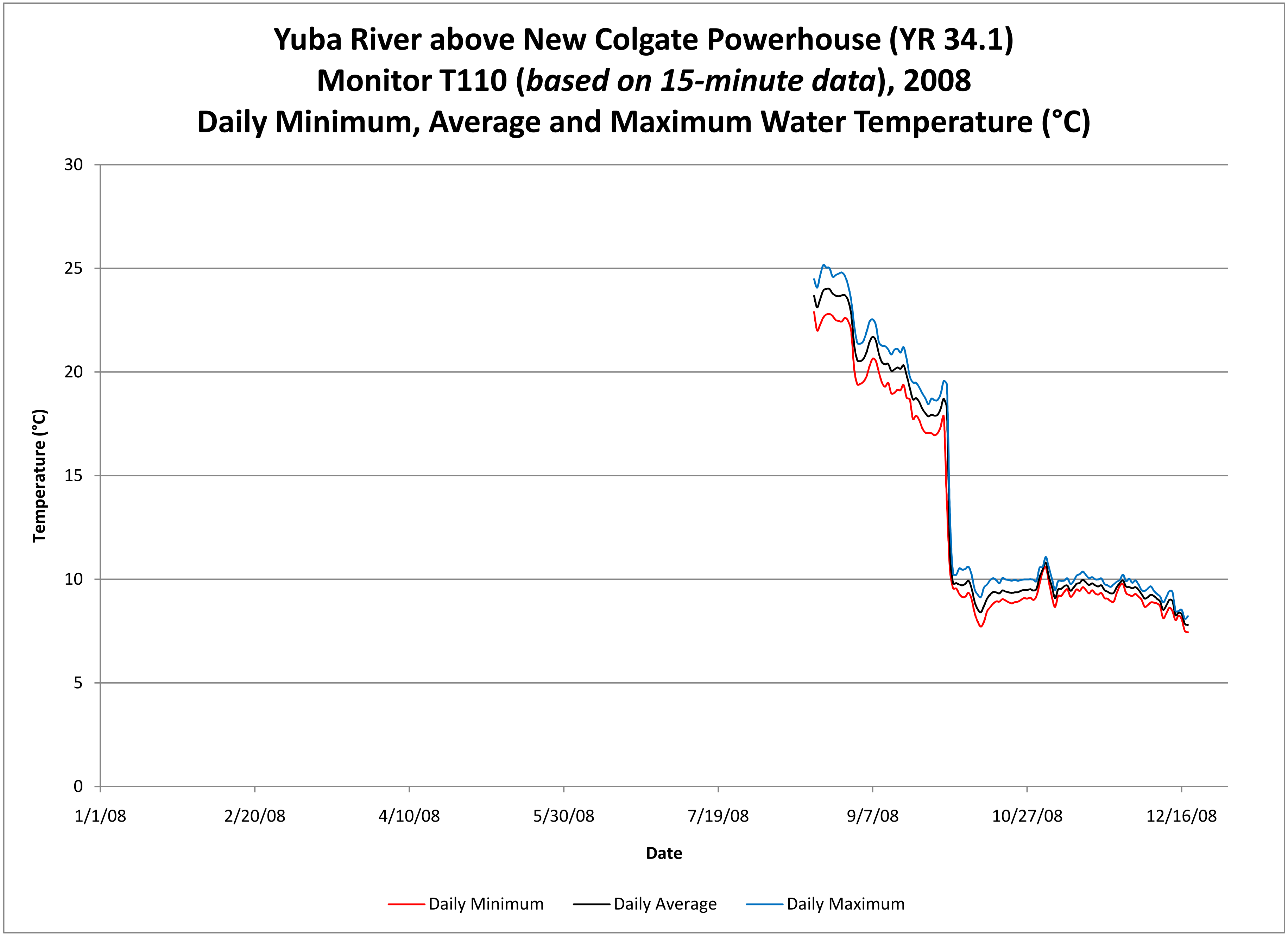

Yuba River below North and Middle Yuba Rivers Confluence (YR 39.5)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T100, CDEC CGT, Flow Gage 11708880 + 11413517
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
40
35
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

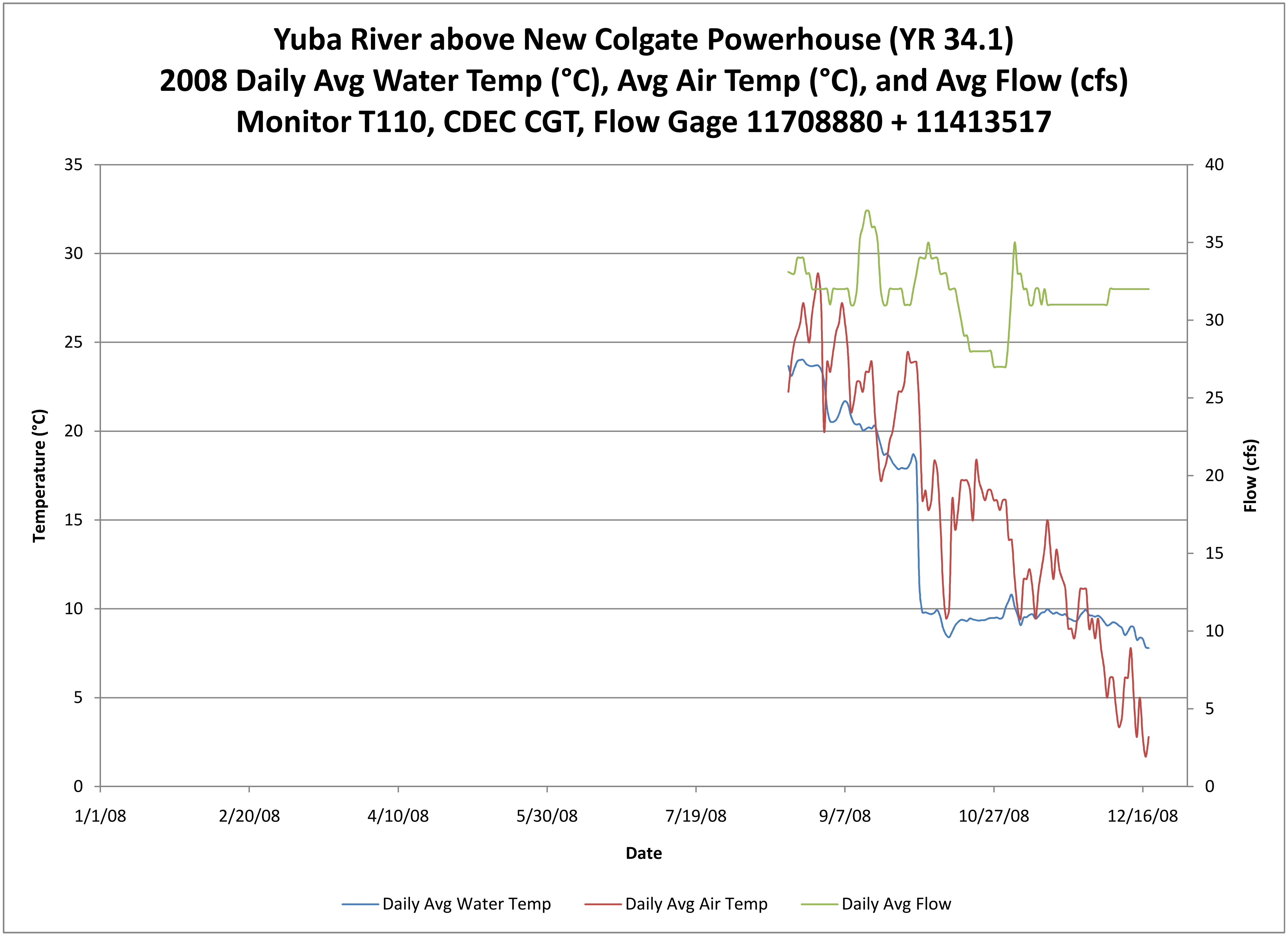

Yuba River below North and Middle Yuba Rivers Confluence (YR 39.5)
Monitor T100 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum

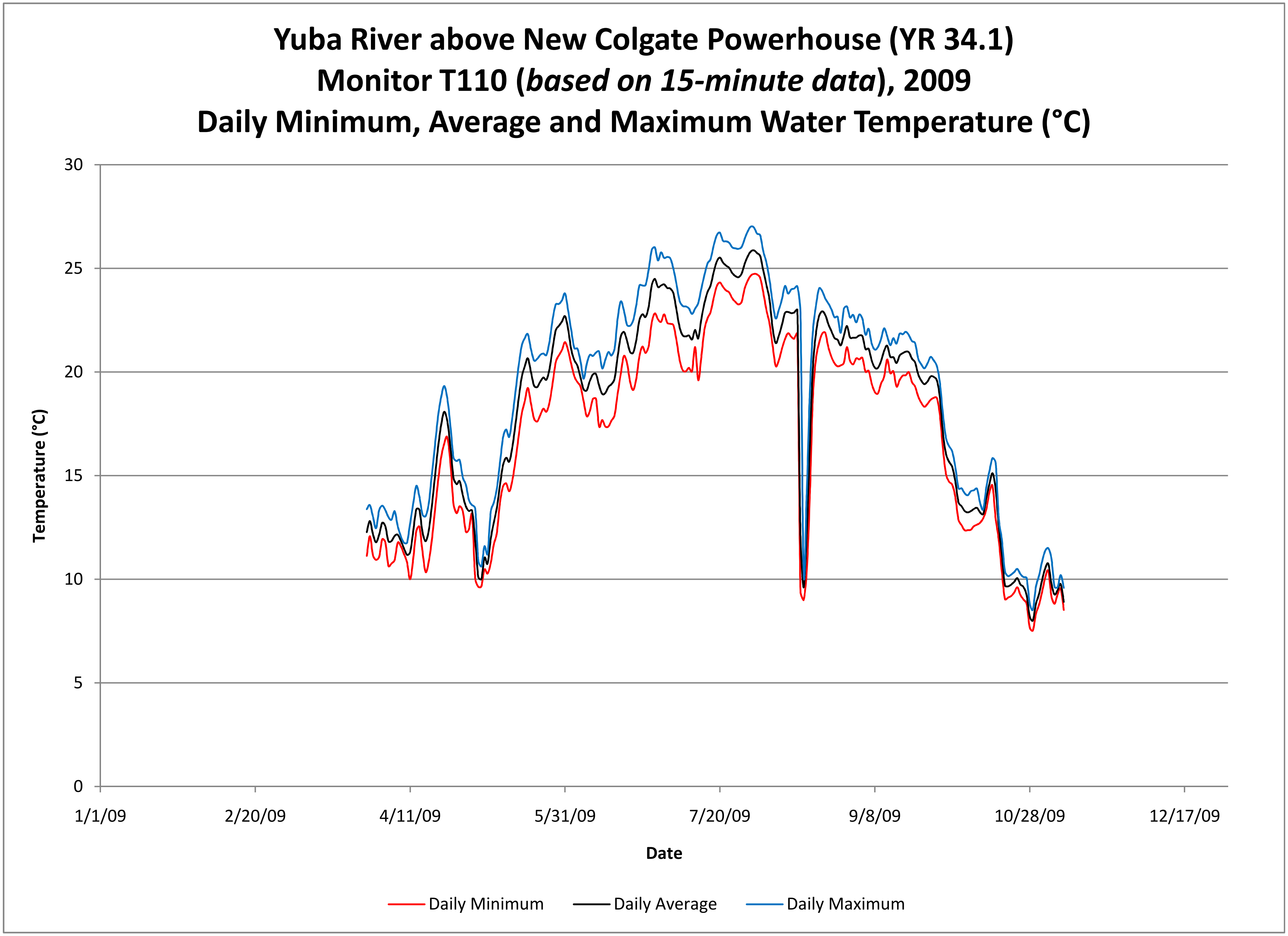

Yuba River below North and Middle Yuba Rivers Confluence (YR 39.5)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T100, CDEC CGT, Flow Gage 11708880 + 11413517
Temperature (°C)
0
5
10
15
20
25
30
35
Flow (cfs)
0
500
1000
1500
2000
2500
3000
3500
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

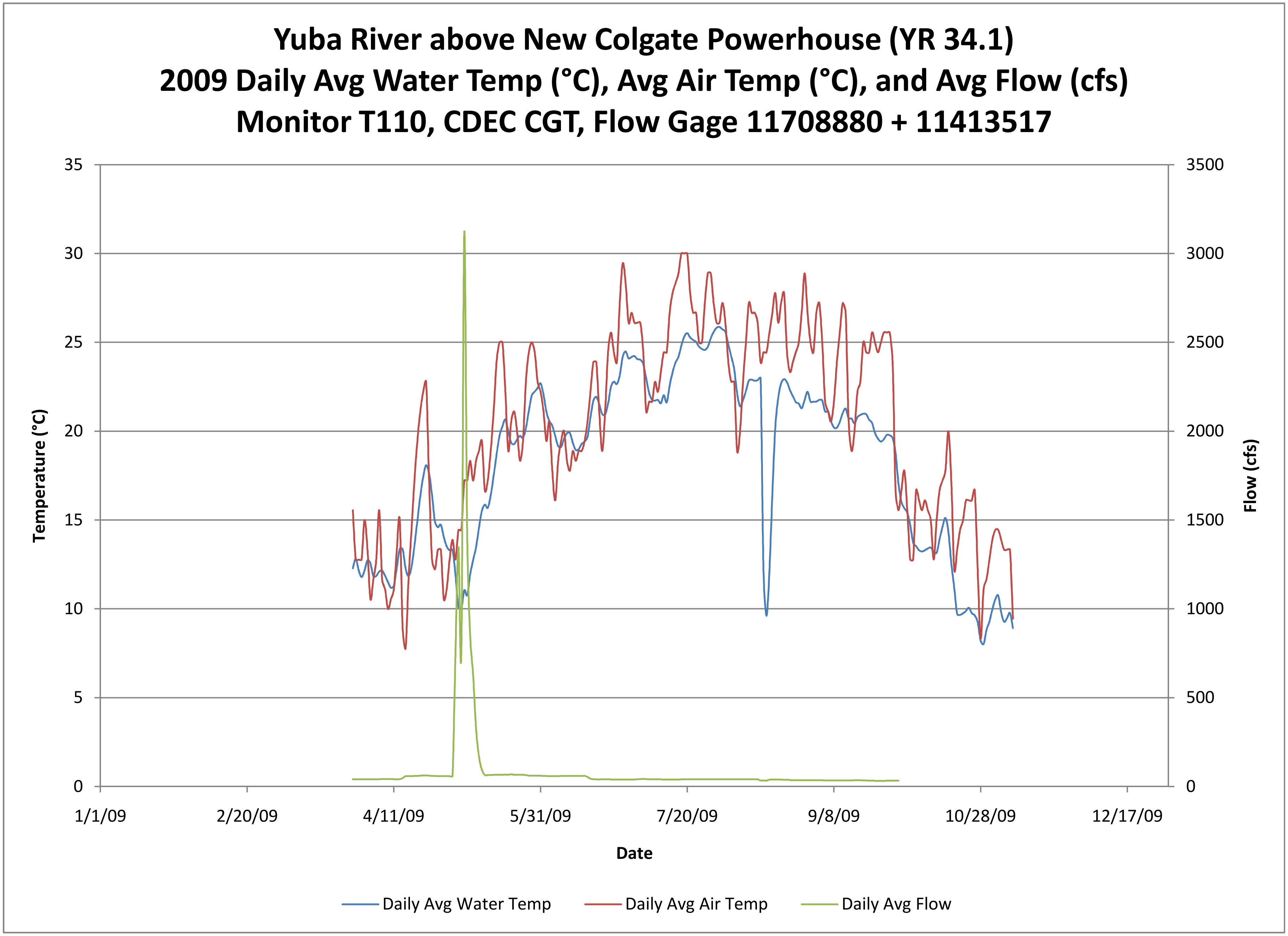

Yuba River below North and Middle Yuba Rivers Confluence (YR 39.5)
Monitor T100 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River below North and Middle Yuba Rivers Confluence (YR 39.5)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T100 CDEC CGT, Flow Gage 11708880 + 11413517
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
500
450
400
350
300
250
200
150
100
50
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Yuba River above New Colgate Powerhouse (YR 34.1)
Monitor T110 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River above New Colgate Powerhouse (YR 34.1)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T110, CDEC CGT, Flow Gage 11708880 + 11413517
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
40
35
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Yuba River above New Colgate Powerhouse (YR 34.1)
Monitor T110 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum



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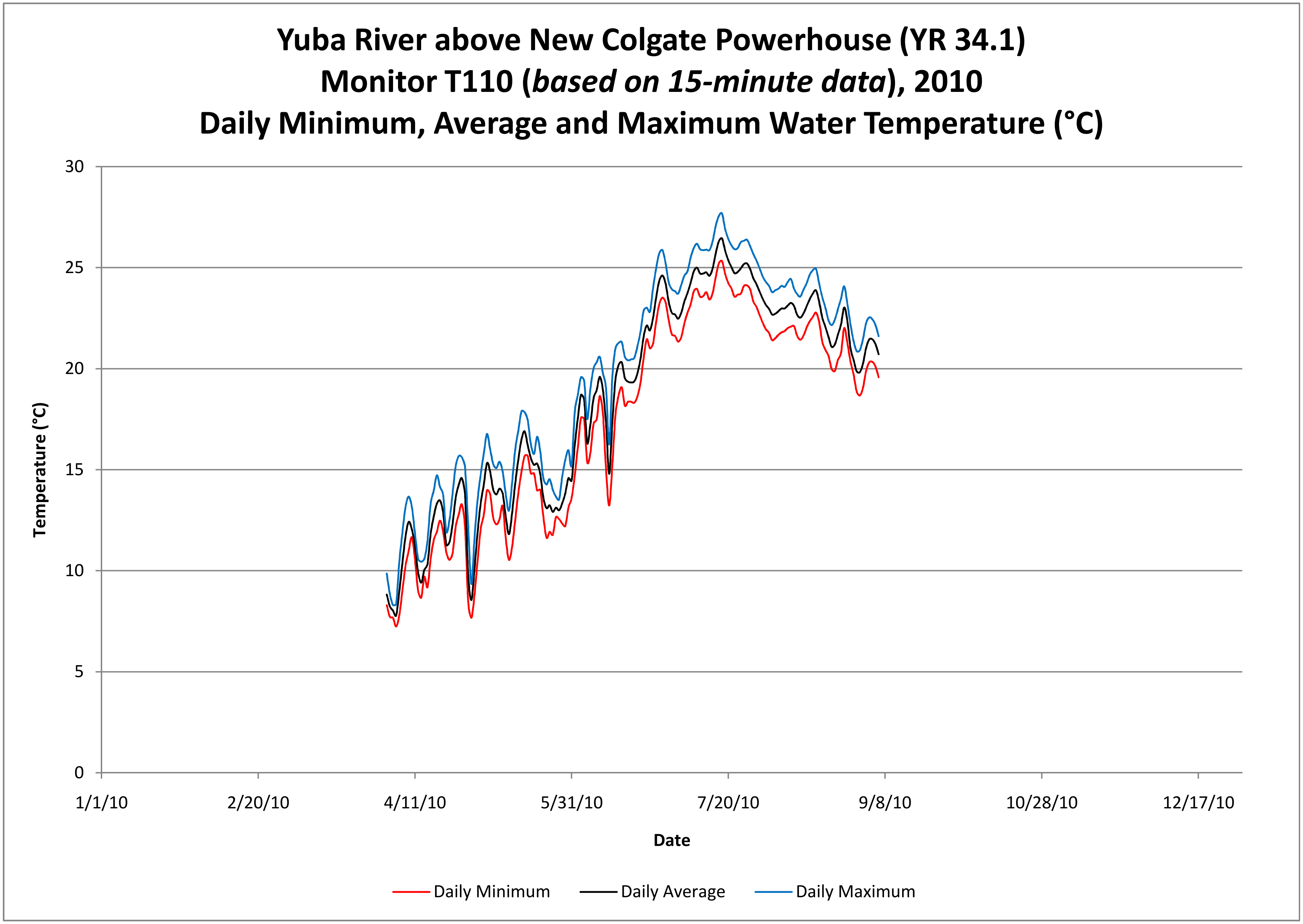
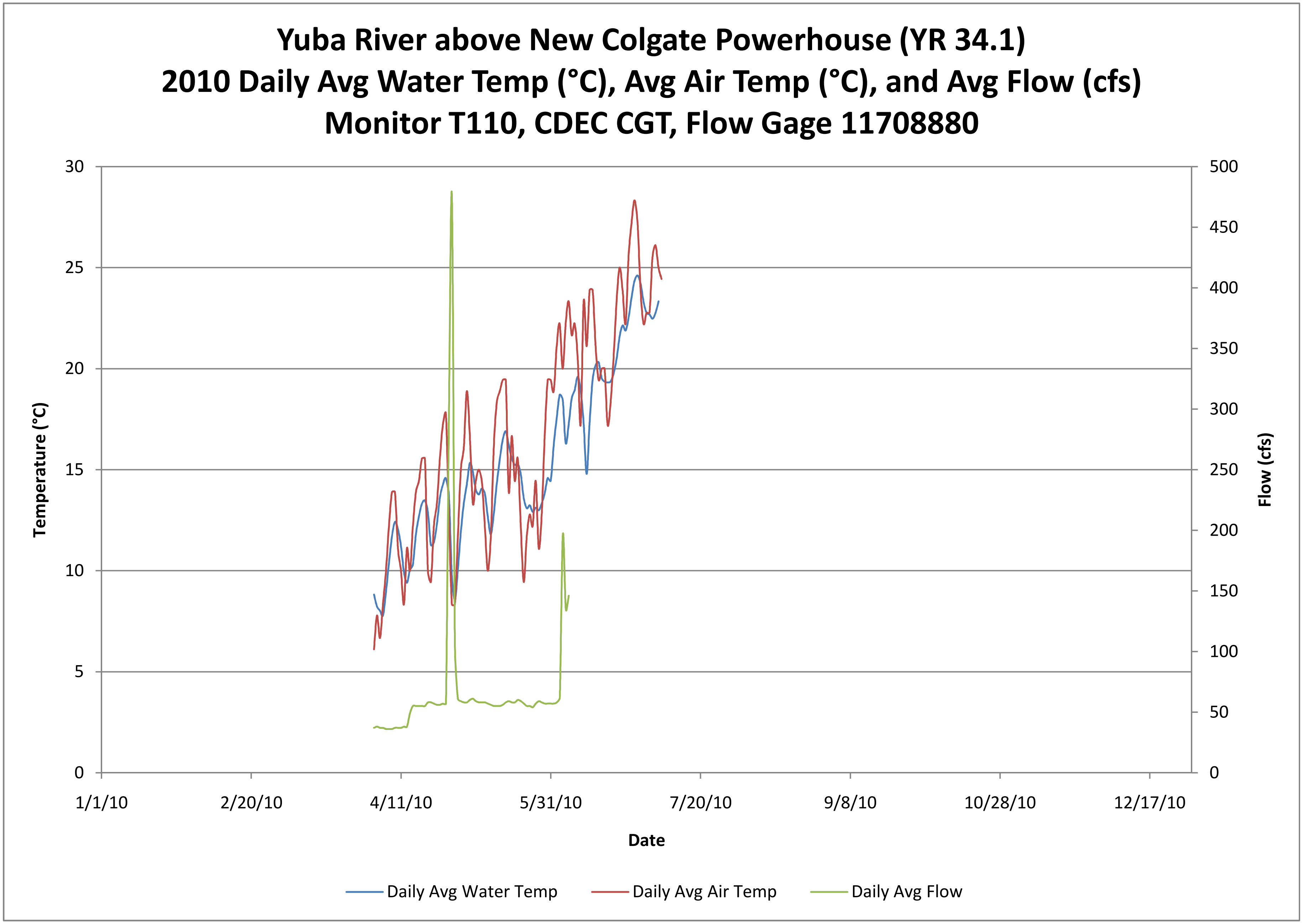

Yuba River above New Colgate Powerhouse (YR 34.1)
Monitor T110 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum



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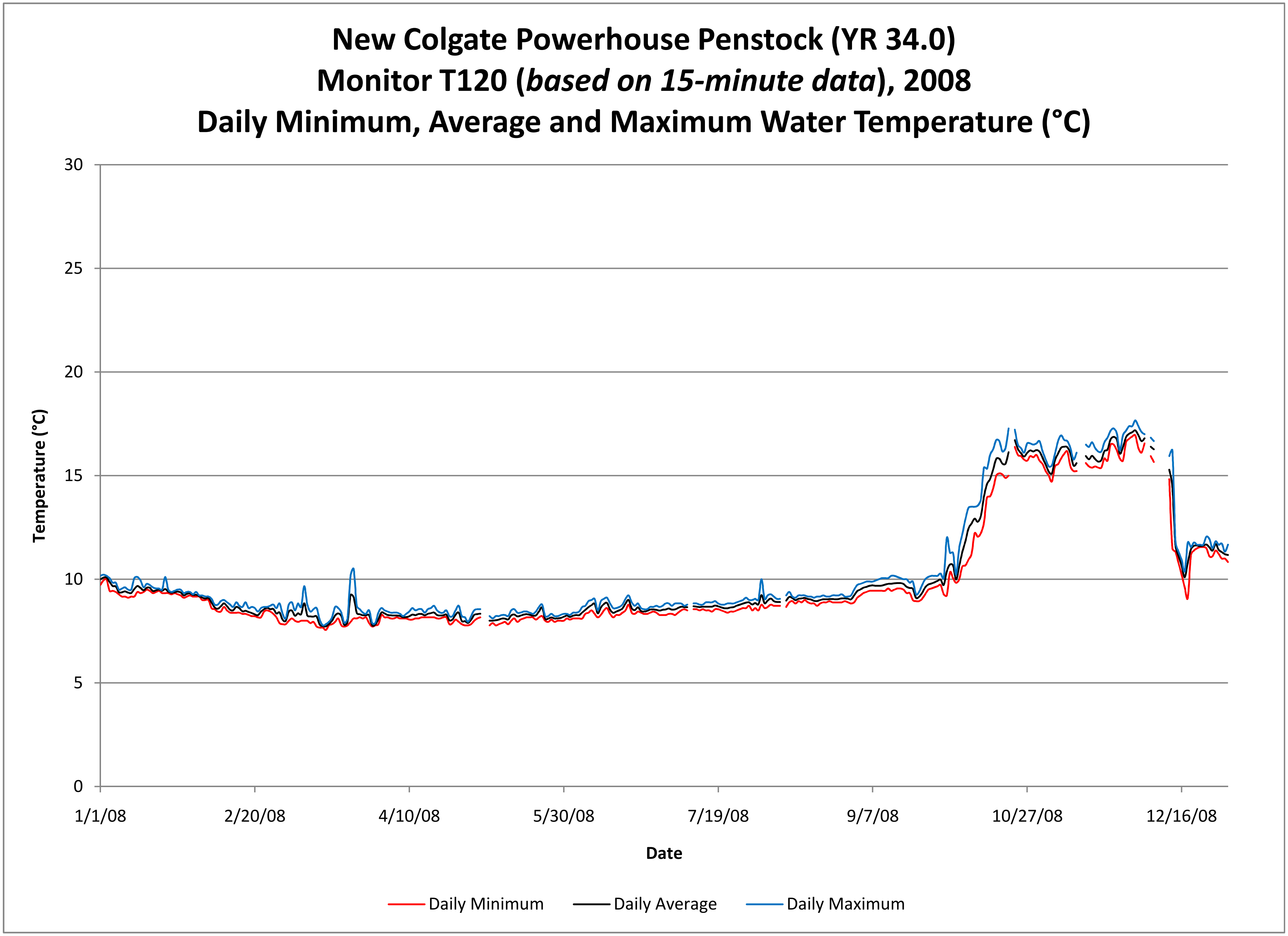

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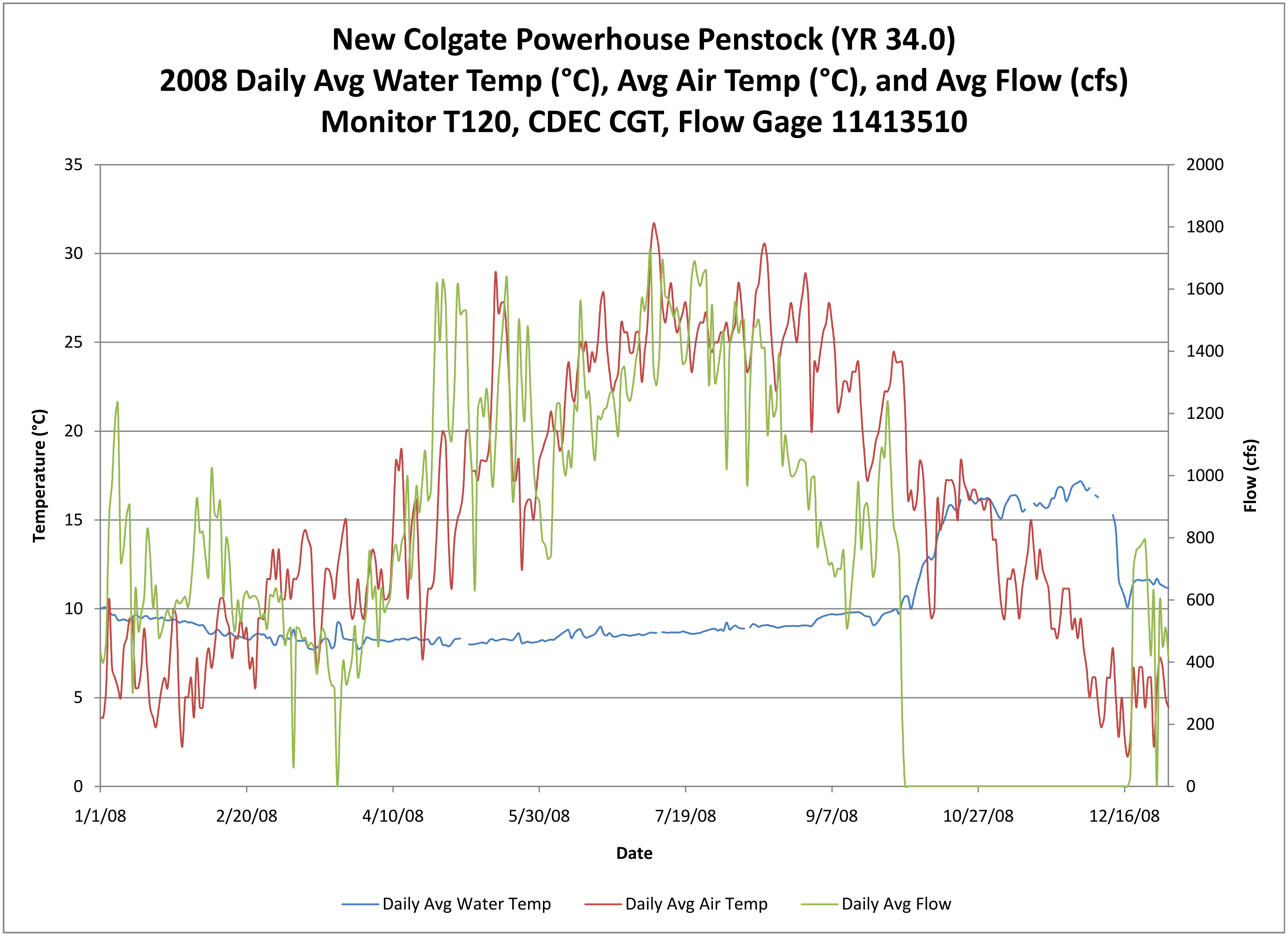
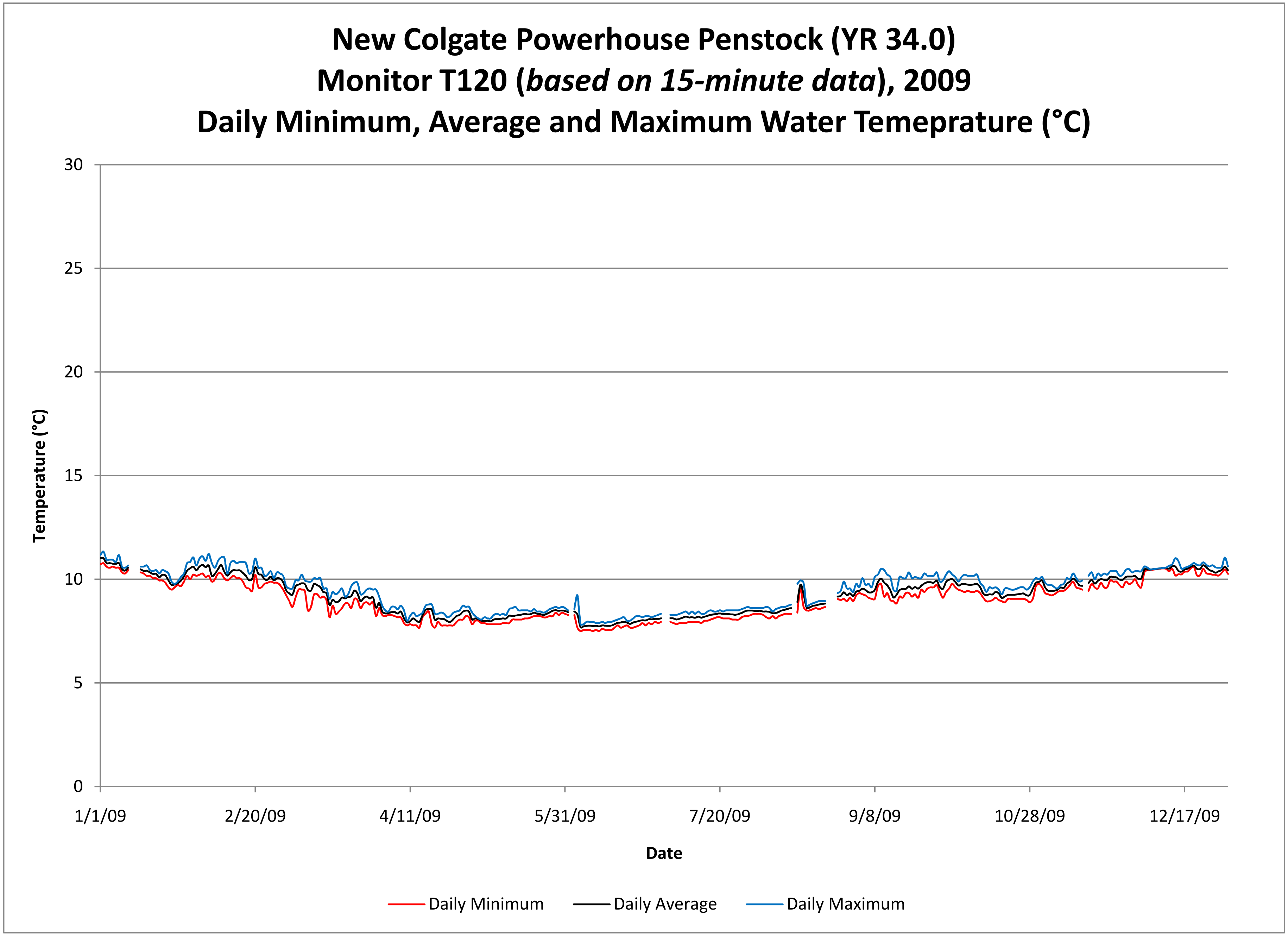
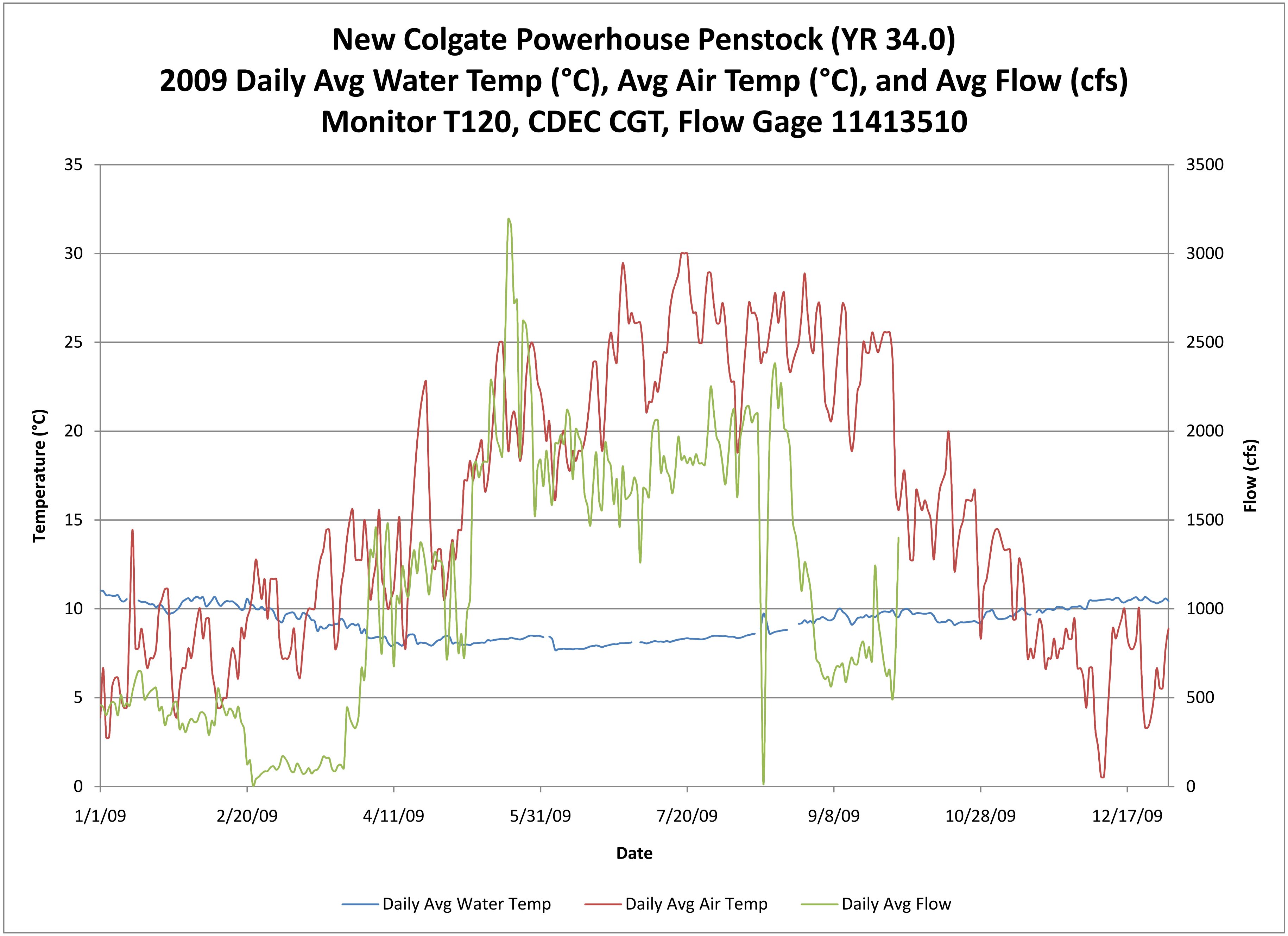
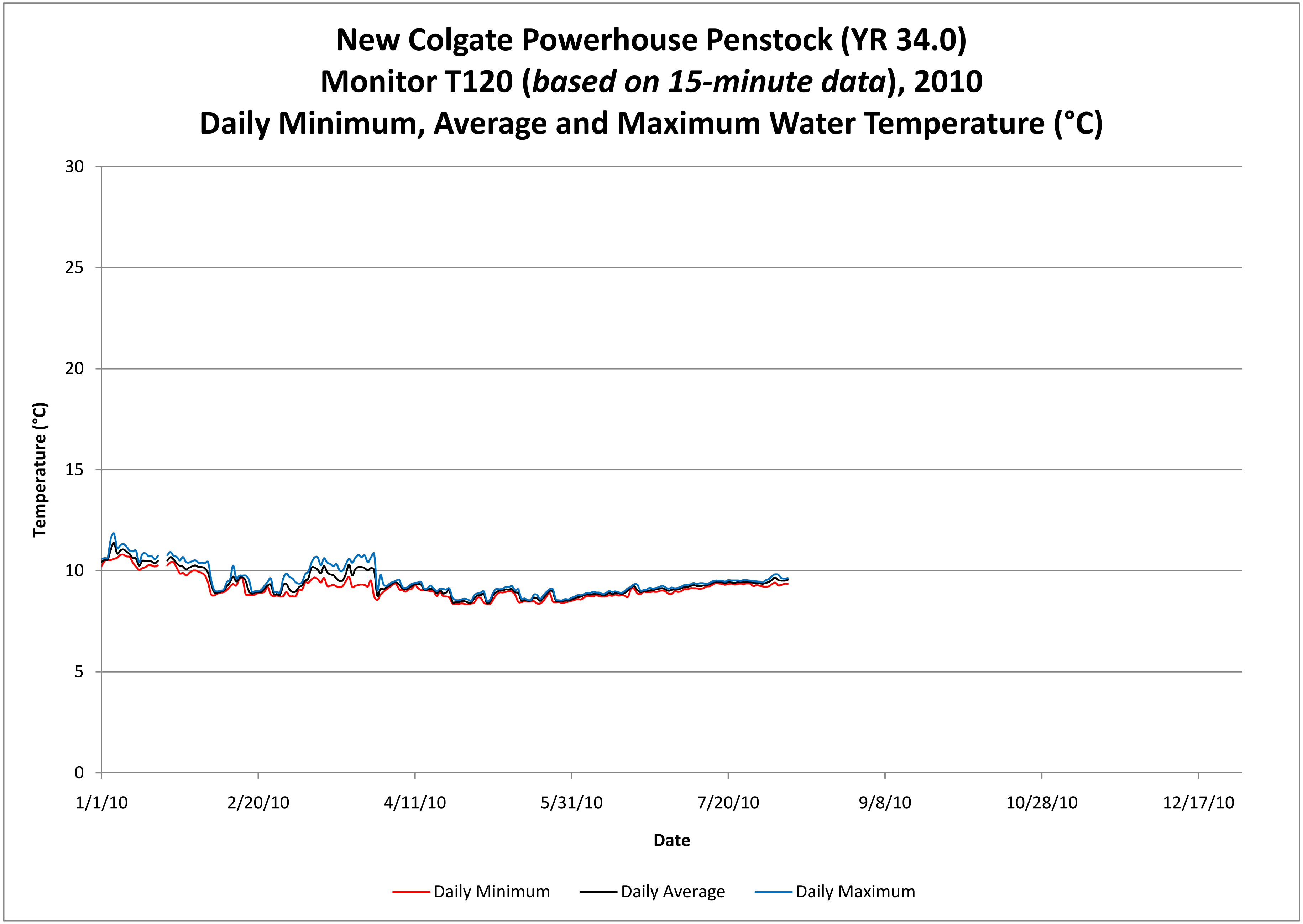
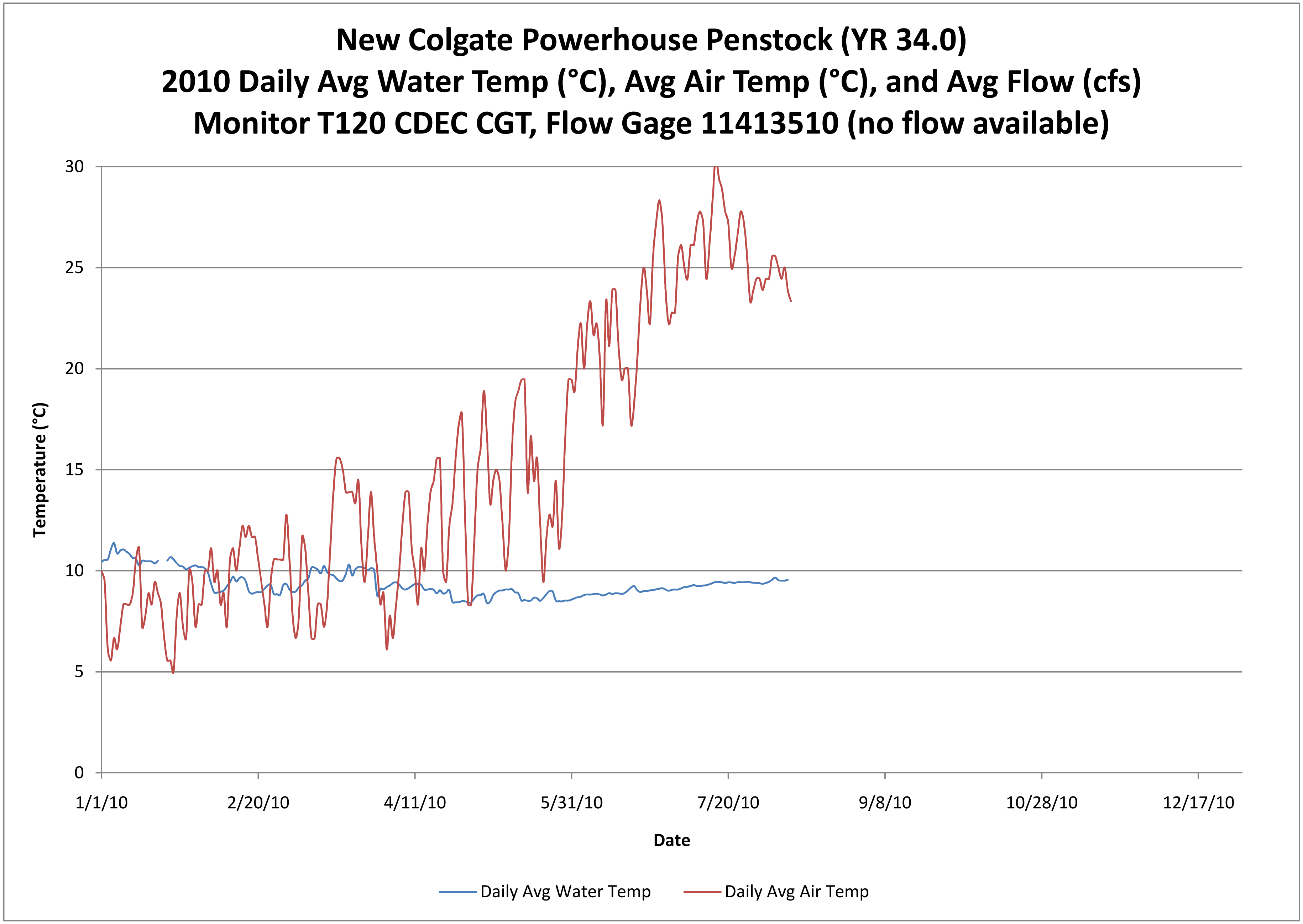

New Colgate Powerhouse Penstock (YR 34.0)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T120, CDEC CGT, Flow Gage 11413510
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


New Colgate Powerhouse Penstock (YR 34.0)
Monitor T120 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temeprature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


New Colgate Powerhouse Penstock (YR 34.0)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T120, CDEC CGT, Flow Gage 11413510
Temperature (°C)
Flow (cfs)
Date
0
5
10
15
20
25
30
35
0
500
1000
1500
2000
2500
3000
3500
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


New Colgate Powerhouse Penstock (YR 34.0)
Monitor T120 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum



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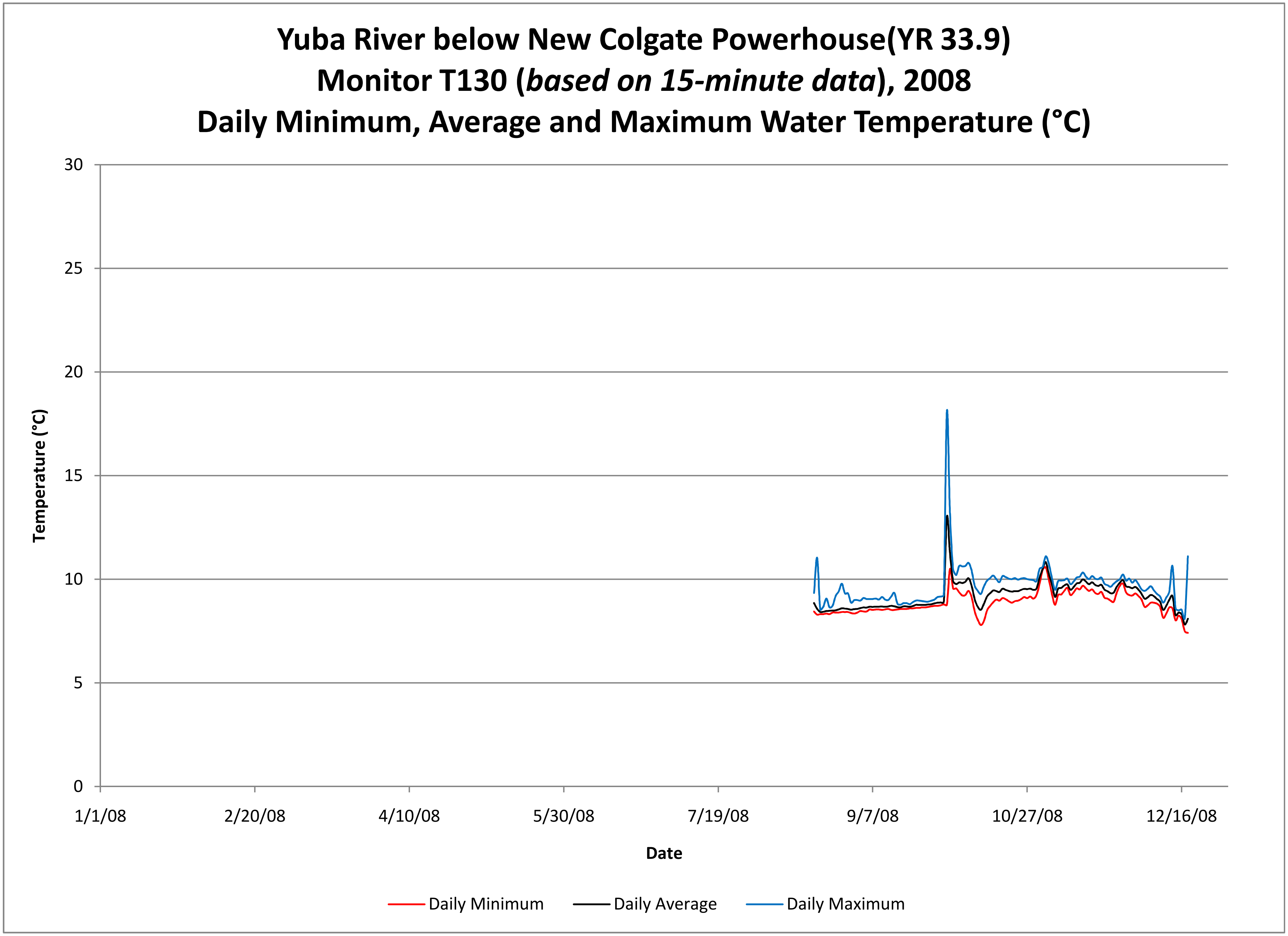
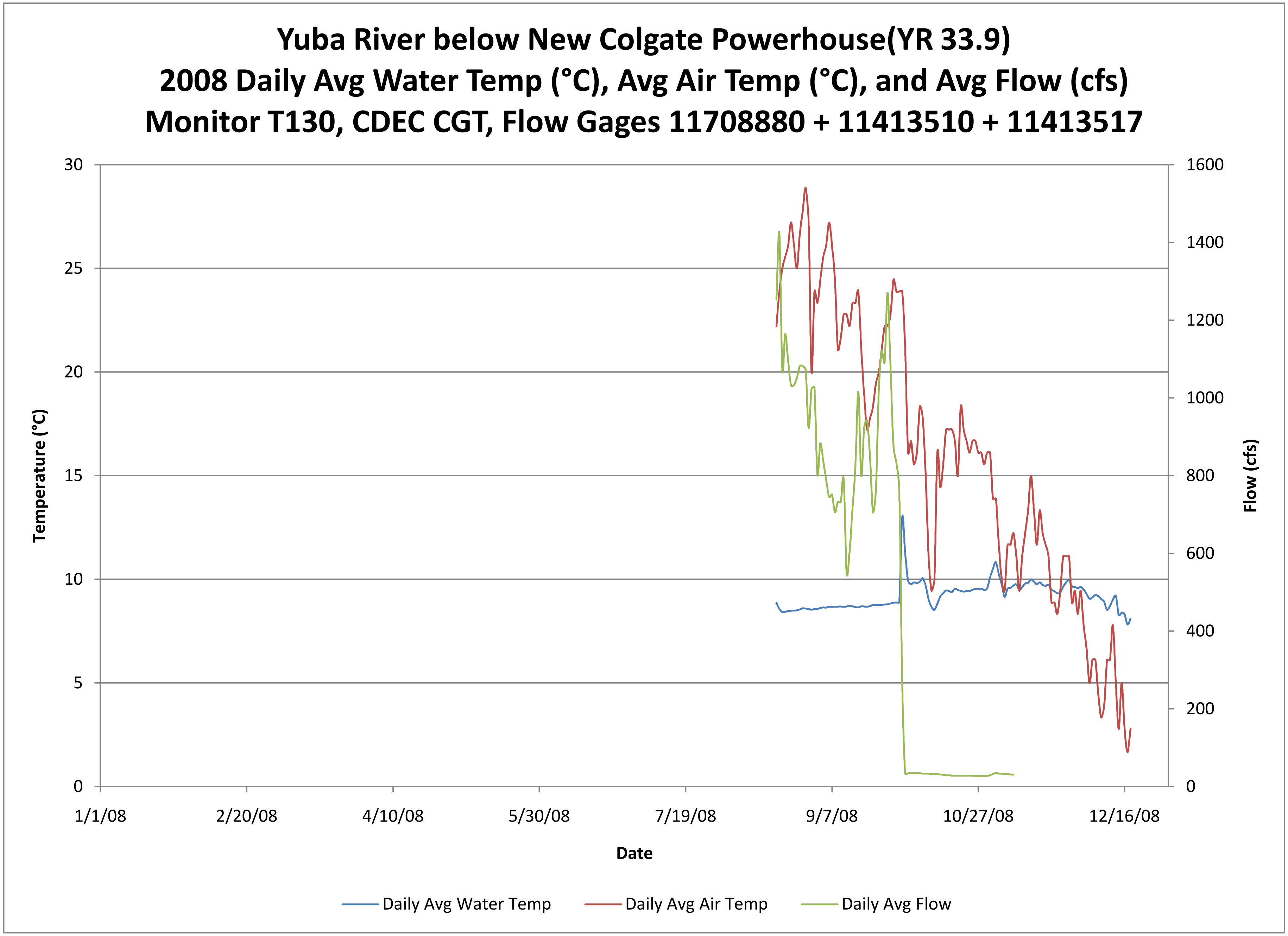
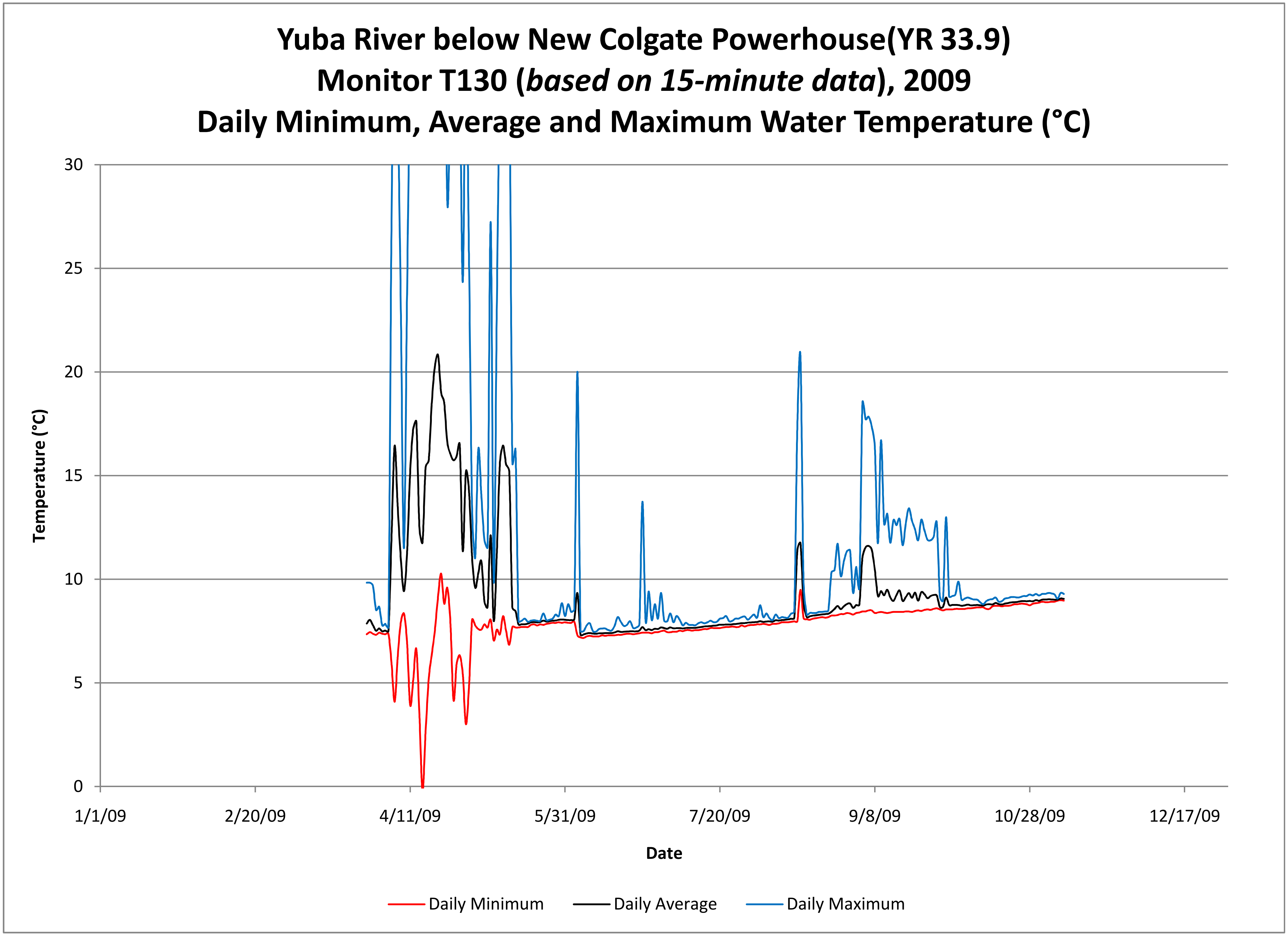

Yuba River below New Colgate Powerhouse(YR 33.9)
Monitor T130 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River below New Colgate Powerhouse(YR 33.9)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T130, CDEC CGT, Flow Gages 11708880 + 11413510 + 11413517
Temperature (°C)
0
5
10
15
20
25
30
Flow (cfs)
0
200
400
600
800
1000
1200
1400
1600
Date
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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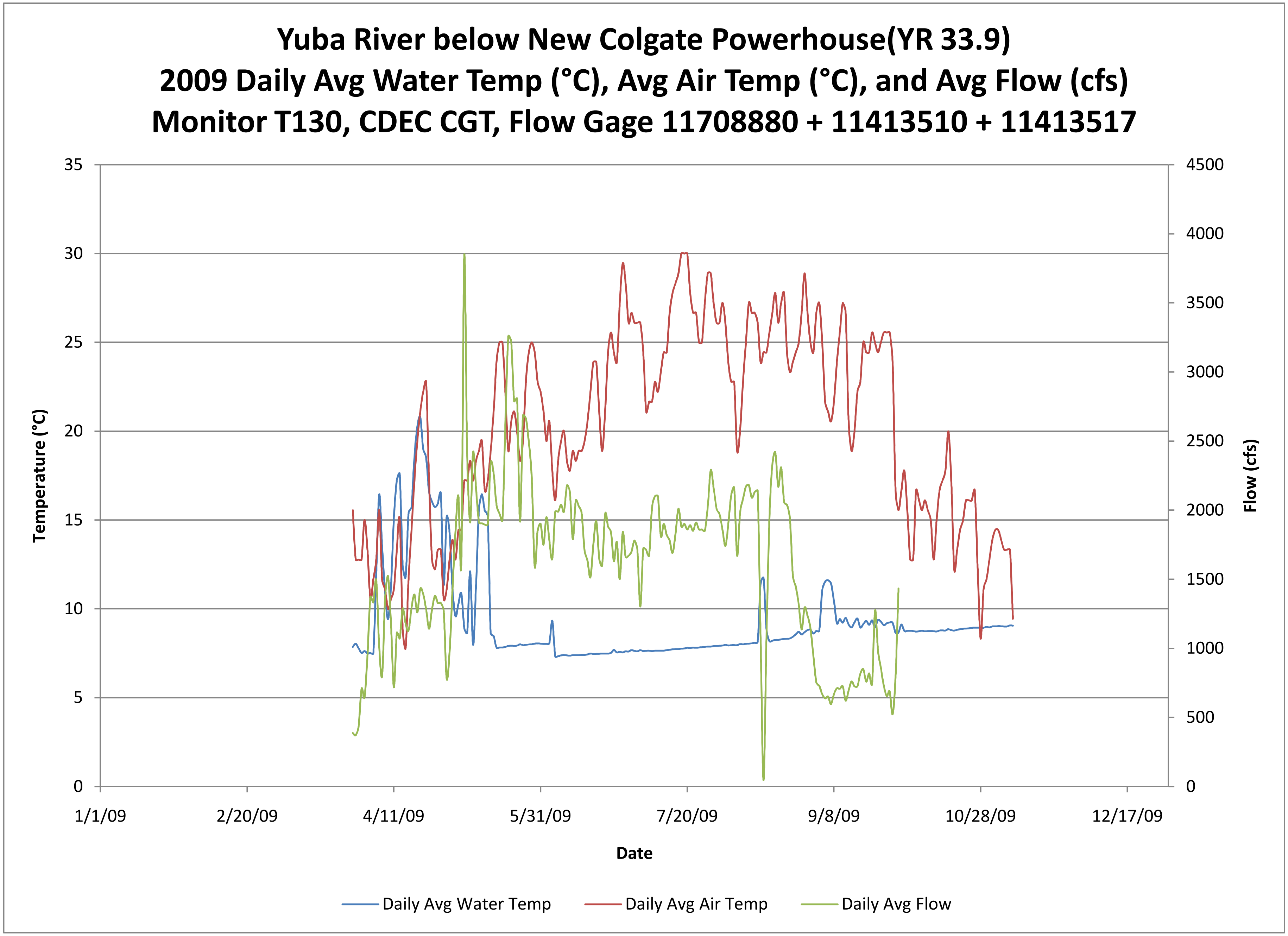
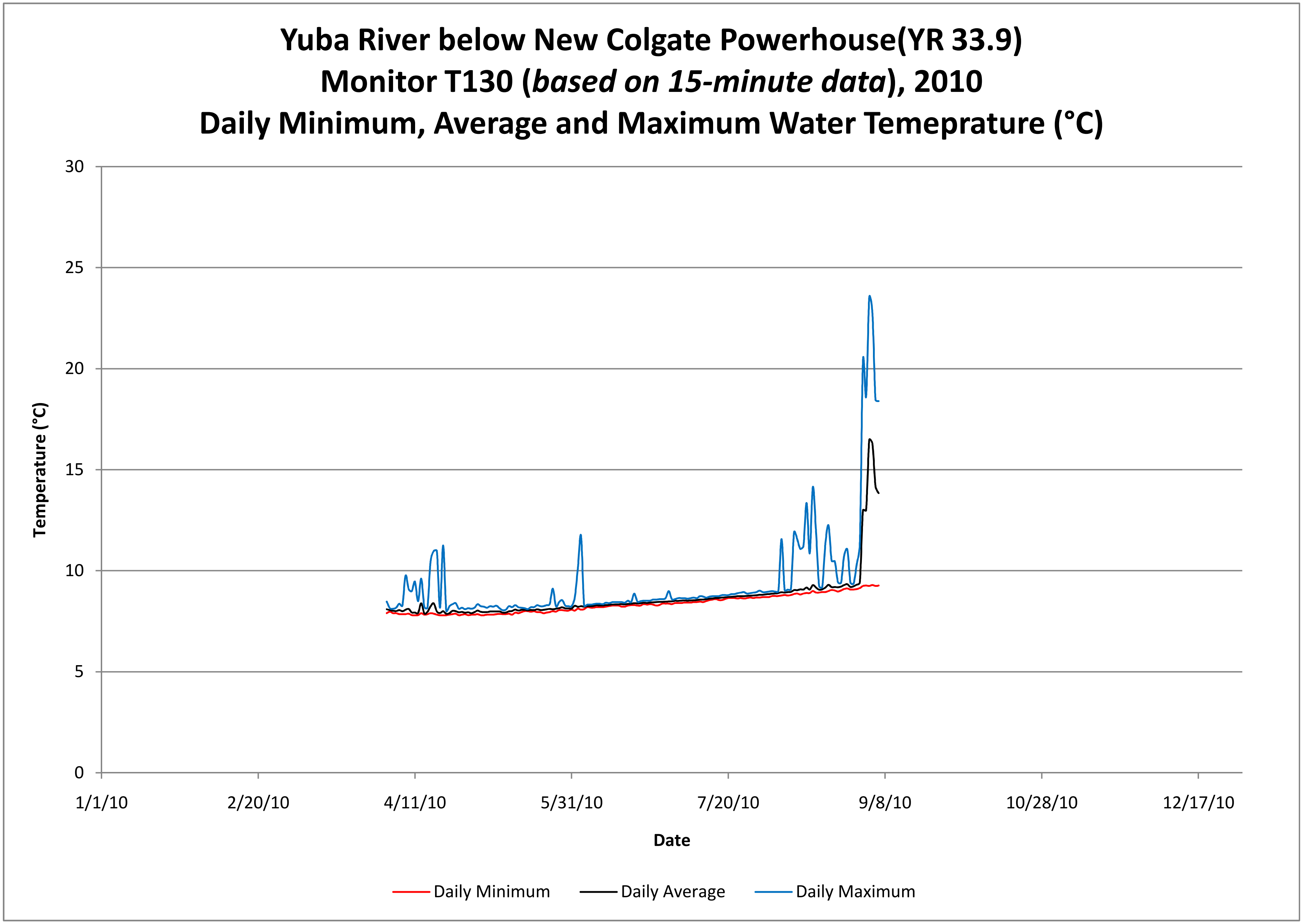

Yuba River below New Colgate Powerhouse(YR 33.9)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T130, CDEC CGT, Flow Gage 11708880 + 11413510 + 11413517
Temperature (°C)
0
5
10
15
20
25
30
35
Flow (cfs)
0
500
1000
1500
2000
2500
3000
3500
4000
4500
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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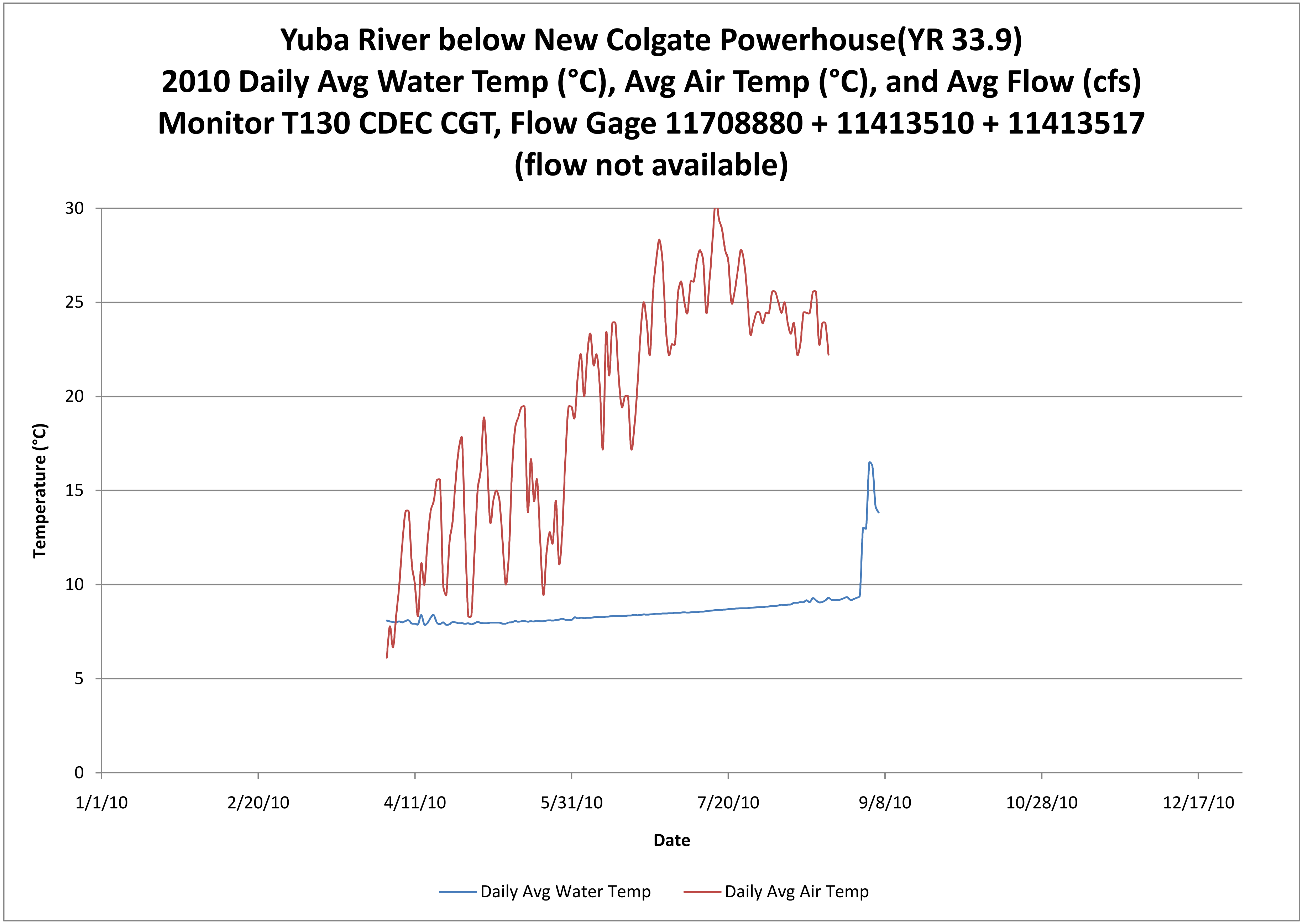

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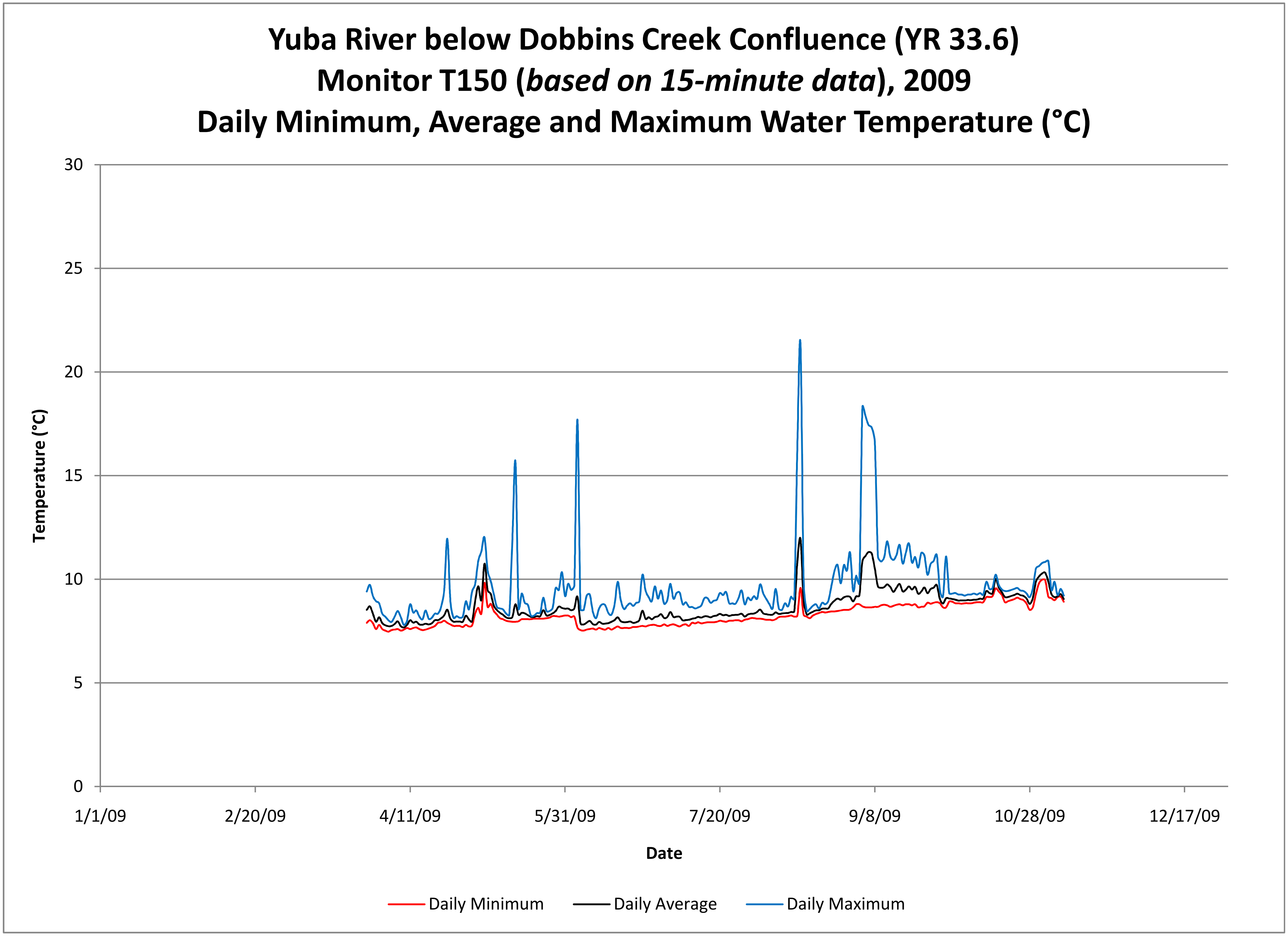
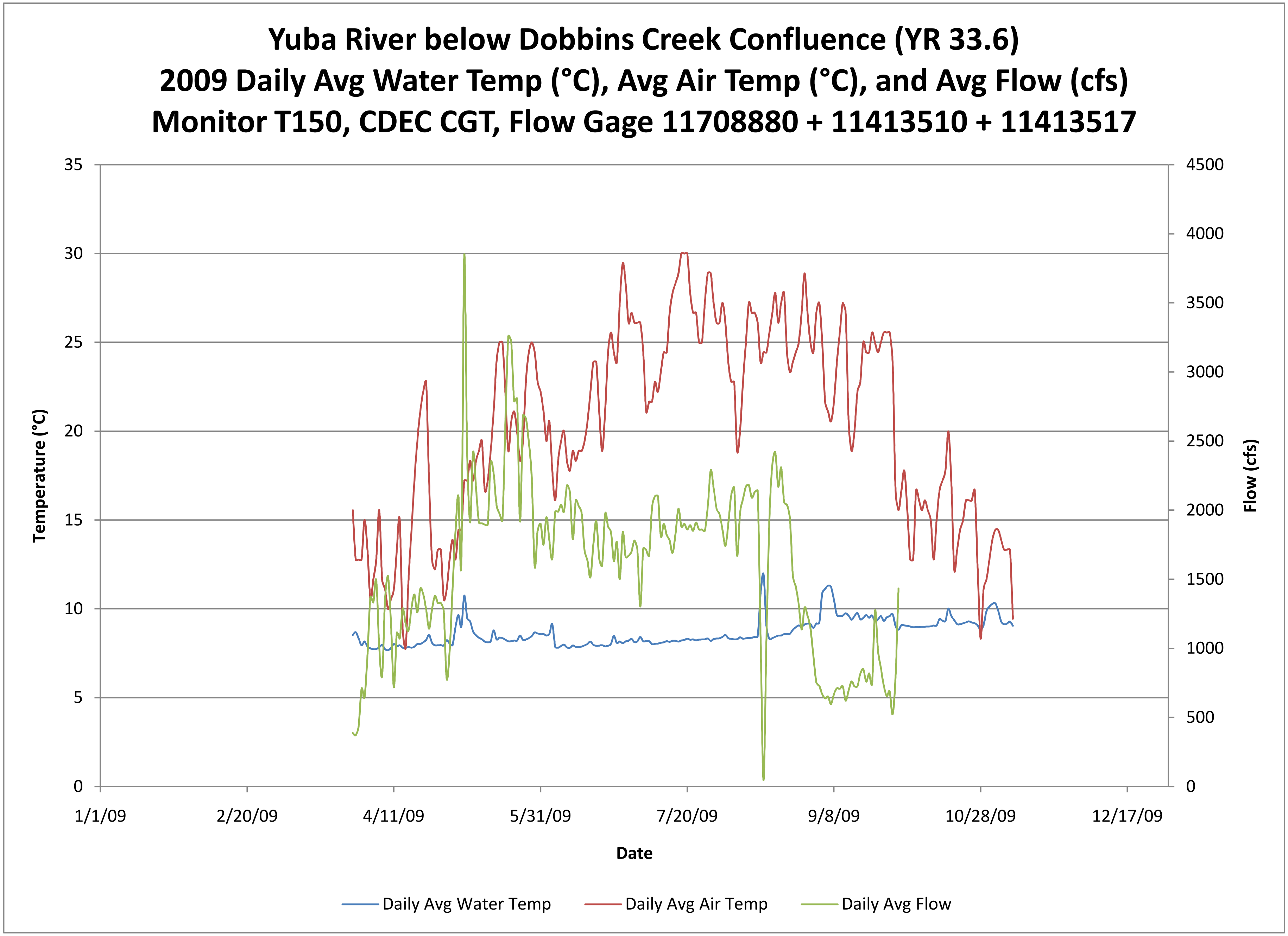
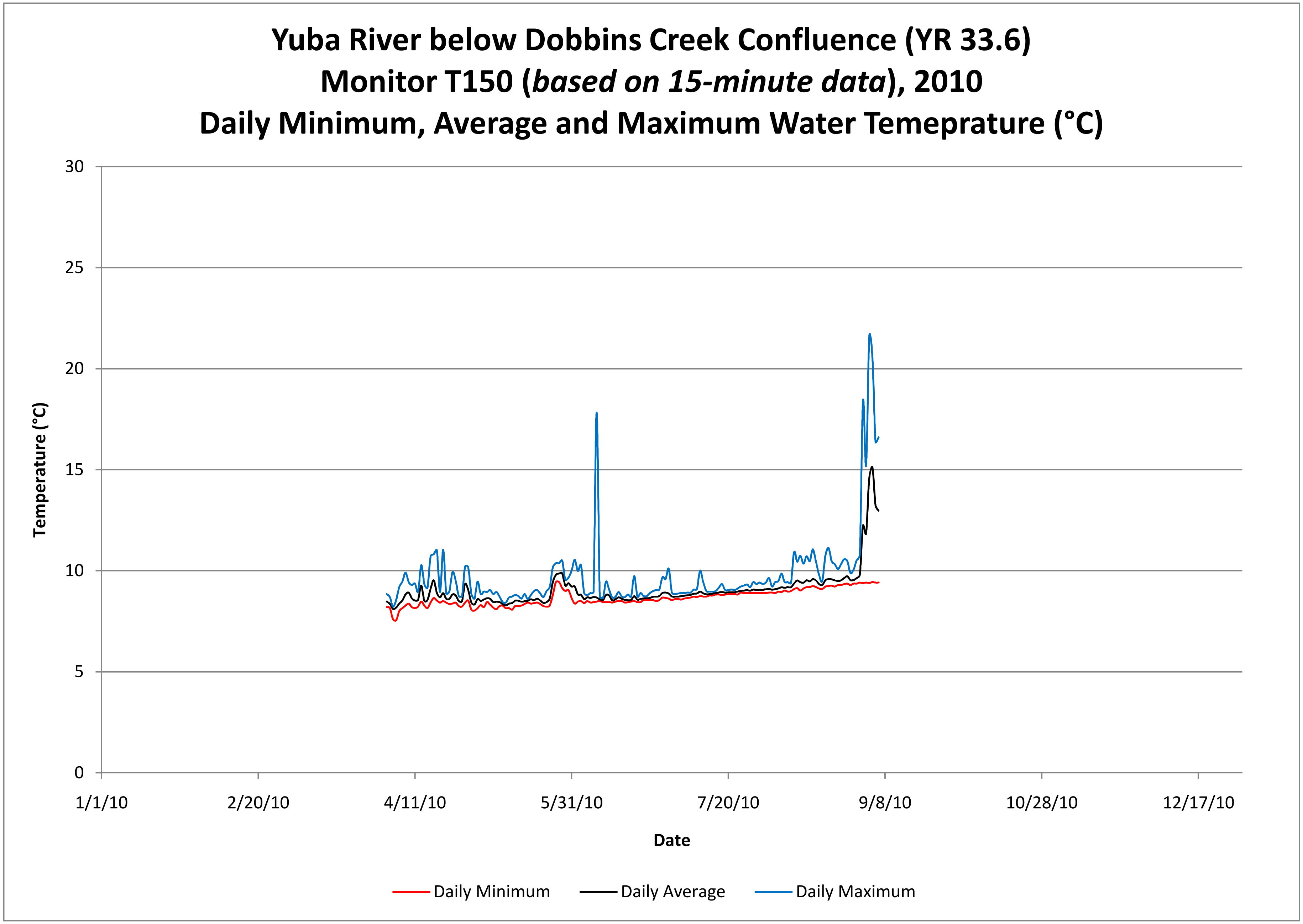

Yuba River below Dobbins Creek Confluence (YR 33.6)
Monitor T150 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River below Dobbins Creek Confluence (YR 33.6)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T150, CDEC CGT, Flow Gage 11708880 + 11413510 + 11413517
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
4500
4000
3500
3000
2500
2000
1500
1000
500
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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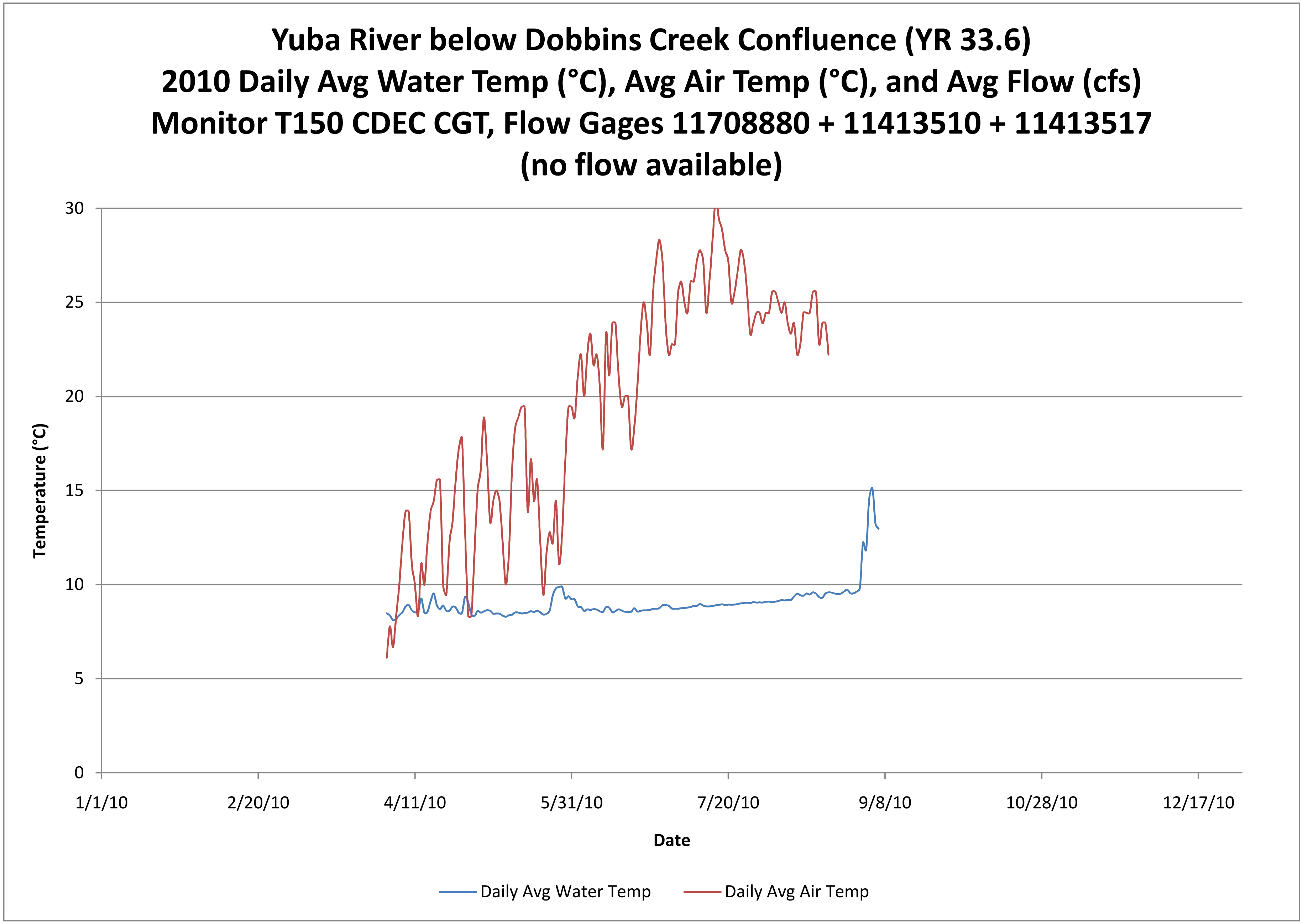
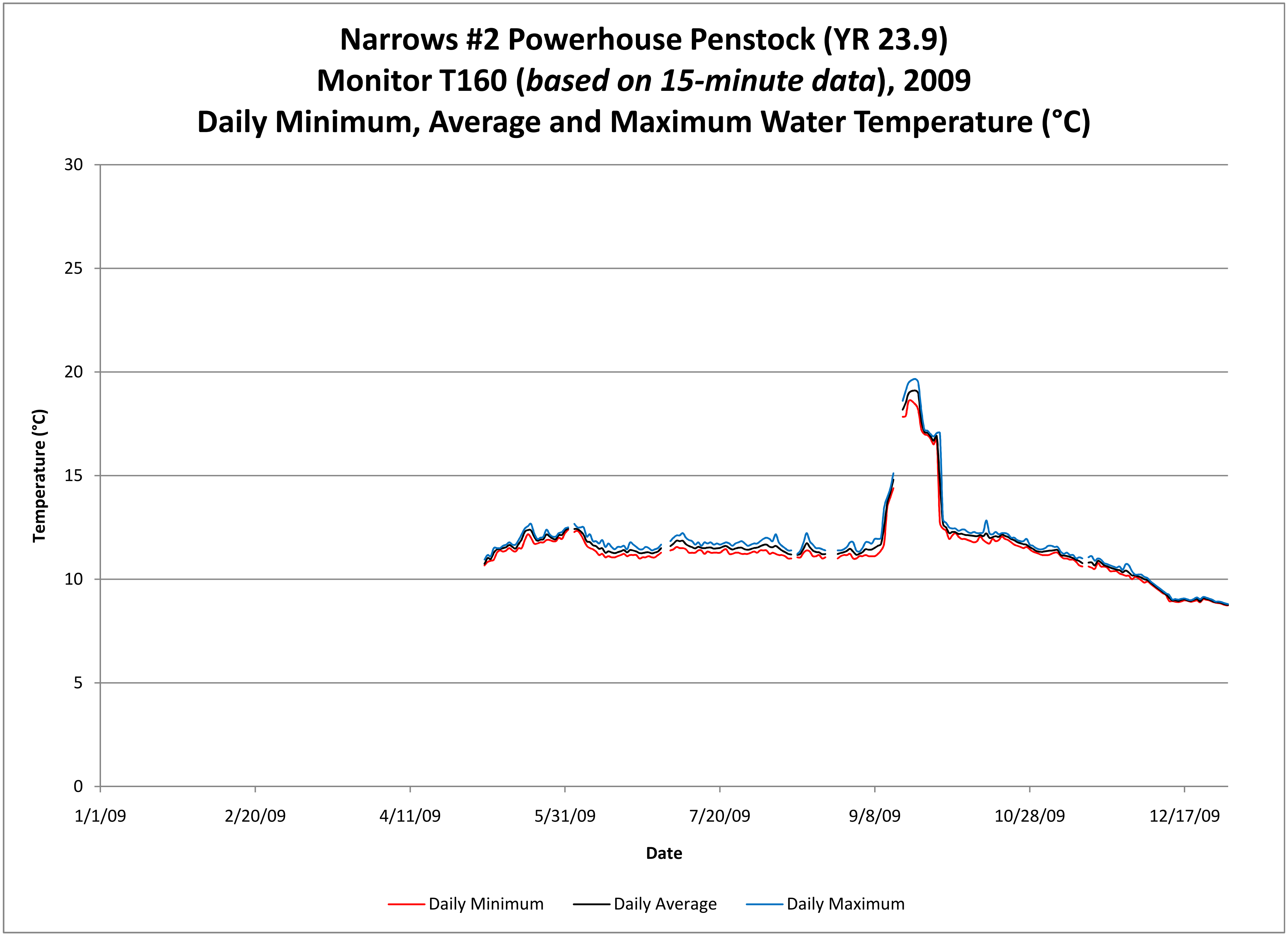
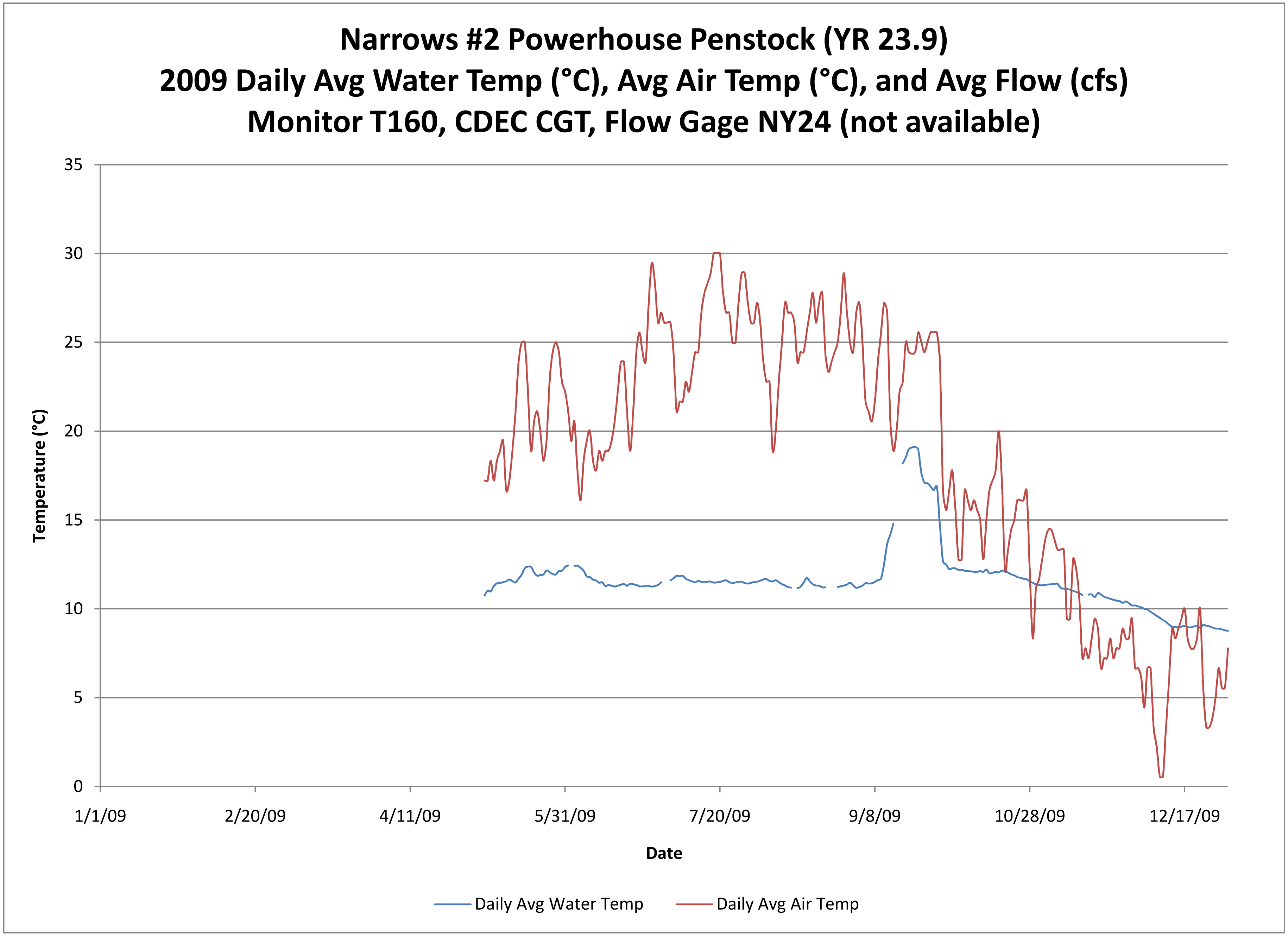
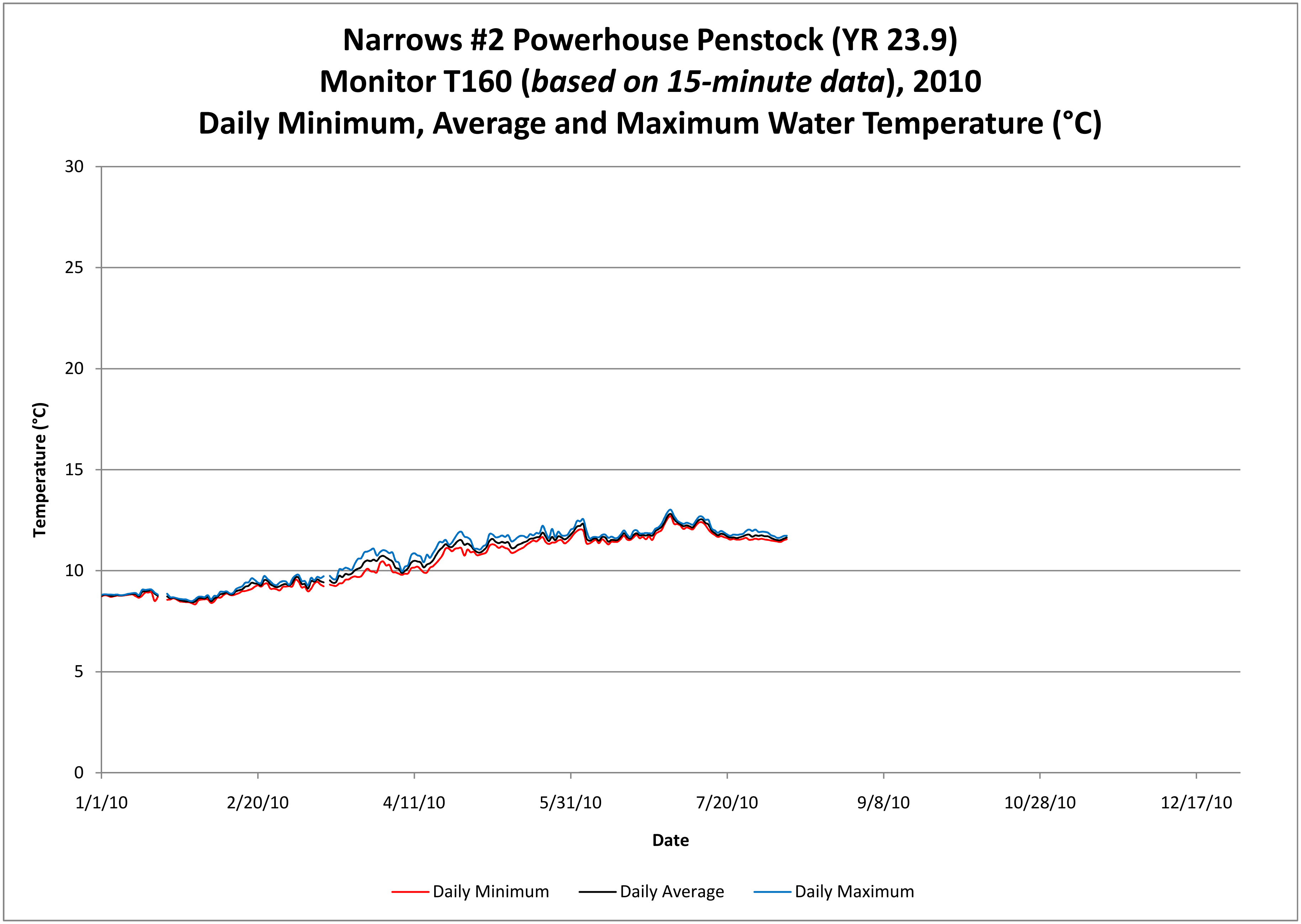
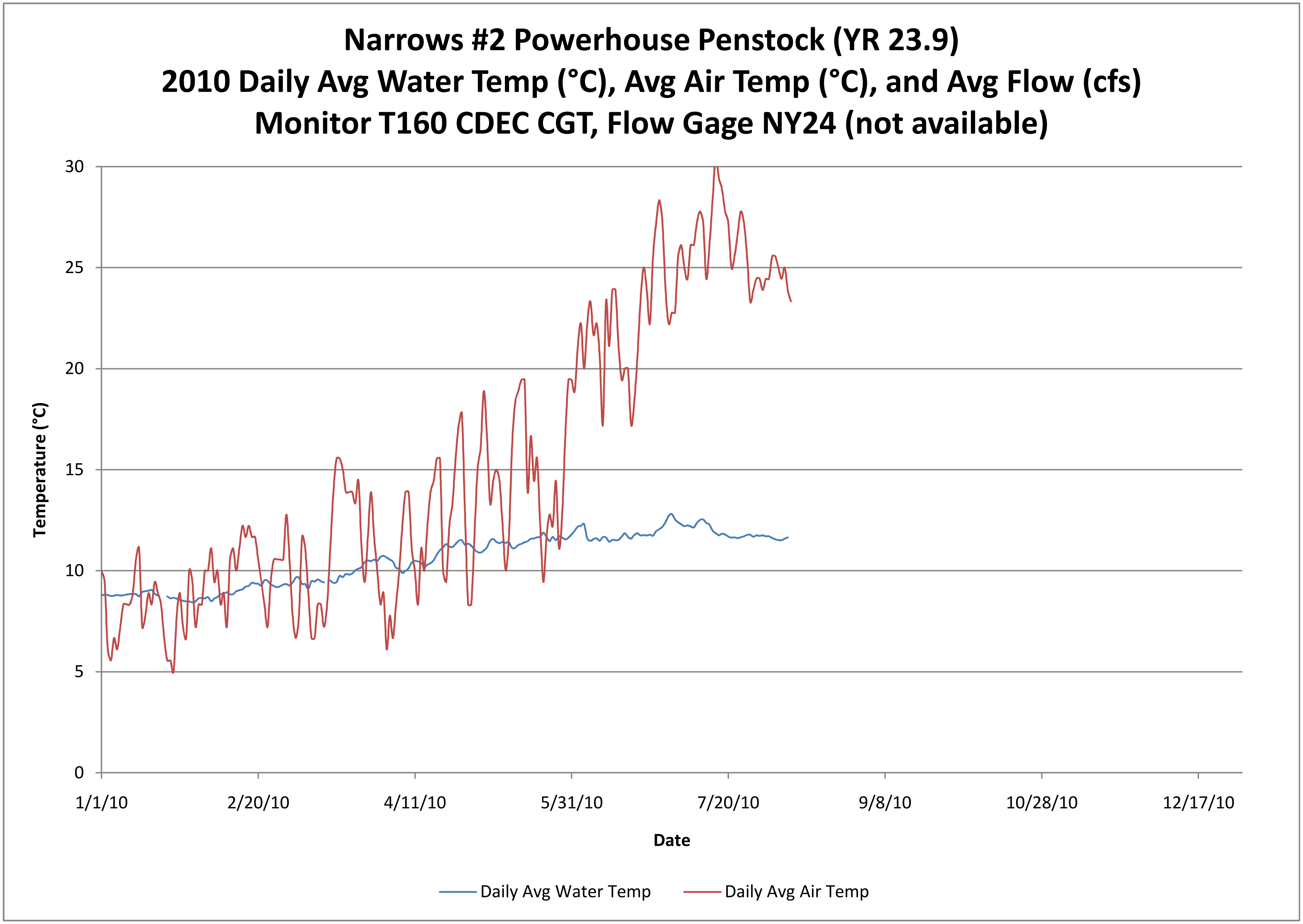
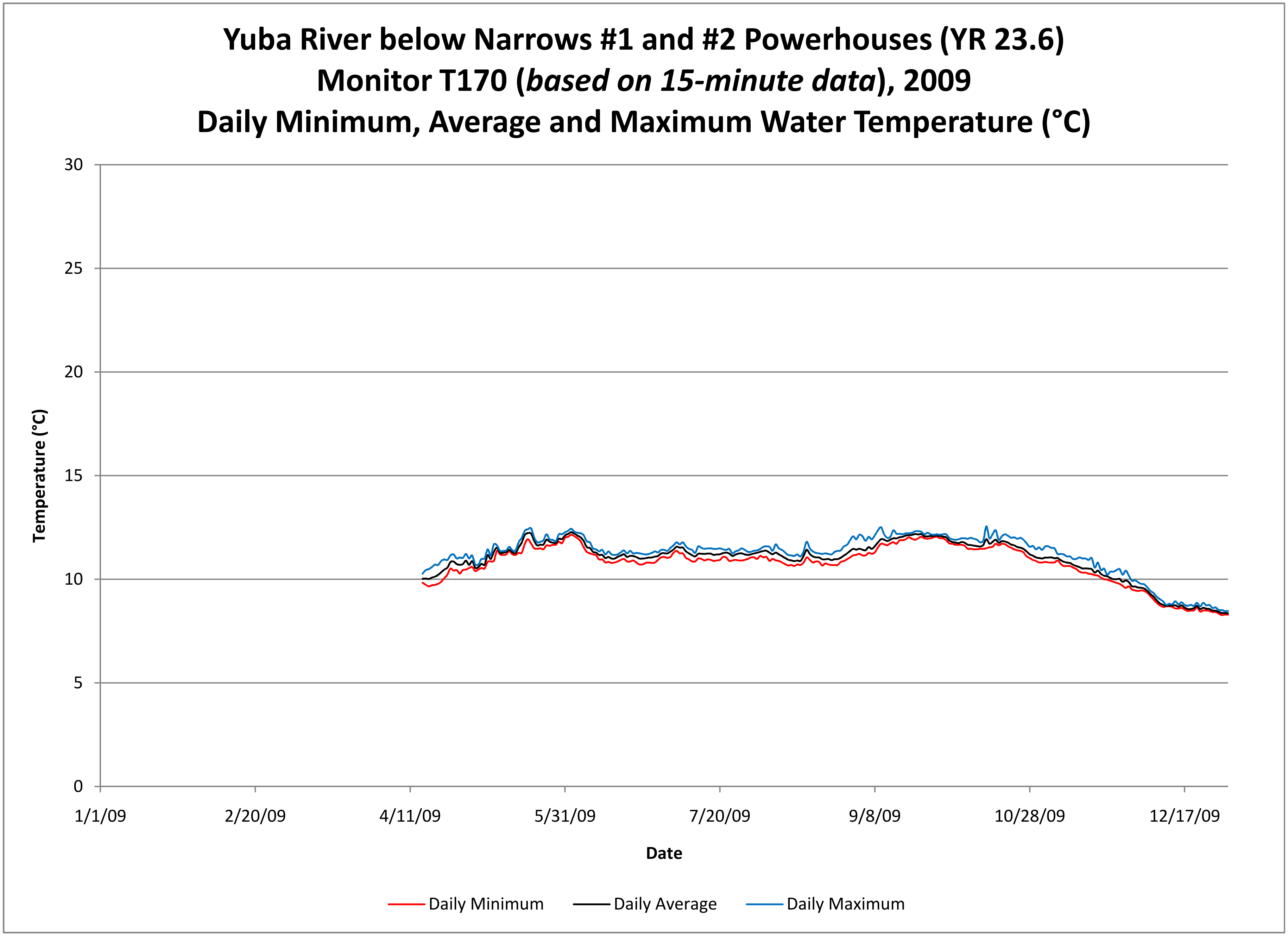

Yuba River below Dobbins Creek Confluence (YR 33.6)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T150 CDEC CGT, Flow Gages 11708880 + 11413510 + 11413517
(no flow available)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp

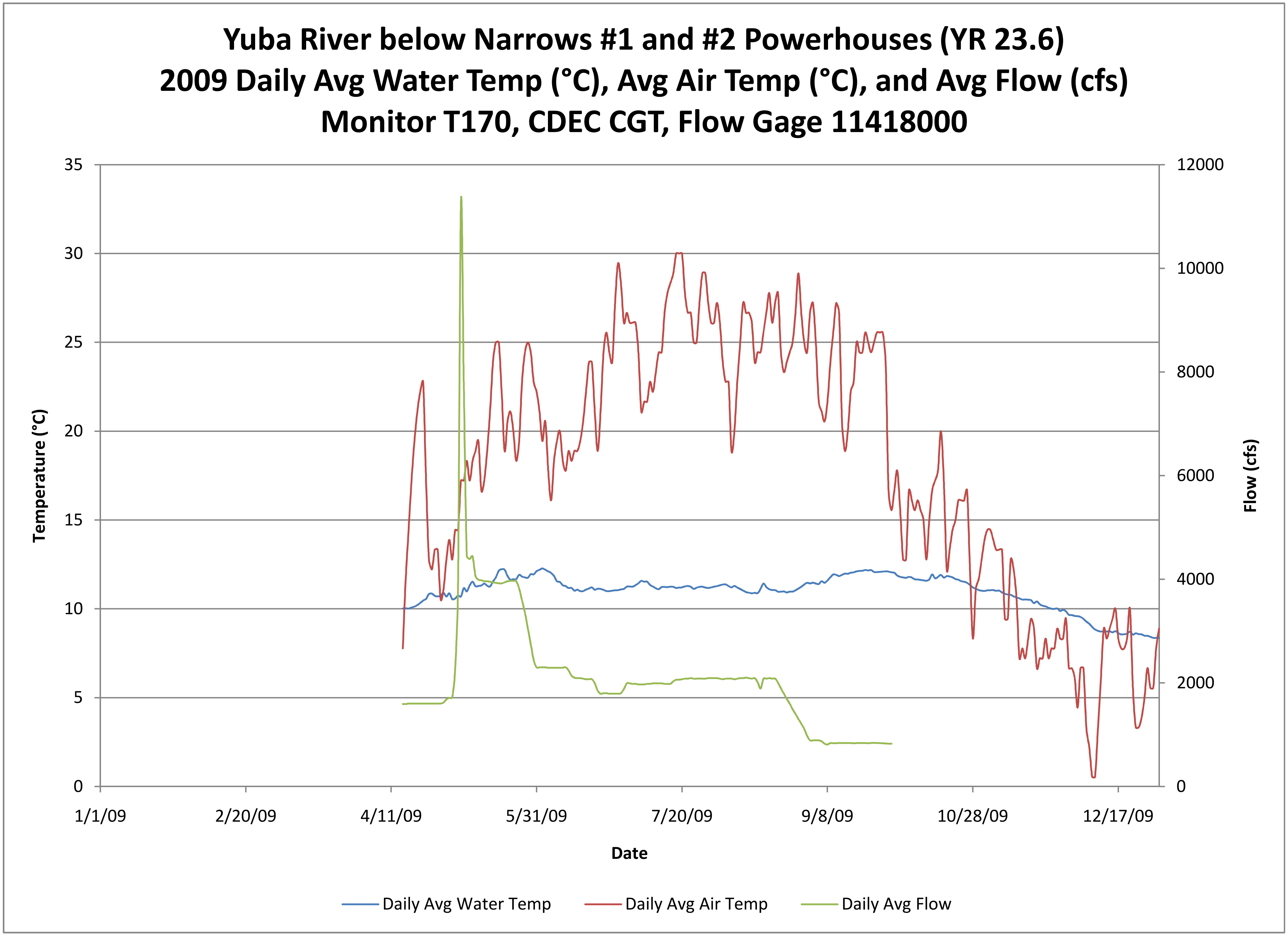

Narrows #2 Powerhouse Penstock (YR 23.9)
Monitor T160 (based on 15-minute data), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum

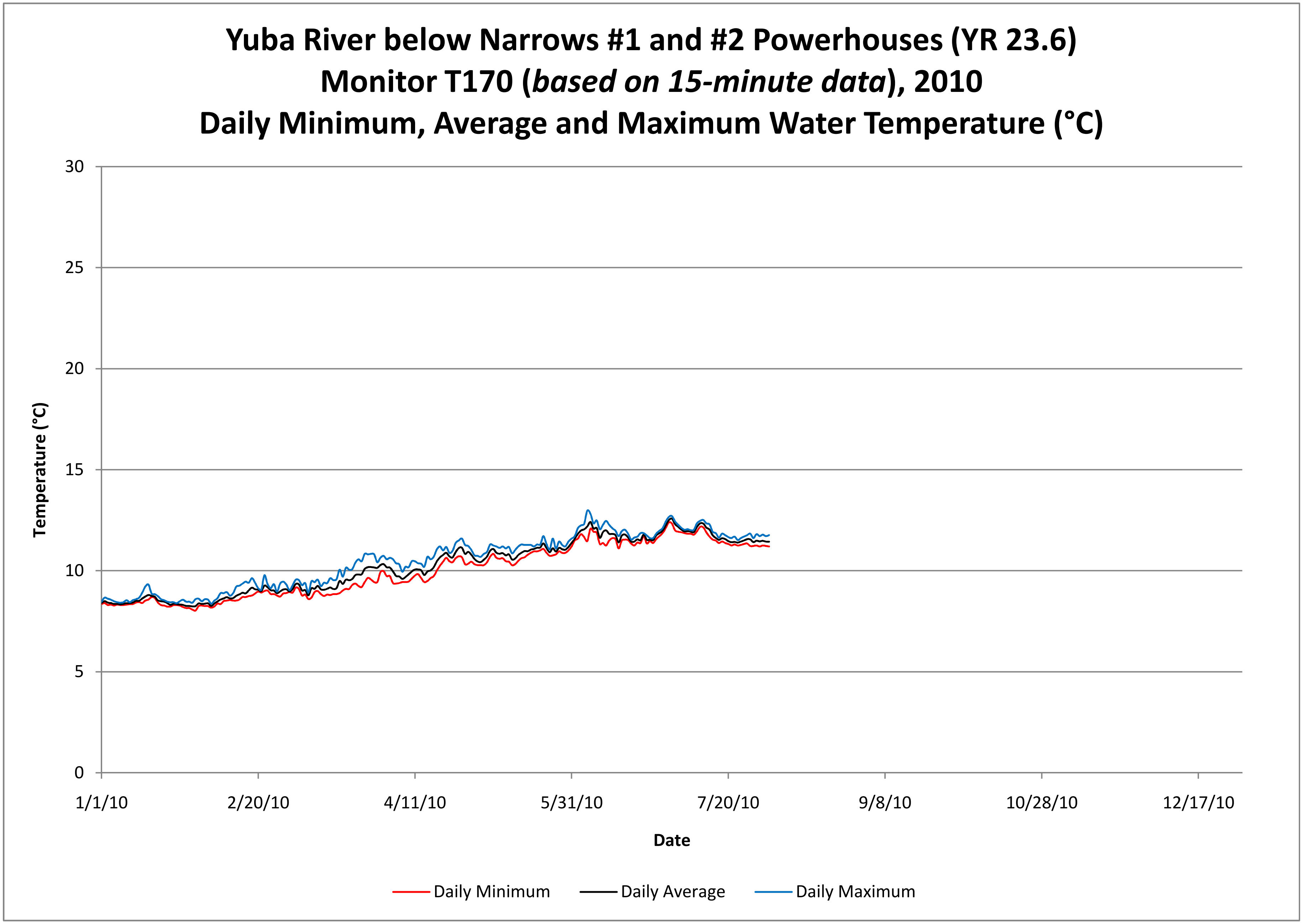

Narrows #2 Powerhouse Penstock (YR 23.9)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T160, CDEC CGT, Flow Gage NY24 (not available)
Temperature (°C)
35
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp

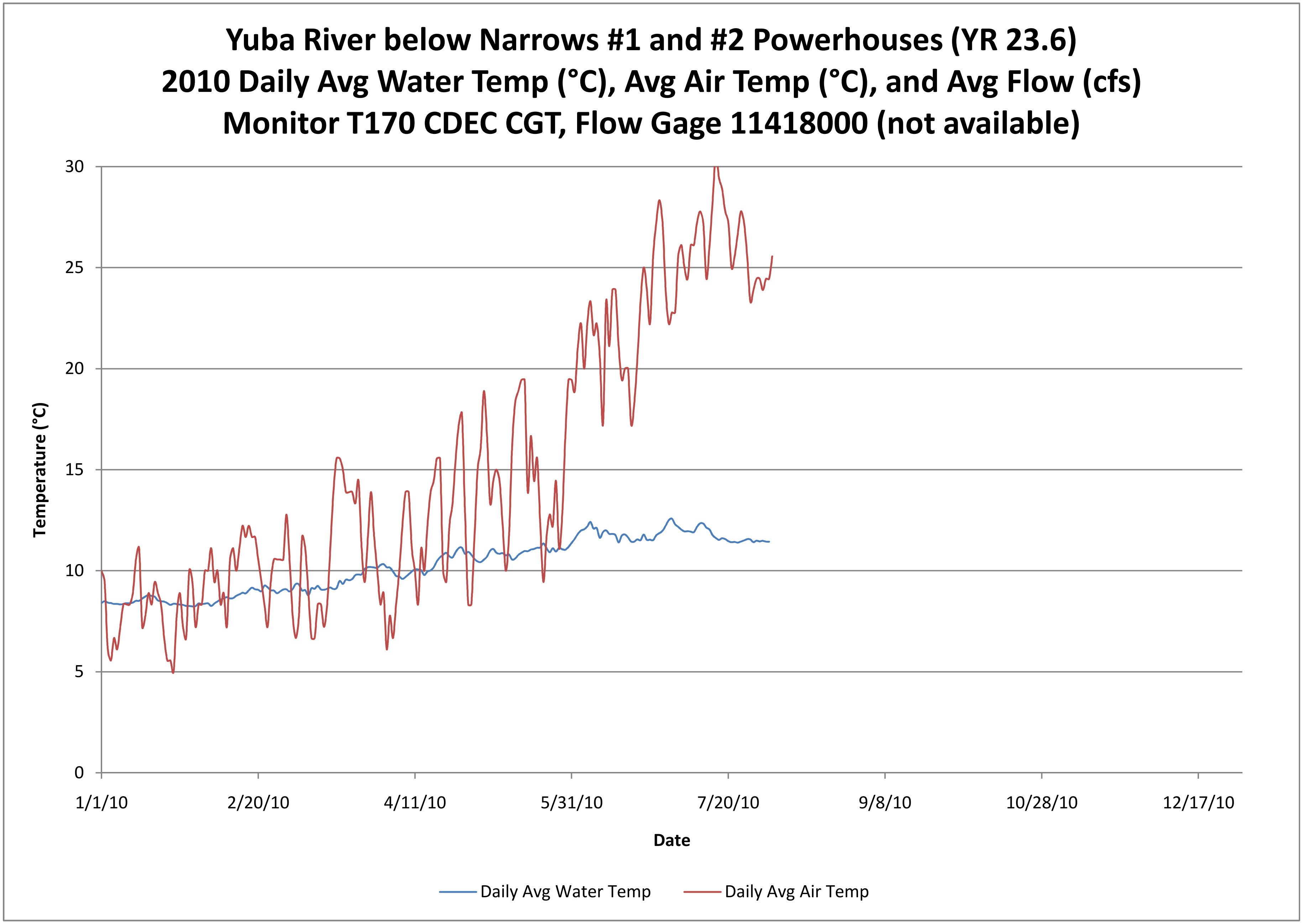

Narrows #2 Powerhouse Penstock (YR 23.9)
Monitor T160 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum

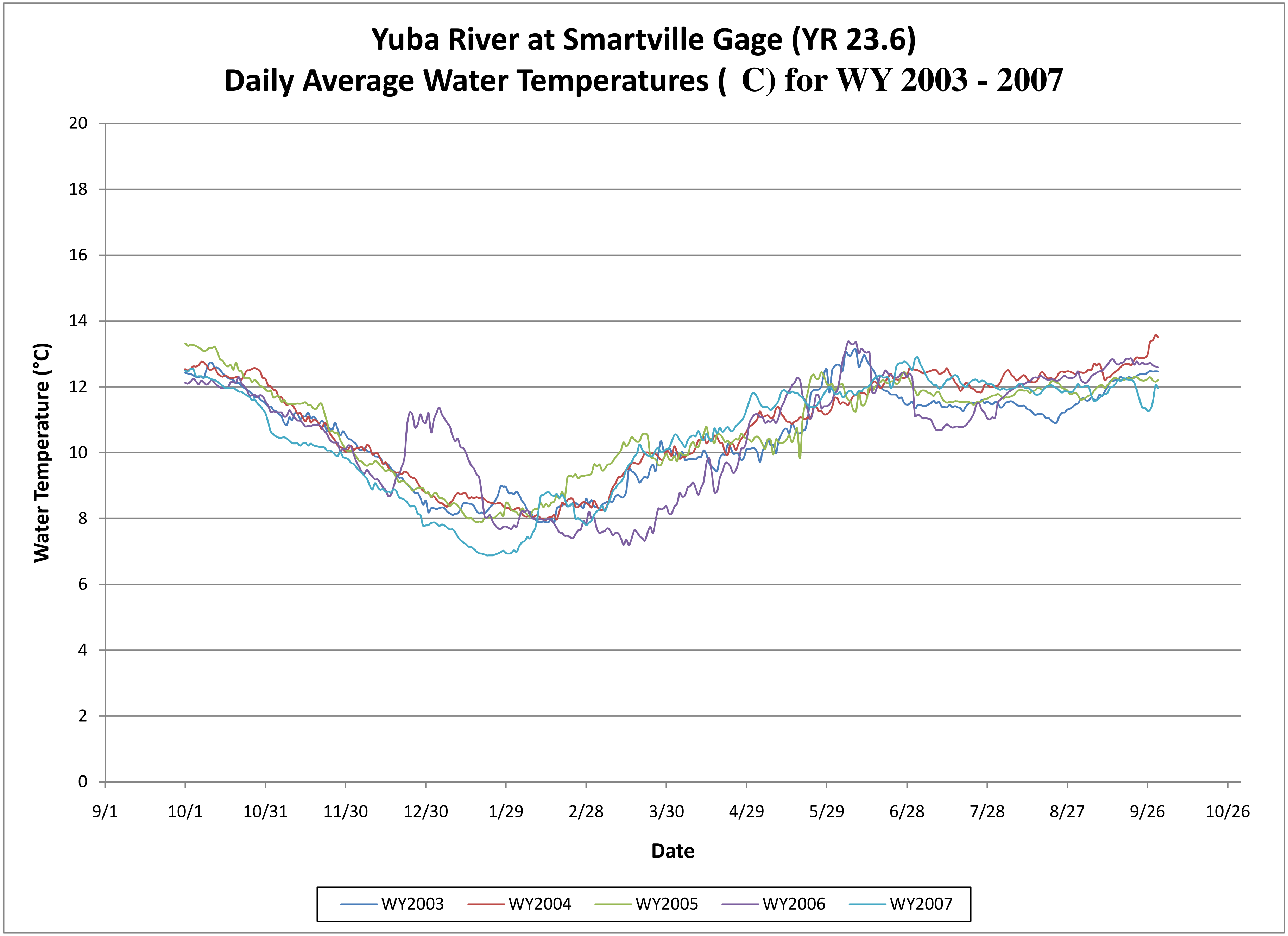

Narrows #2 Powerhouse Penstock (YR 23.9)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T160 CDEC CGT, Flow Gage NY24 (not available)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp


Yuba River below Narrows #1 and #2 Powerhouses (YR 23.6)
Monitor T170 (based on 15-minute data), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River below Narrows #1 and #2 Powerhouses (YR 23.6)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T170, CDEC CGT, Flow Gage 11418000
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
12000
10000
8000
6000
4000
2000
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Yuba River below Narrows #1 and #2 Powerhouses (YR 23.6)
Monitor T170 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River below Narrows #1 and #2 Powerhouses (YR 23.6)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T170 CDEC CGT, Flow Gage 11418000 (not available)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp



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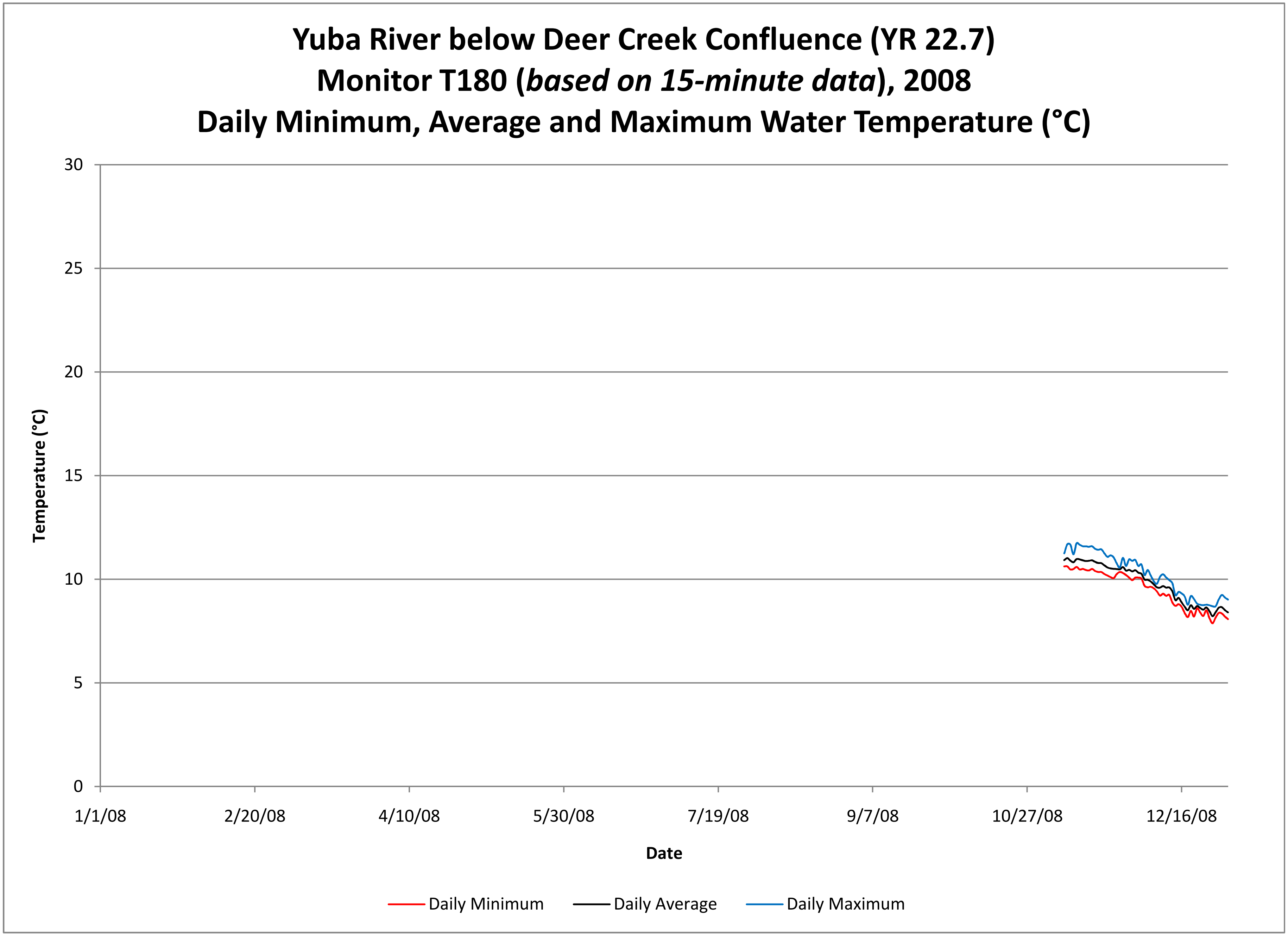
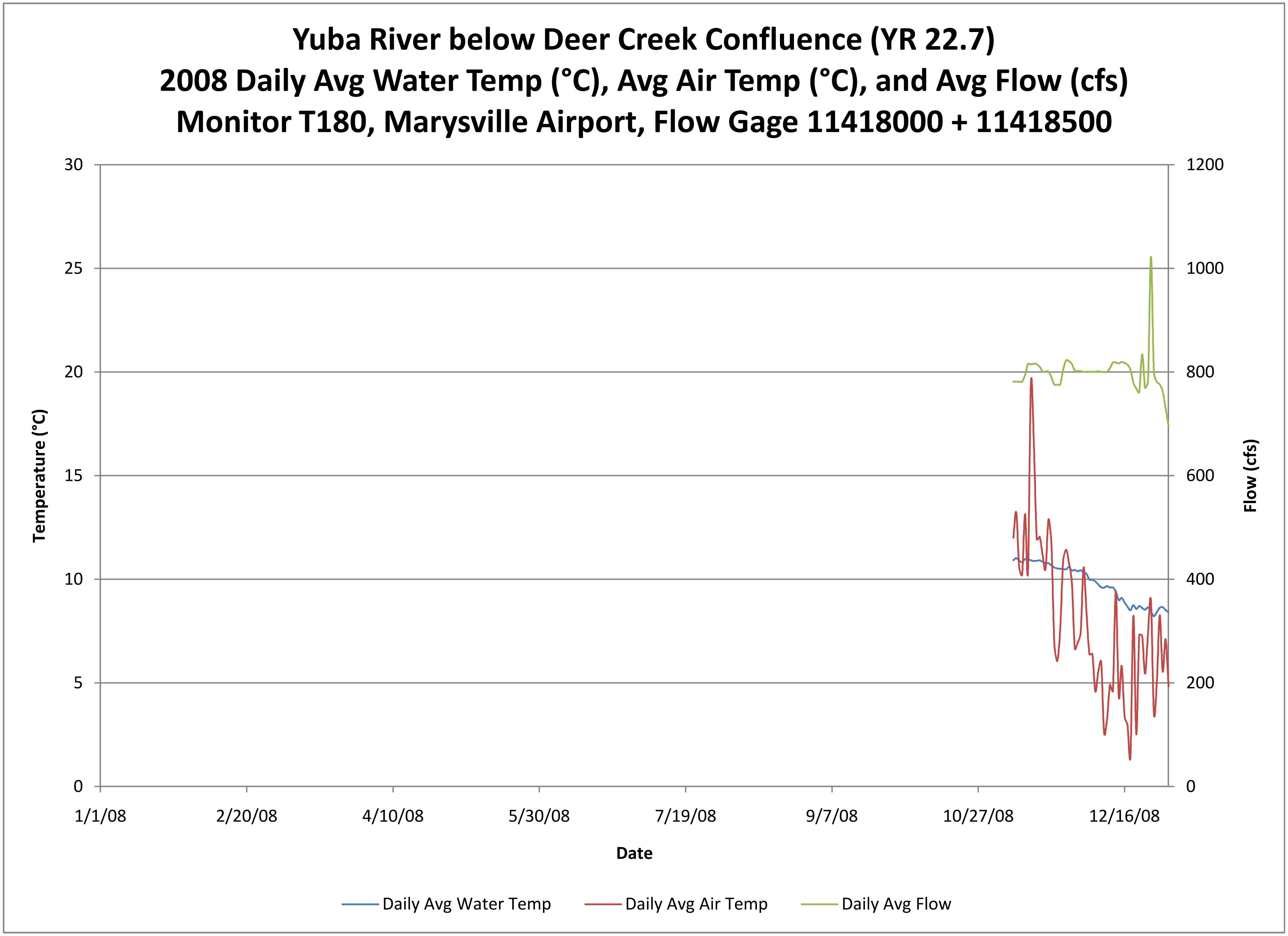
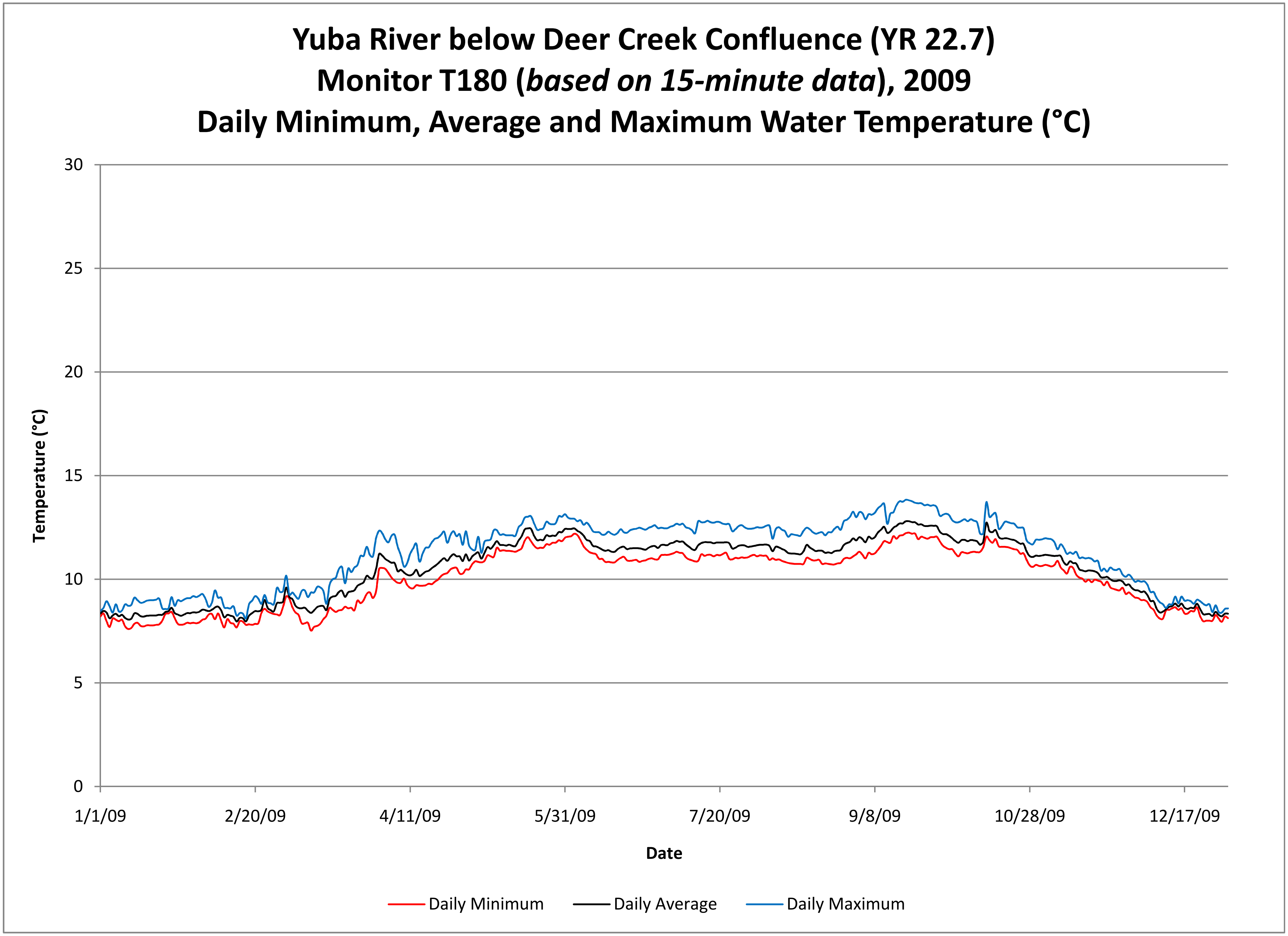
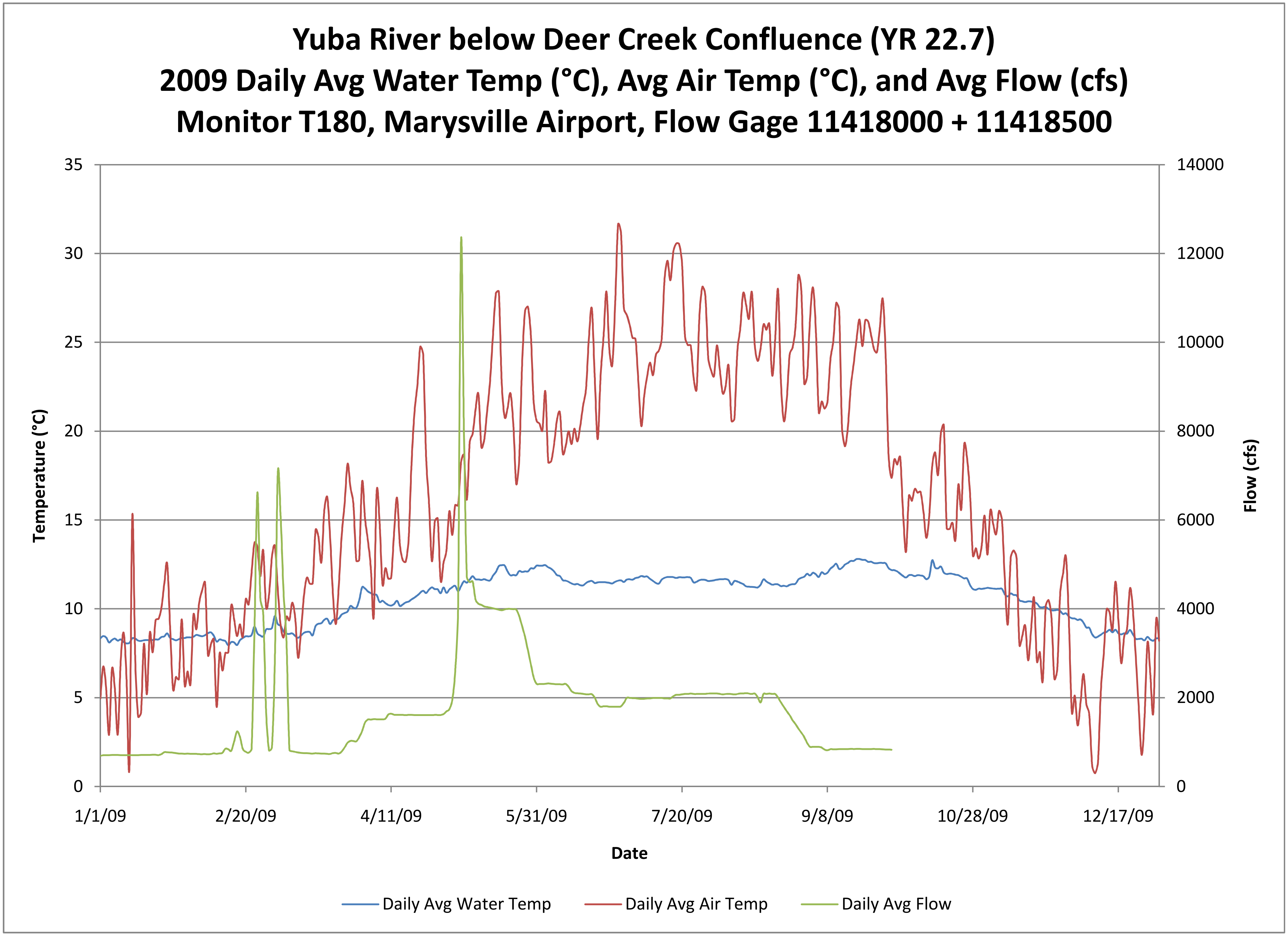
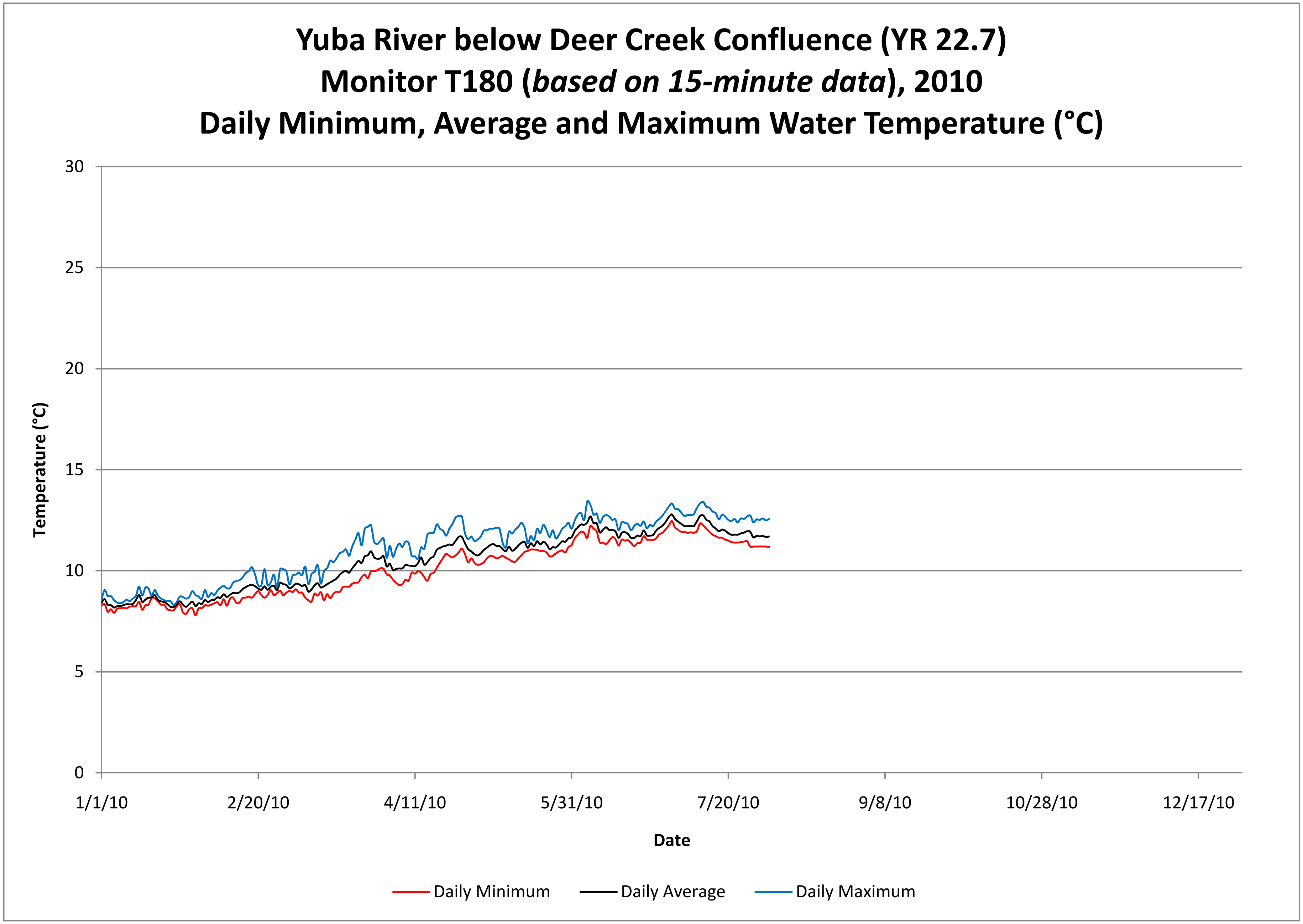
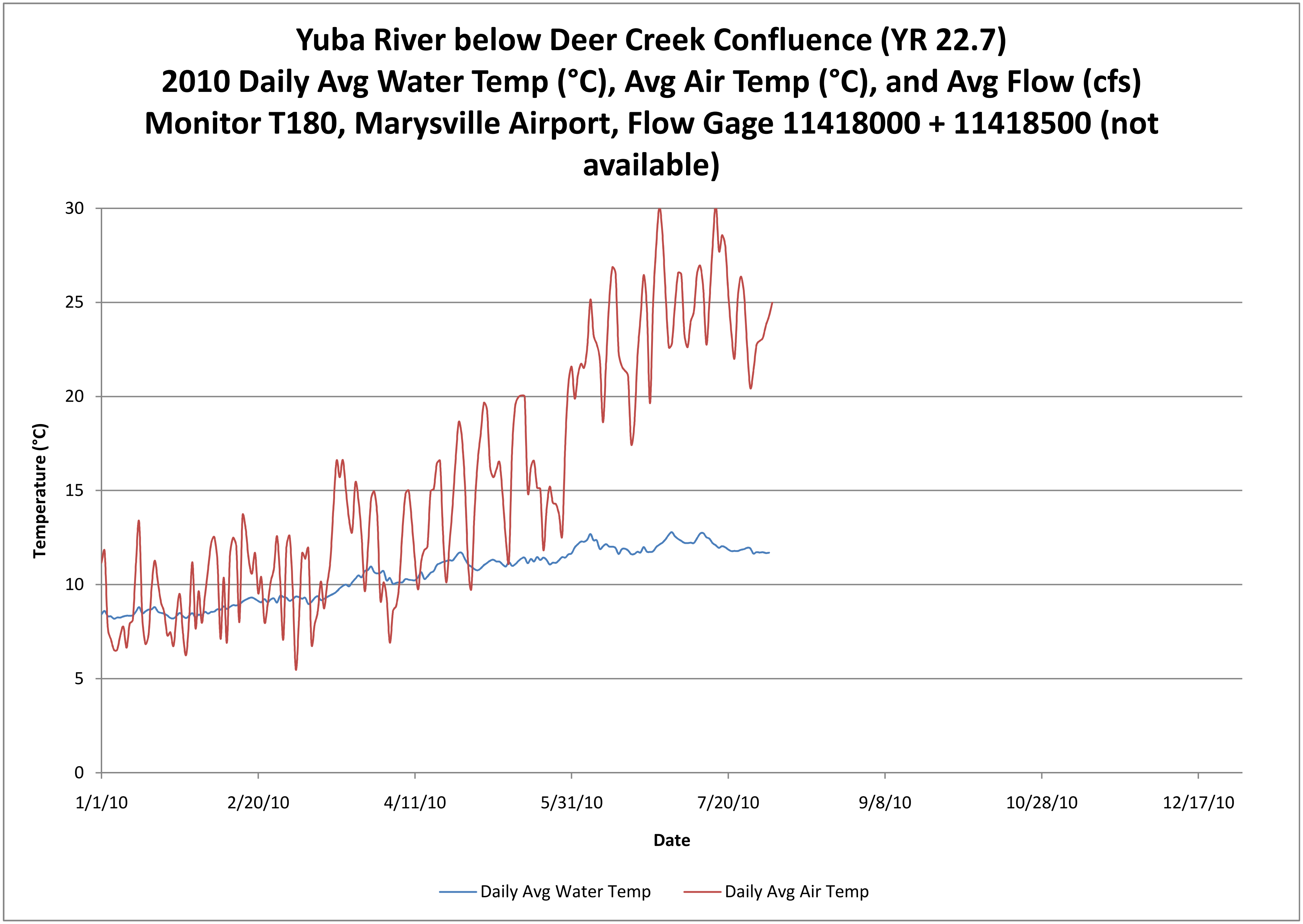

Yuba River below Deer Creek Confluence (YR 22.7)
Monitor T180 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum

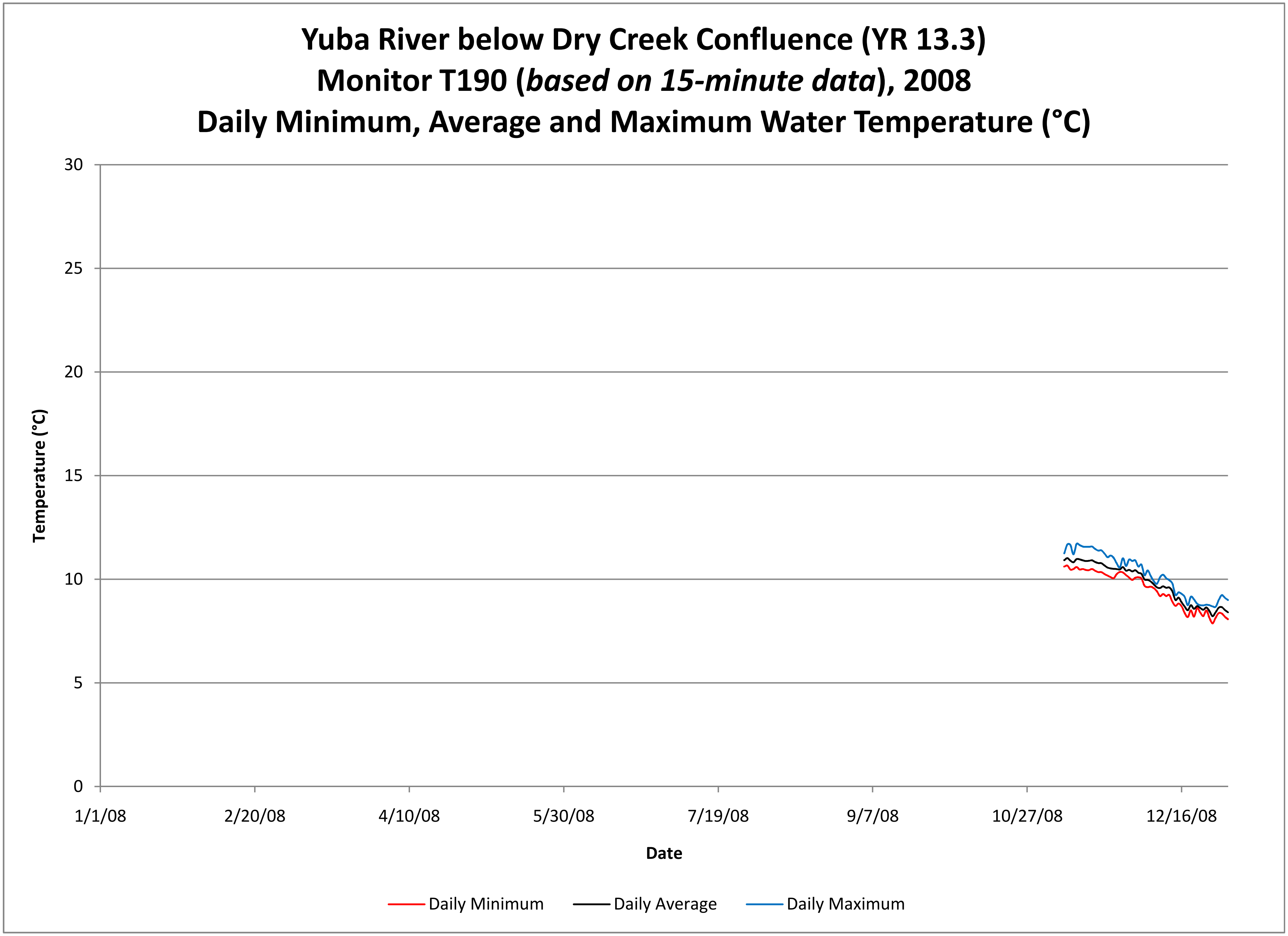

Yuba River below Deer Creek Confluence (YR 22.7)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T180, Marysville Airport, Flow Gage 11418000 + 11418500
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
1200
1000
800
600
400
200
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

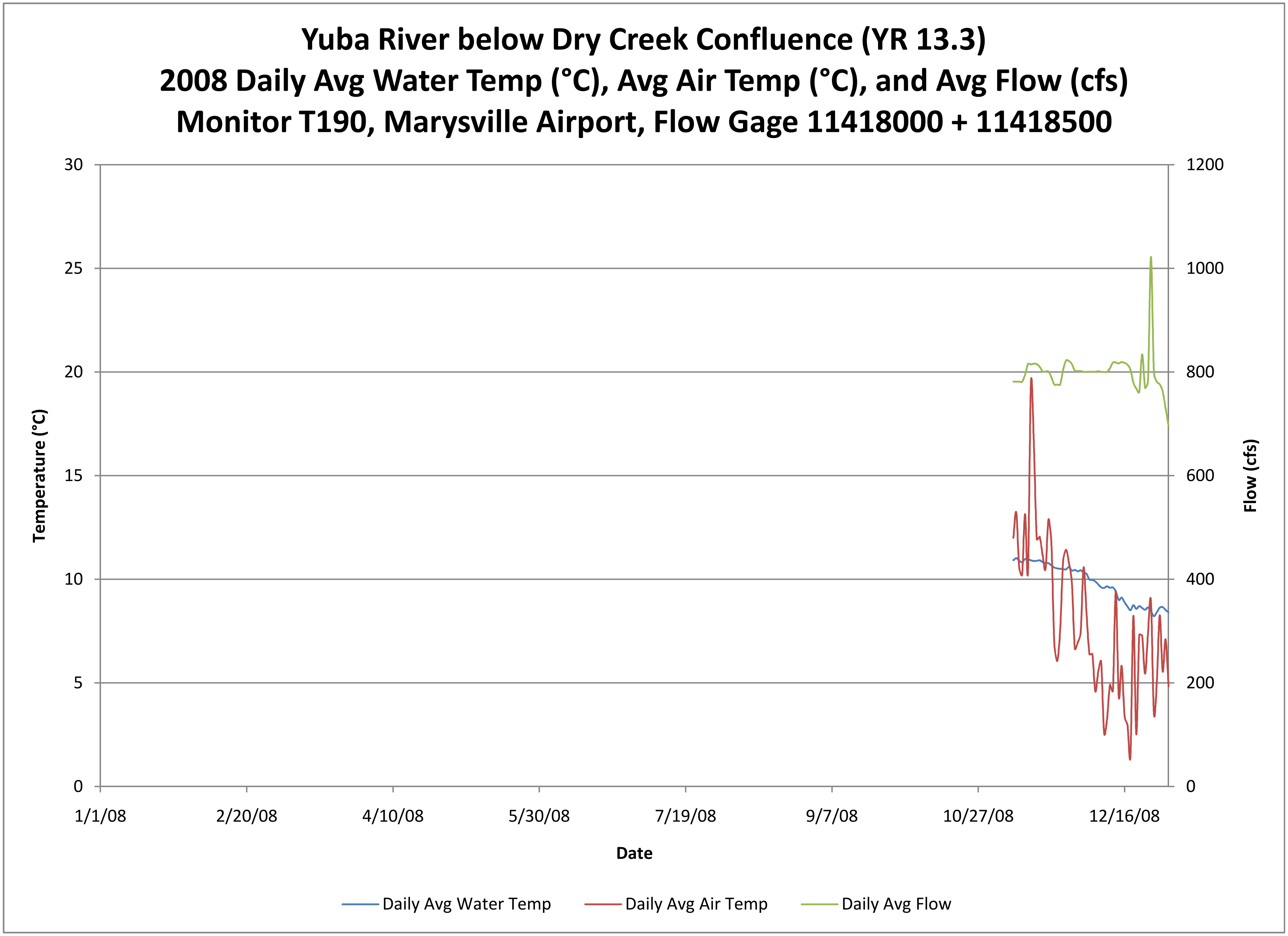

Yuba River below Deer Creek Confluence (YR 22.7)
Monitor T180 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River below Deer Creek Confluence (YR 22.7)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T180, Marysville Airport, Flow Gage 11418000 + 11418500
Temperature (°C)
0
5
10
15
20
25
30
35
Flow (cfs)
0
2000
4000
6000
8000
10000
12000
14000
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Yuba River below Deer Creek Confluence (YR 22.7)
Monitor T180 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River below Deer Creek Confluence (YR 22.7)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T180, Marysville Airport, Flow Gage 11418000 + 11418500 (not available)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp


Yuba River below Dry Creek Confluence (YR 13.3)
Monitor T190 (based on 15-minute data), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum



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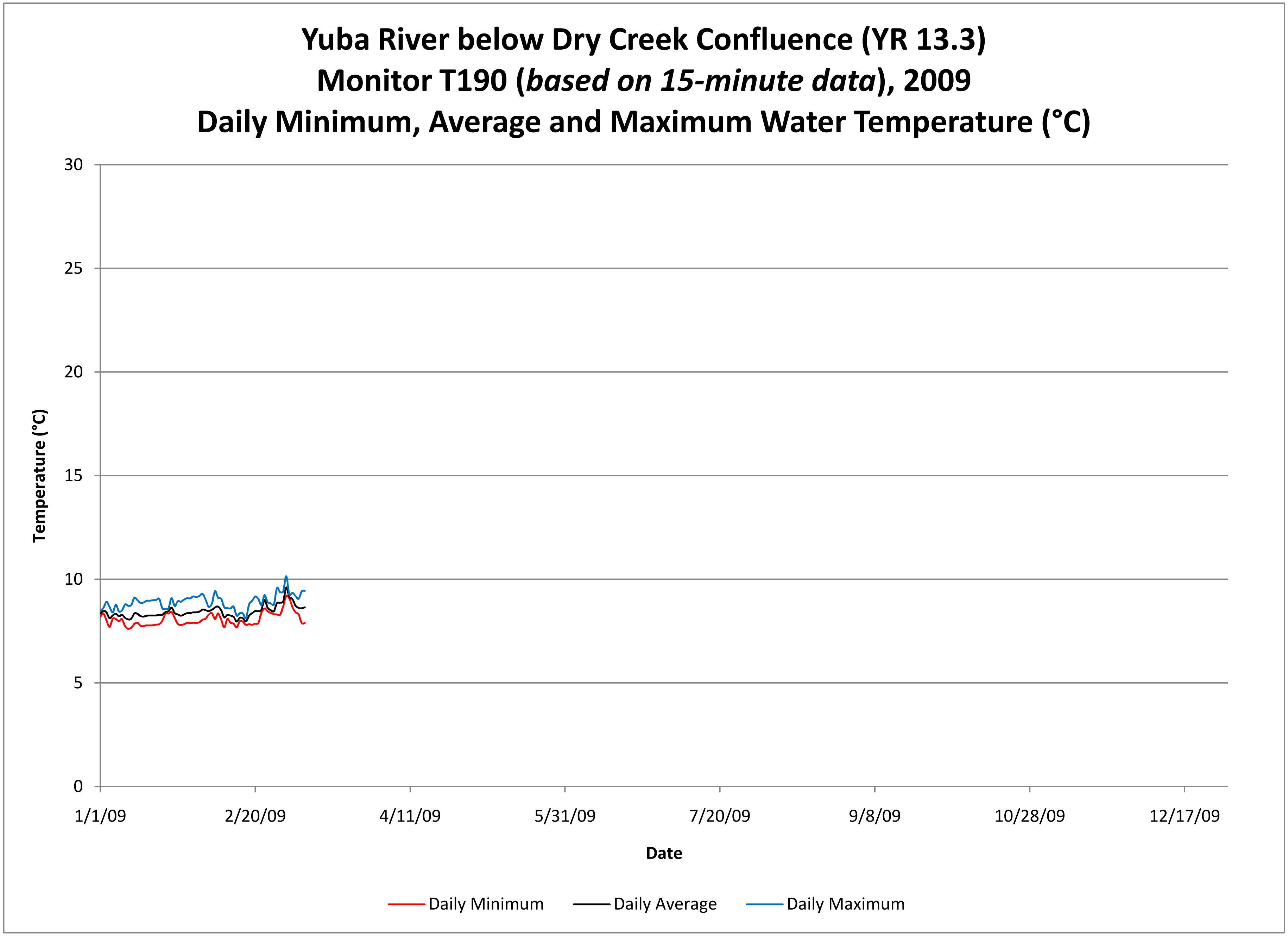
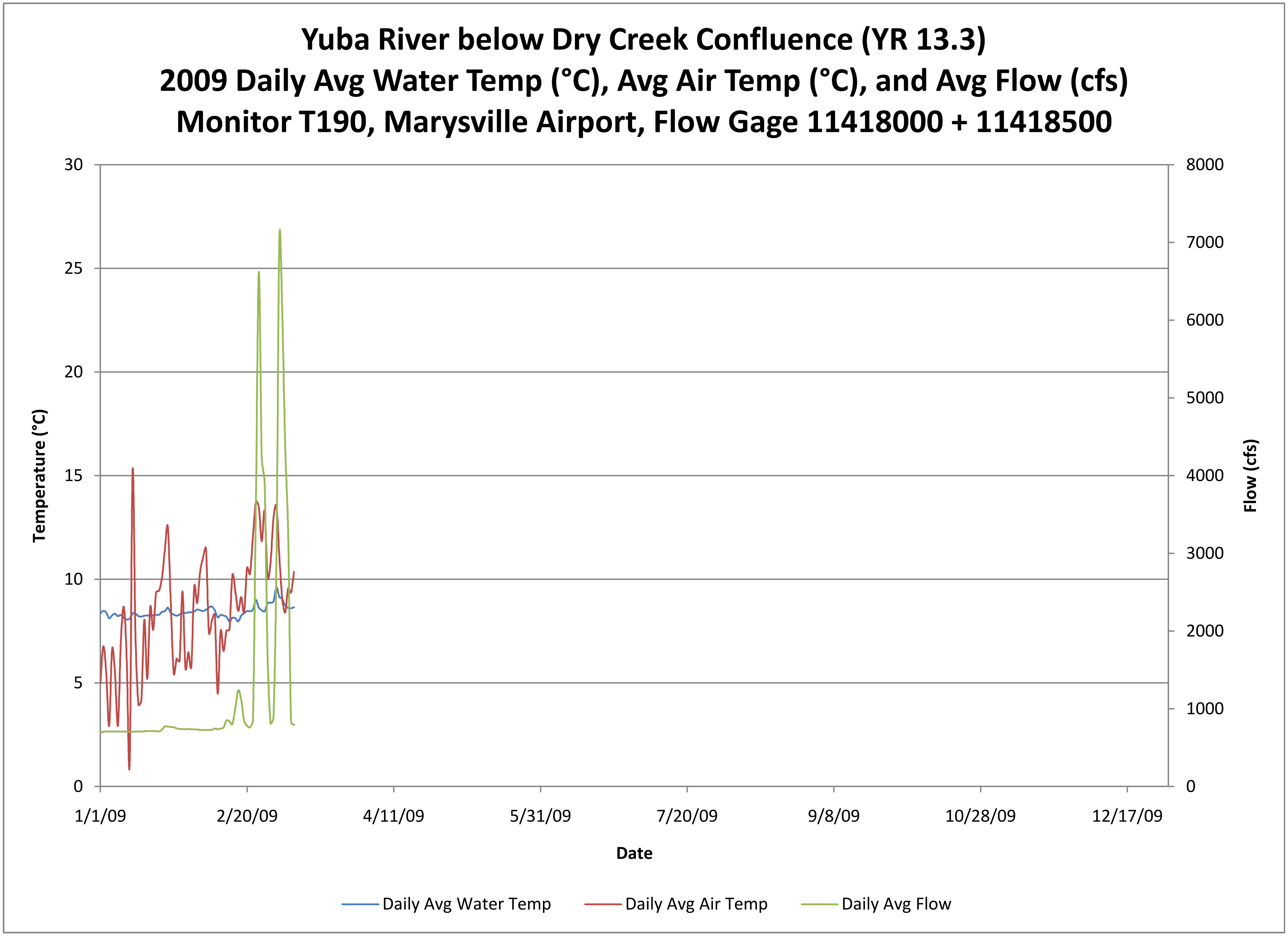
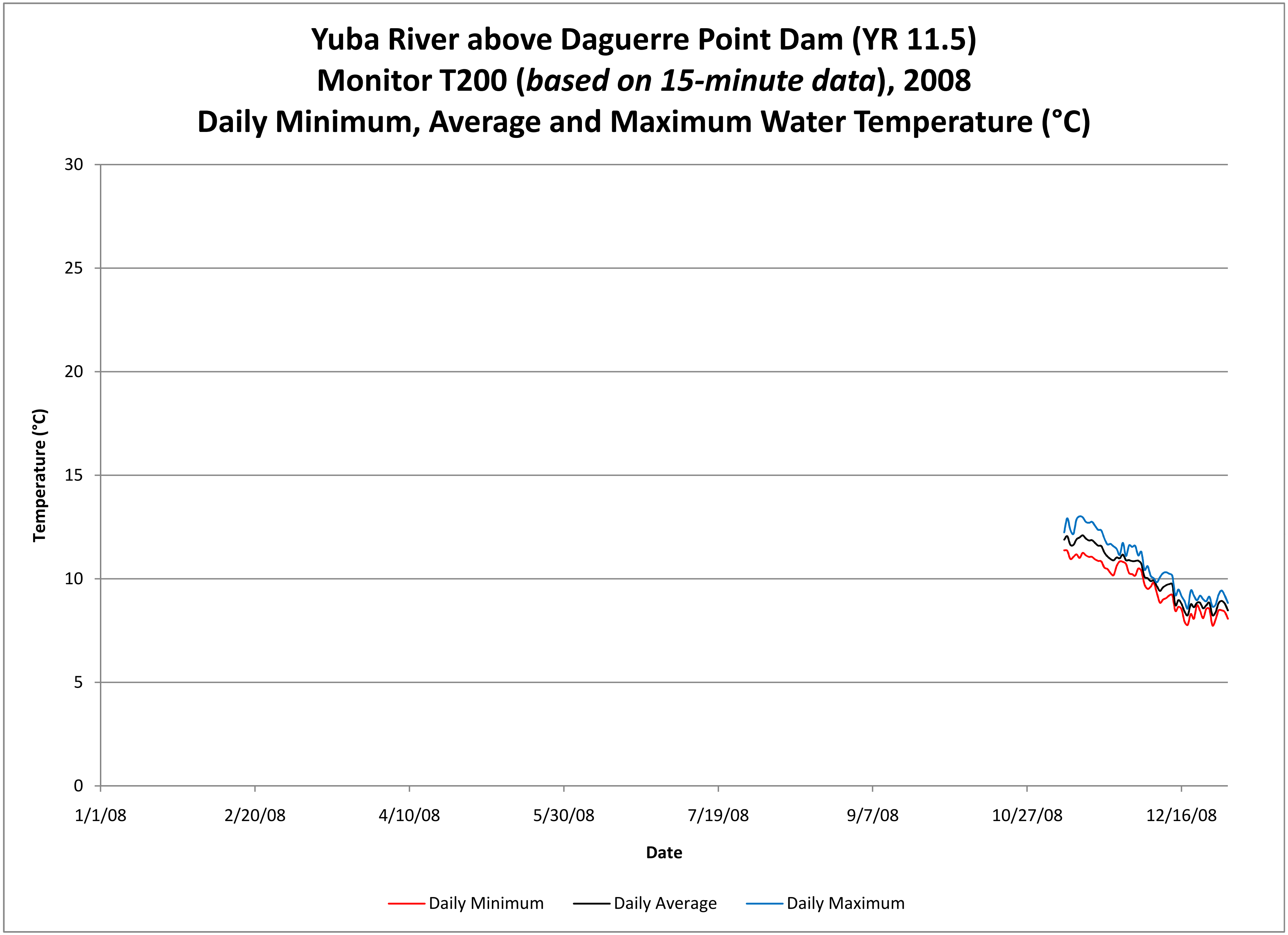

Yuba River below Dry Creek Confluence (YR 13.3)
Monitor T190 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River below Dry Creek Confluence (YR 13.3)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T190, Marysville Airport, Flow Gage 11418000 + 11418500
Temperature (°C)
0
5
10
15
20
25
30
Flow (cfs)
0
1000
2000
3000
4000
5000
6000
7000
8000
Date
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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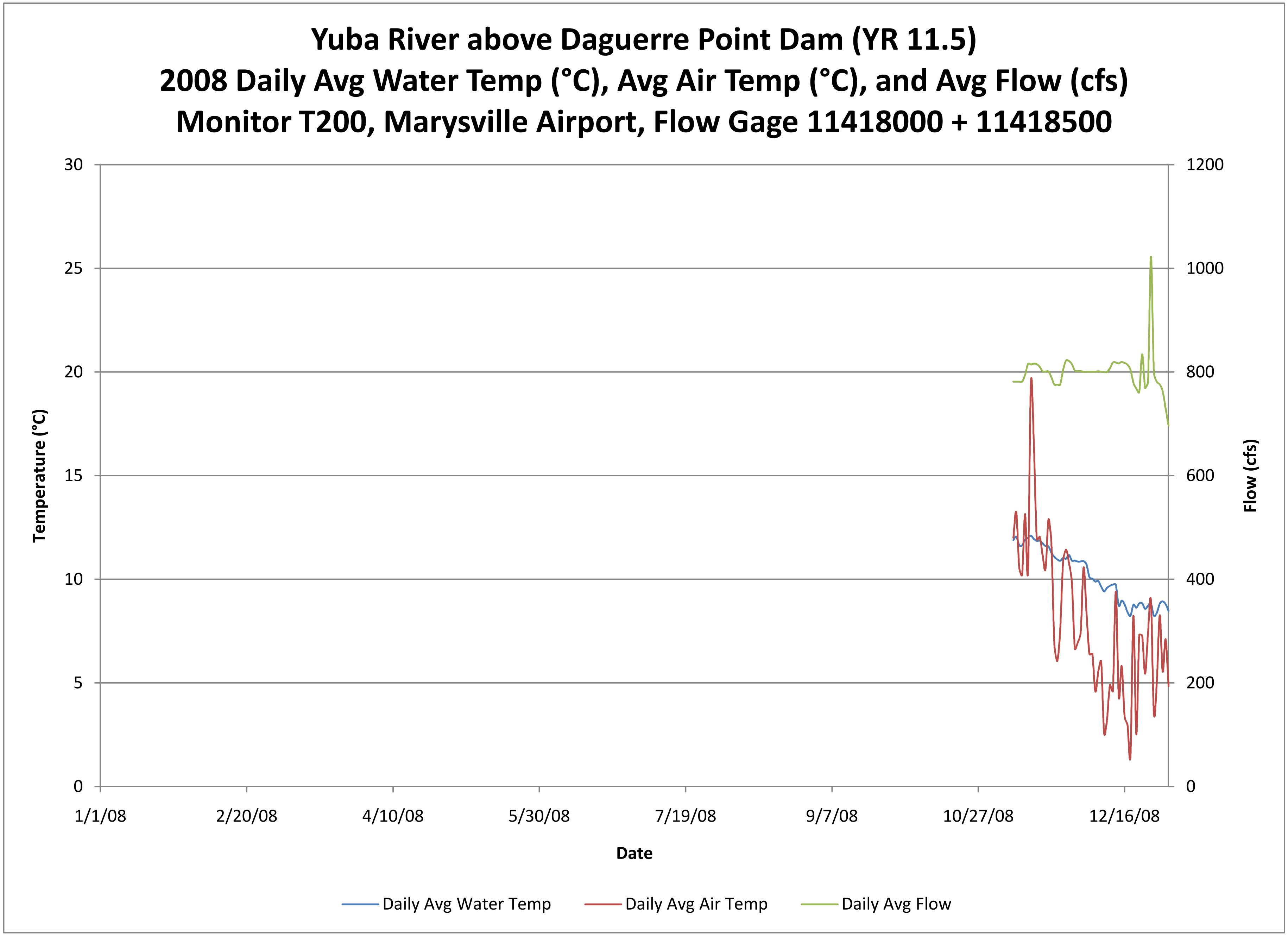
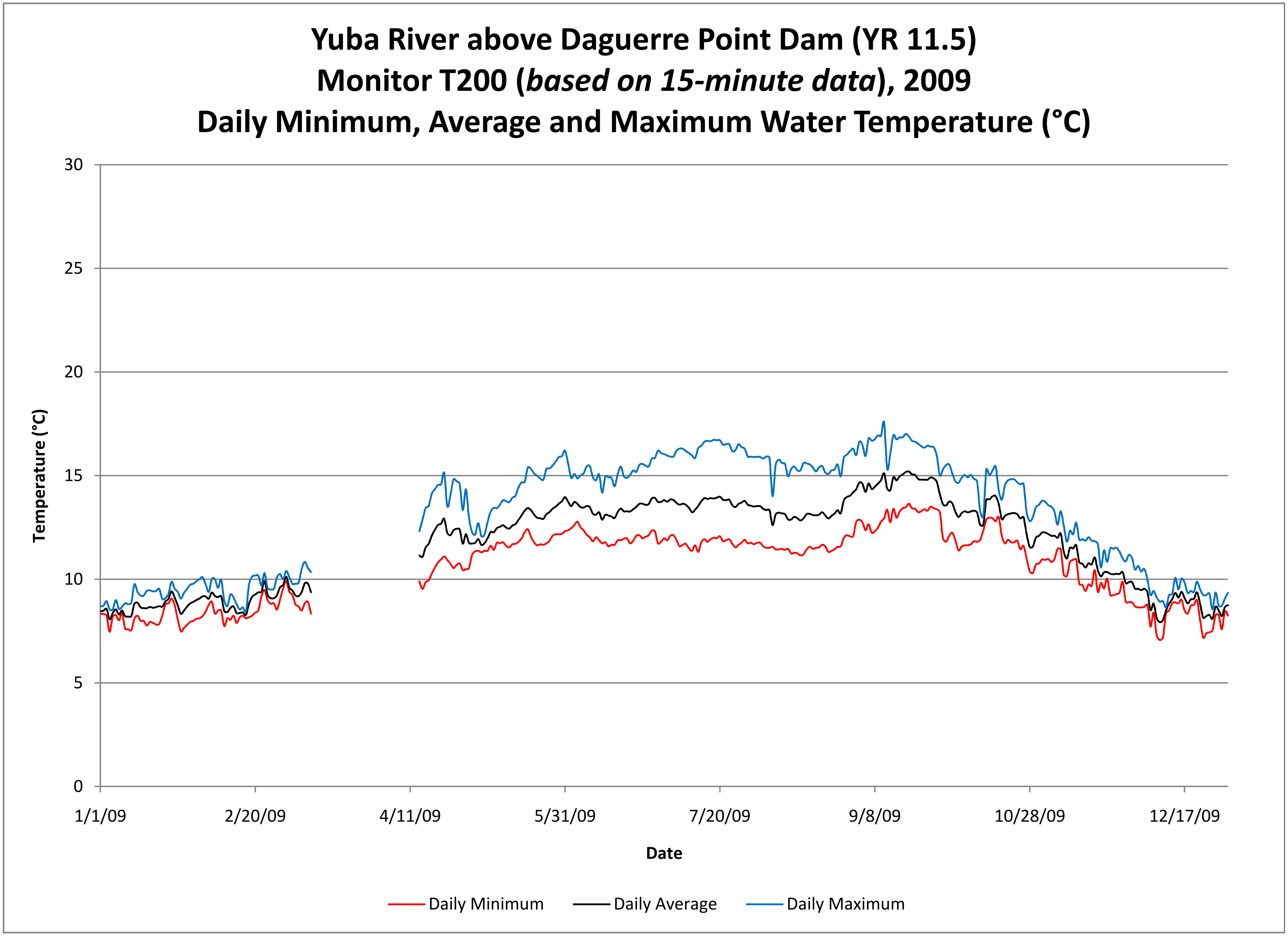
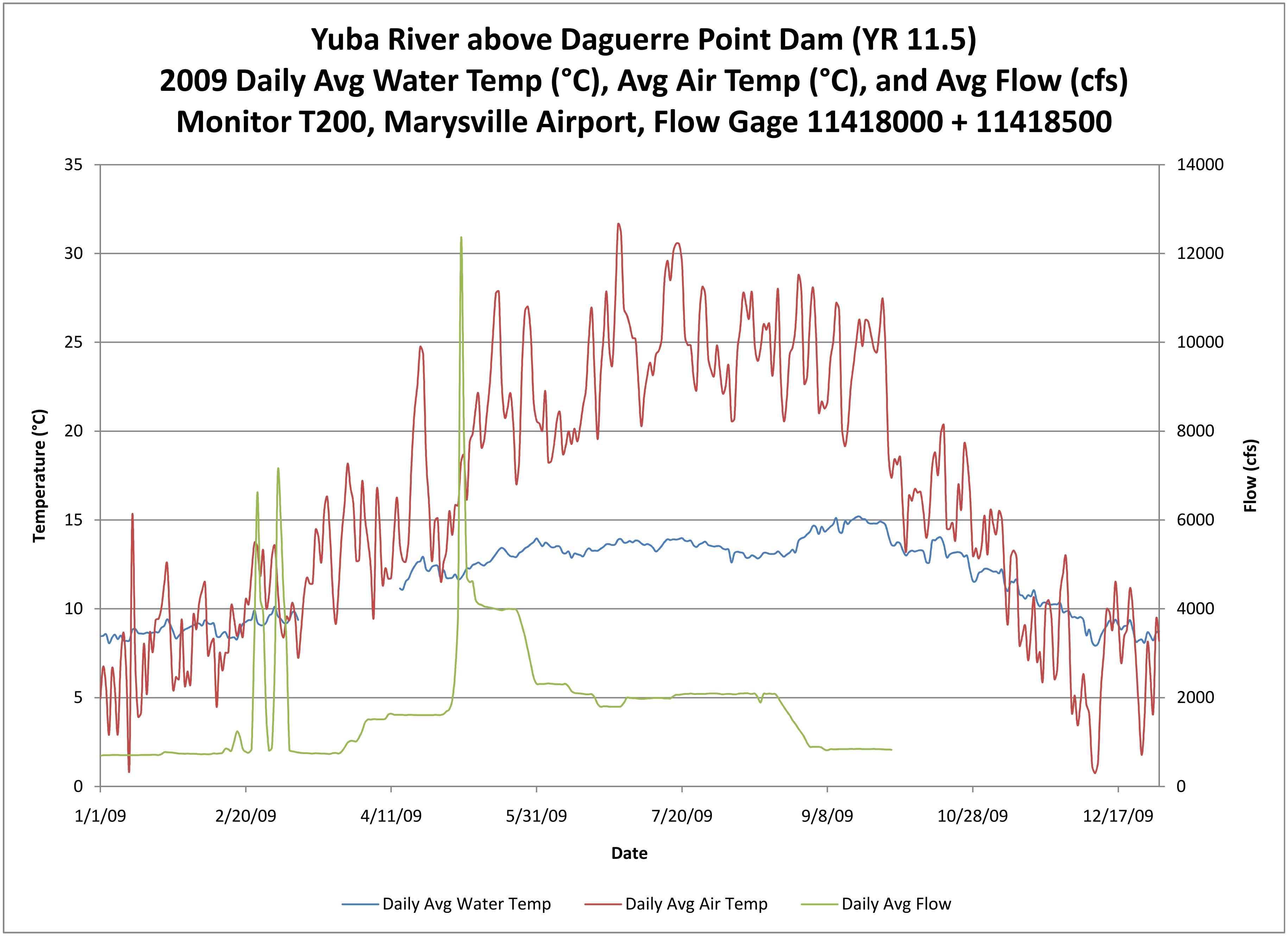
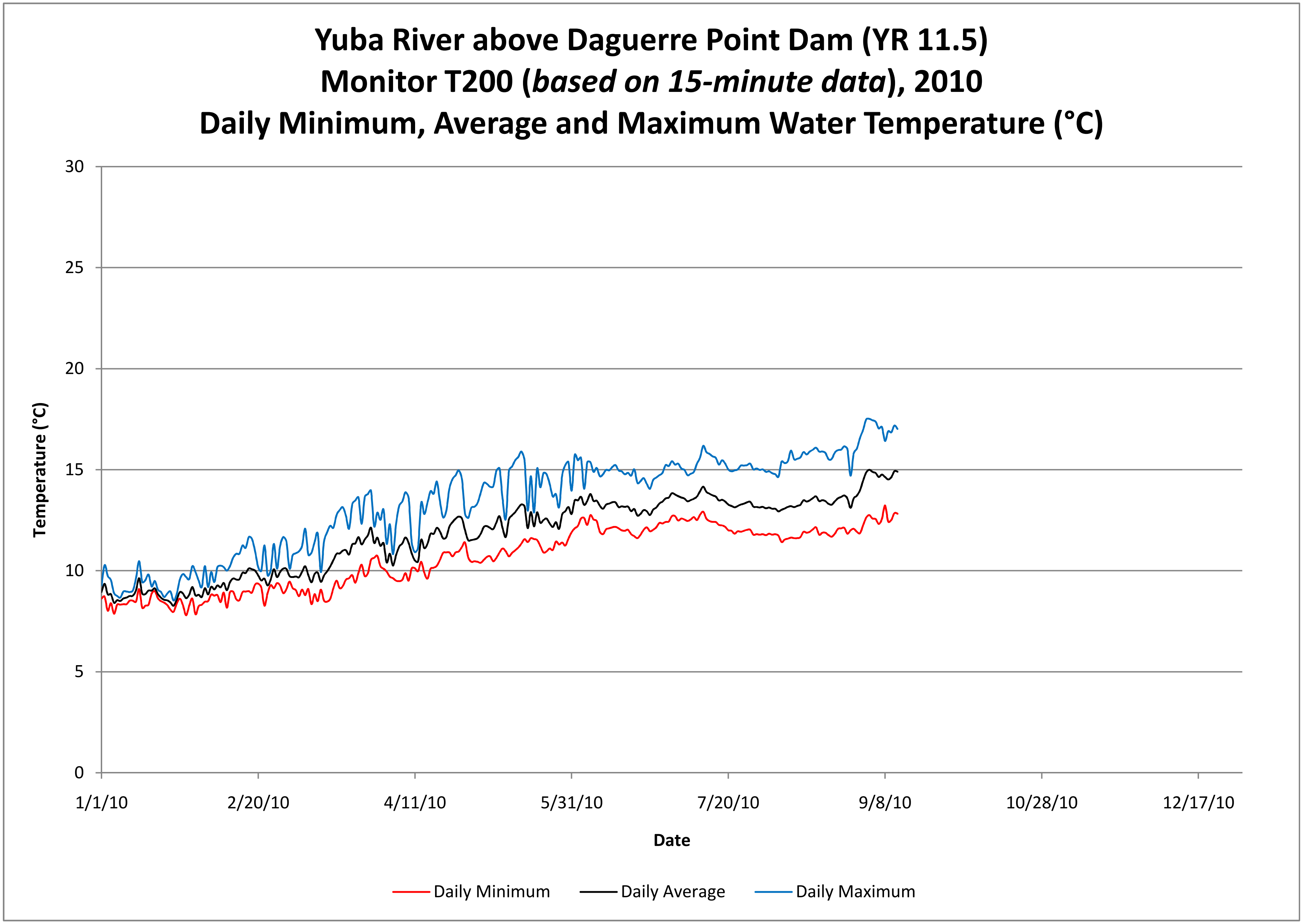
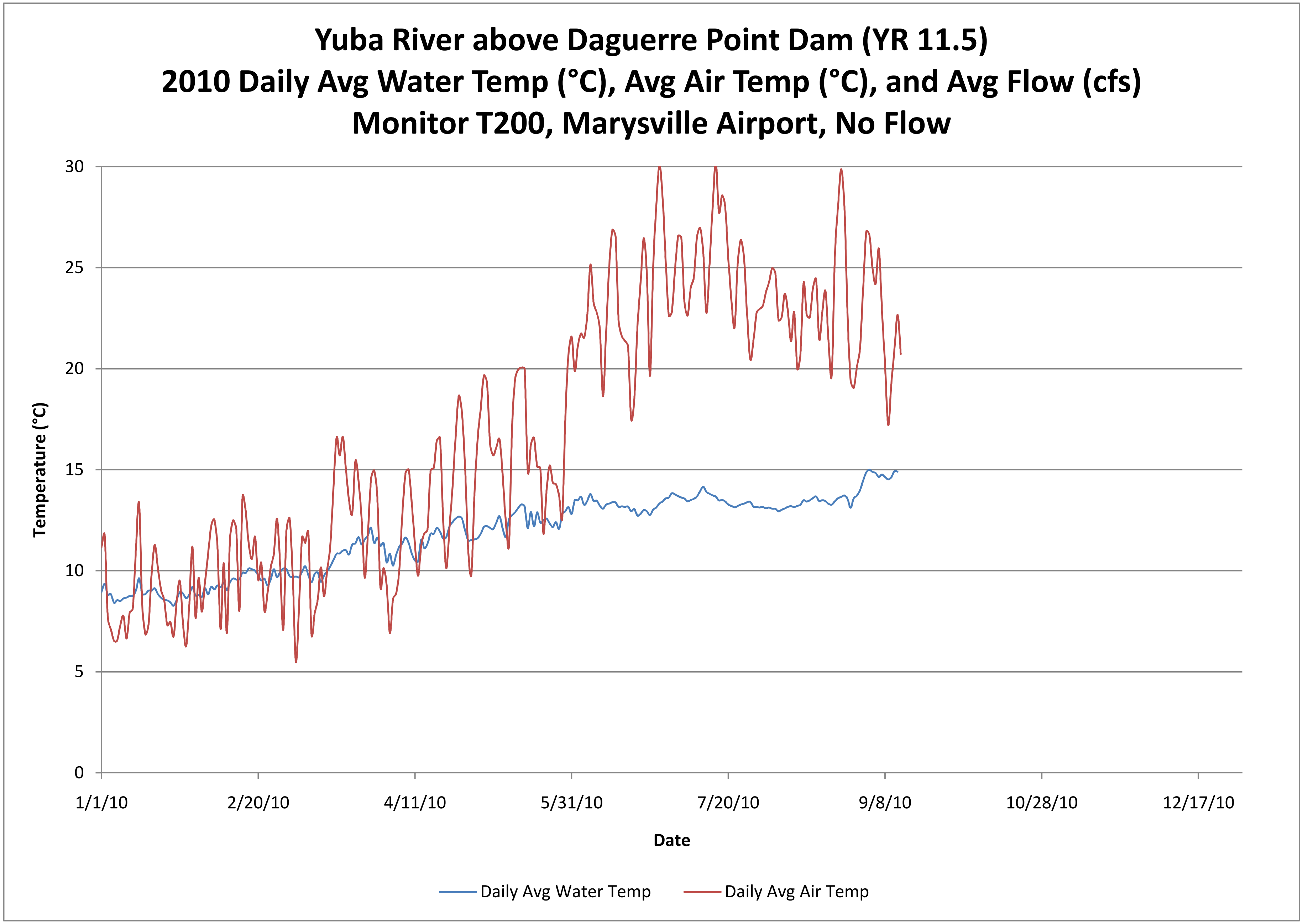
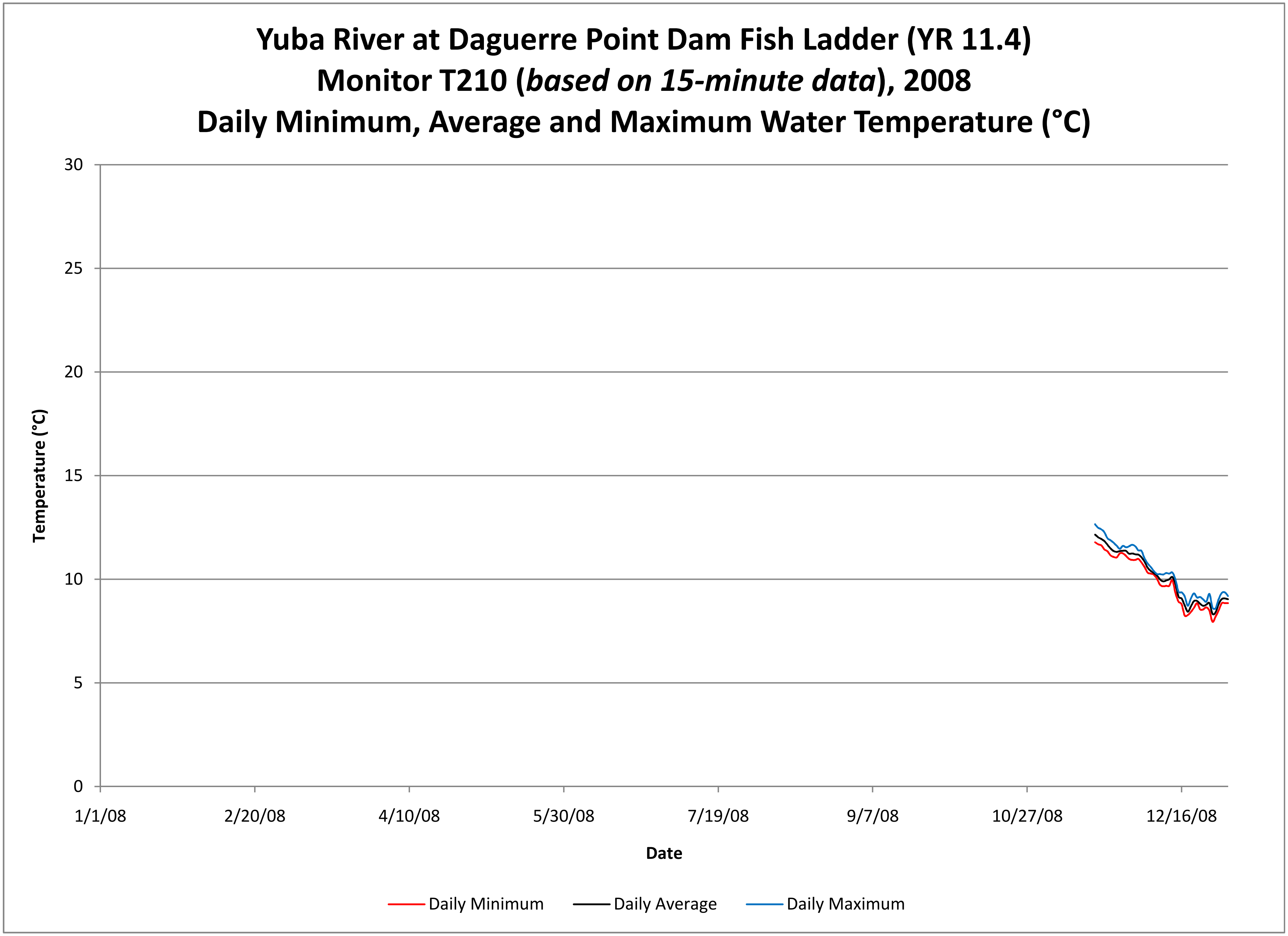

Yuba River above Daguerre Point Dam (YR 11.5)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T200, Marysville Airport, Flow Gage 11418000 + 11418500
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
1200
1000
800
600
400
200
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

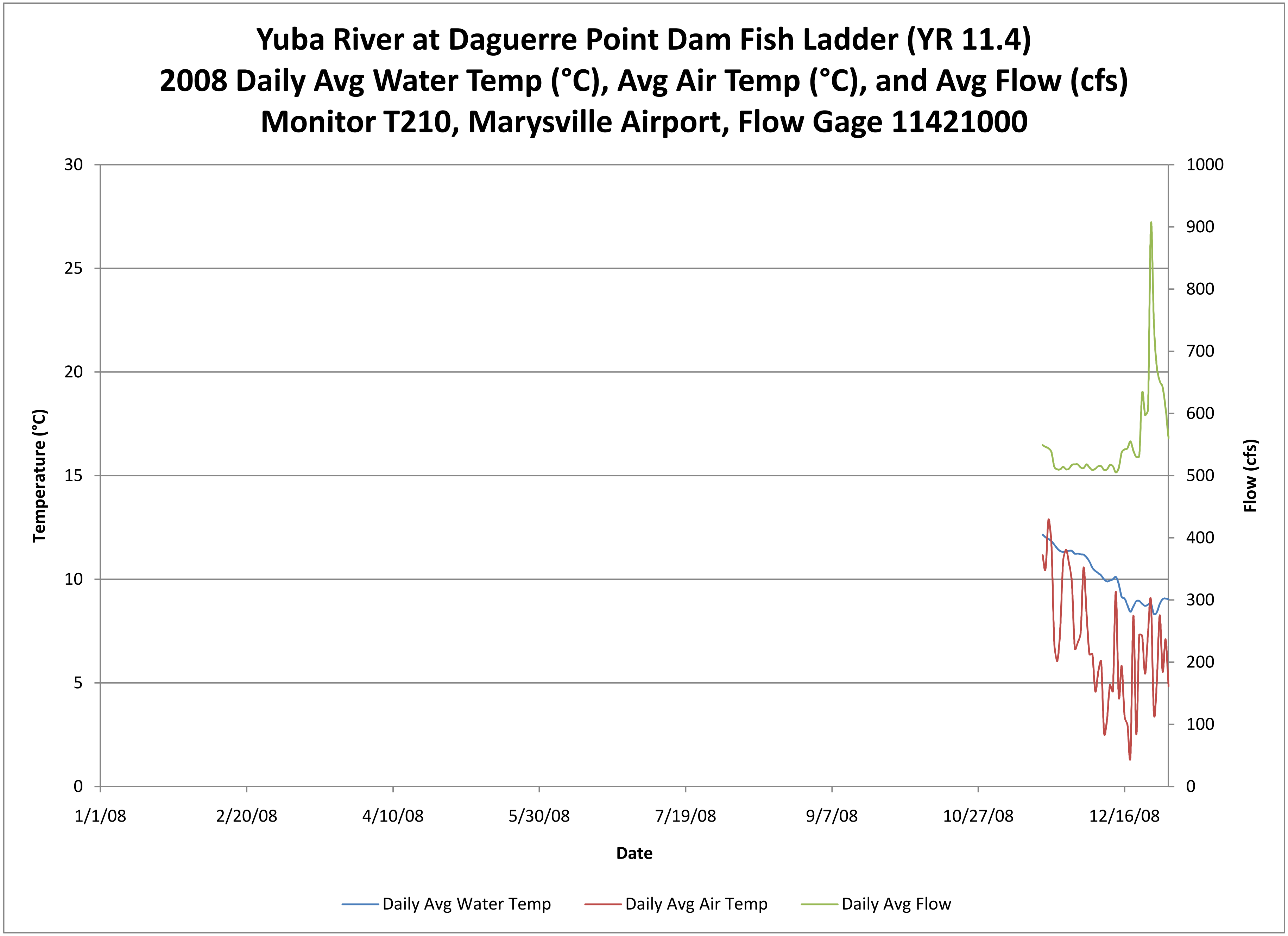

Yuba River above Daguerre Point Dam (YR 11.5)
Monitor T200 (based on 15-minute data), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum

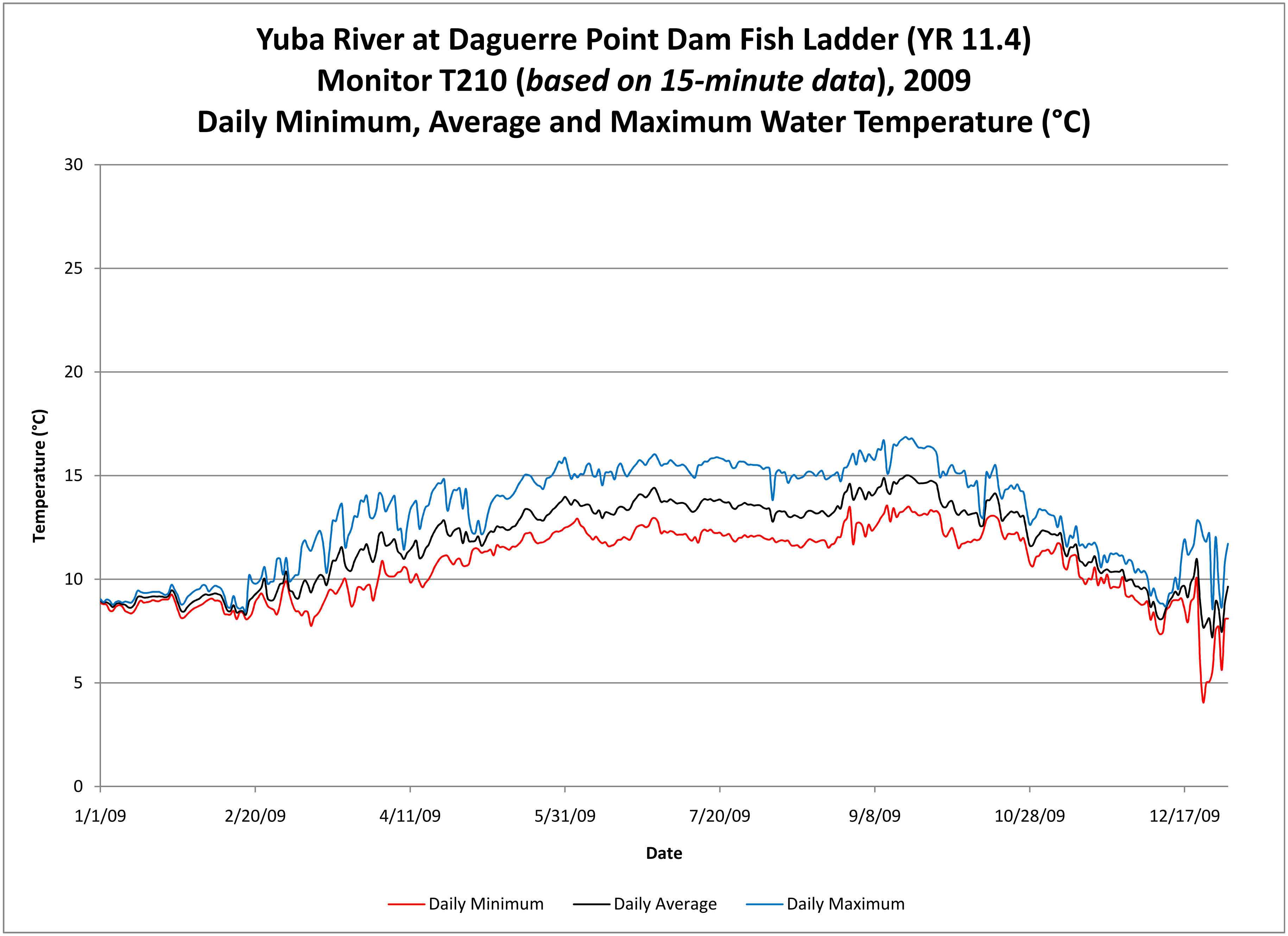

Yuba River above Daguerre Point Dam (YR 11.5)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T200, Marysville Airport, Flow Gage 11418000 + 11418500
Temperature (°C)
0
5
10
15
20
25
30
35
Flow (cfs)
0
2000
4000
6000
8000
10000
12000
14000
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

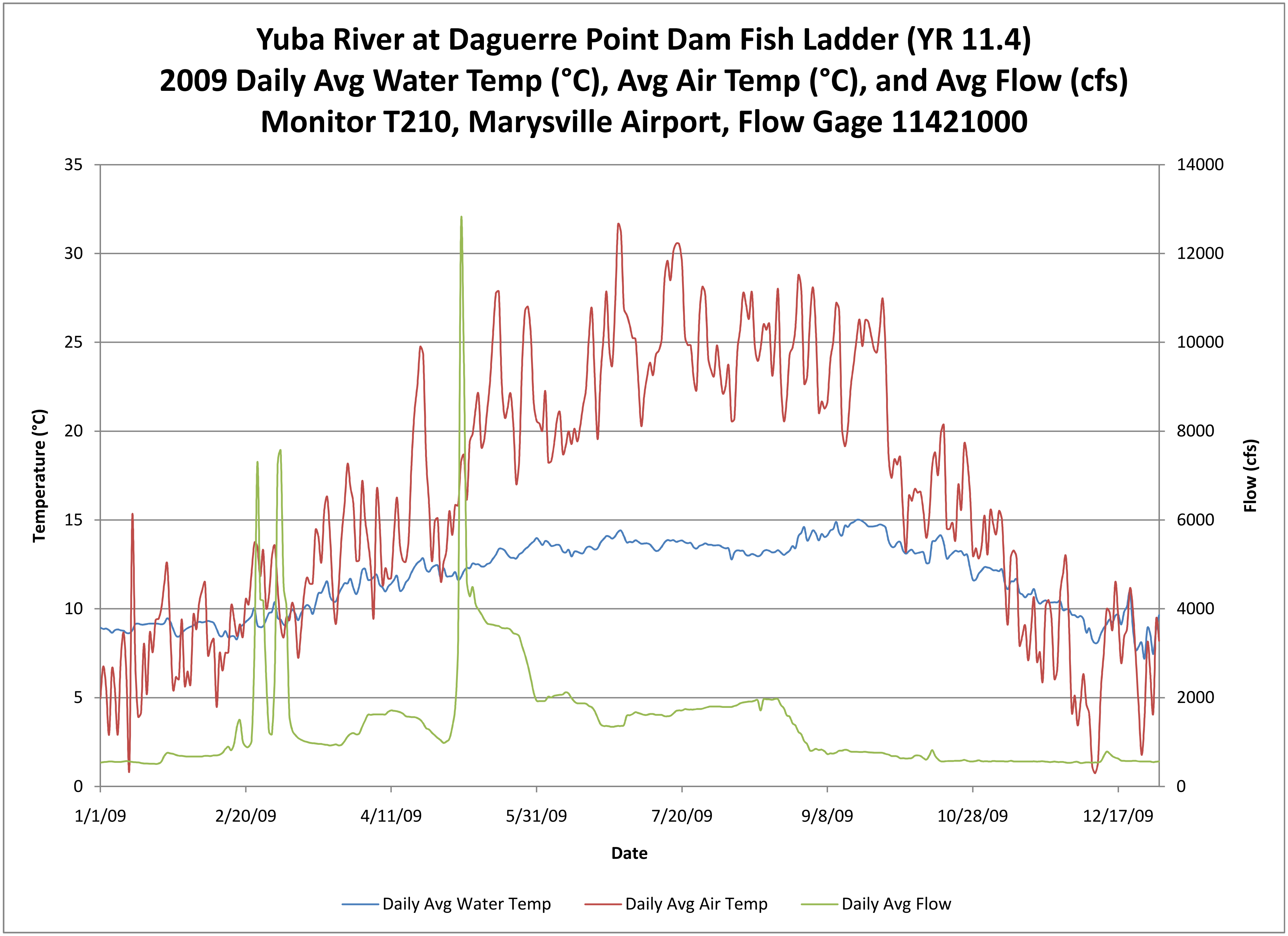

Yuba River above Daguerre Point Dam (YR 11.5)
Monitor T200 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum

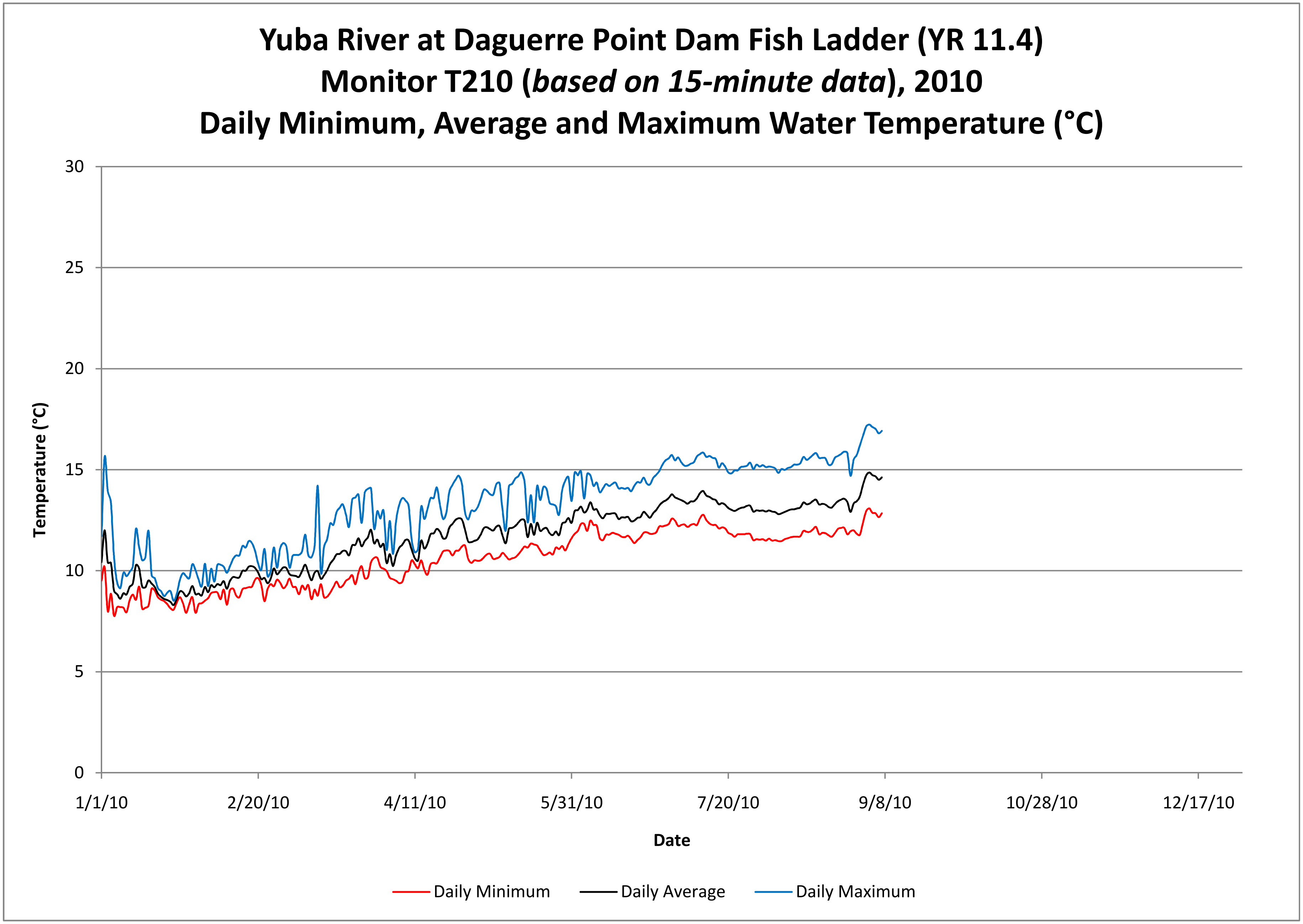

Yuba River above Daguerre Point Dam (YR 11.5)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T200, Marysville Airport, No Flow
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp

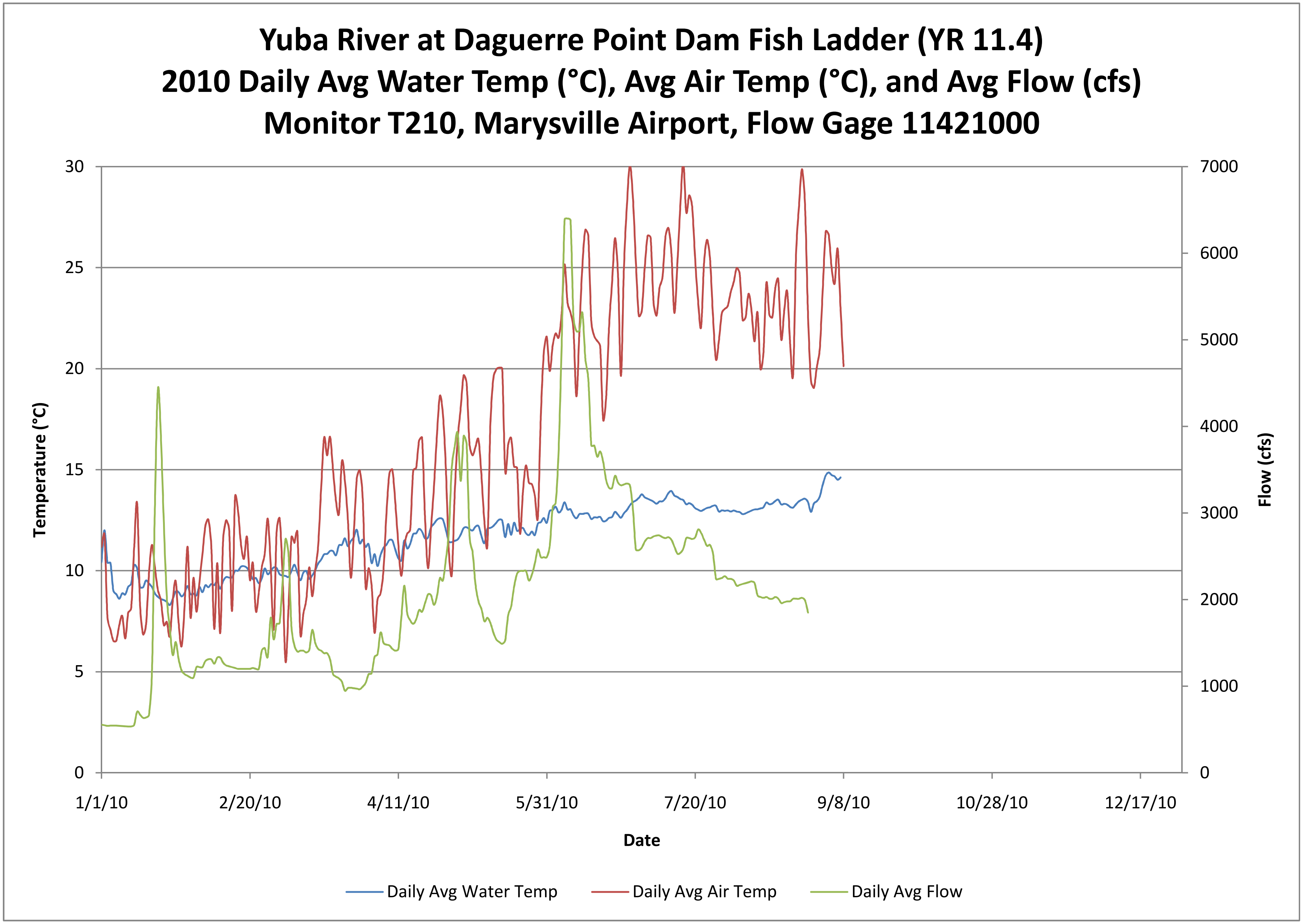

Yuba River at Daguerre Point Dam Fish Ladder (YR 11.4)
Monitor T210 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum

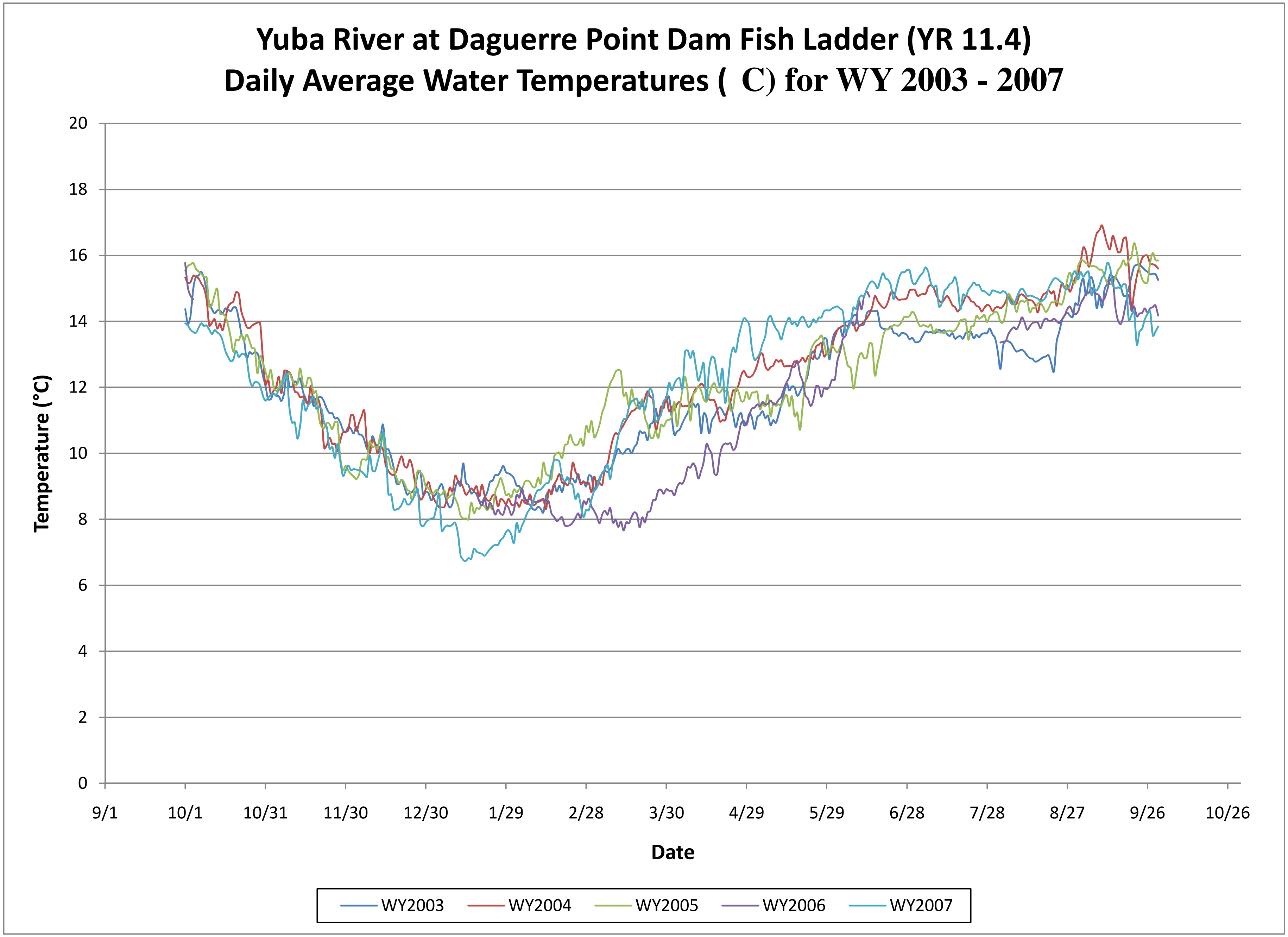

Yuba River at Daguerre Point Dam Fish Ladder (YR 11.4)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T210, Marysville Airport, Flow Gage 11421000
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
1000
900
800
700
600
500
400
300
200
100
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

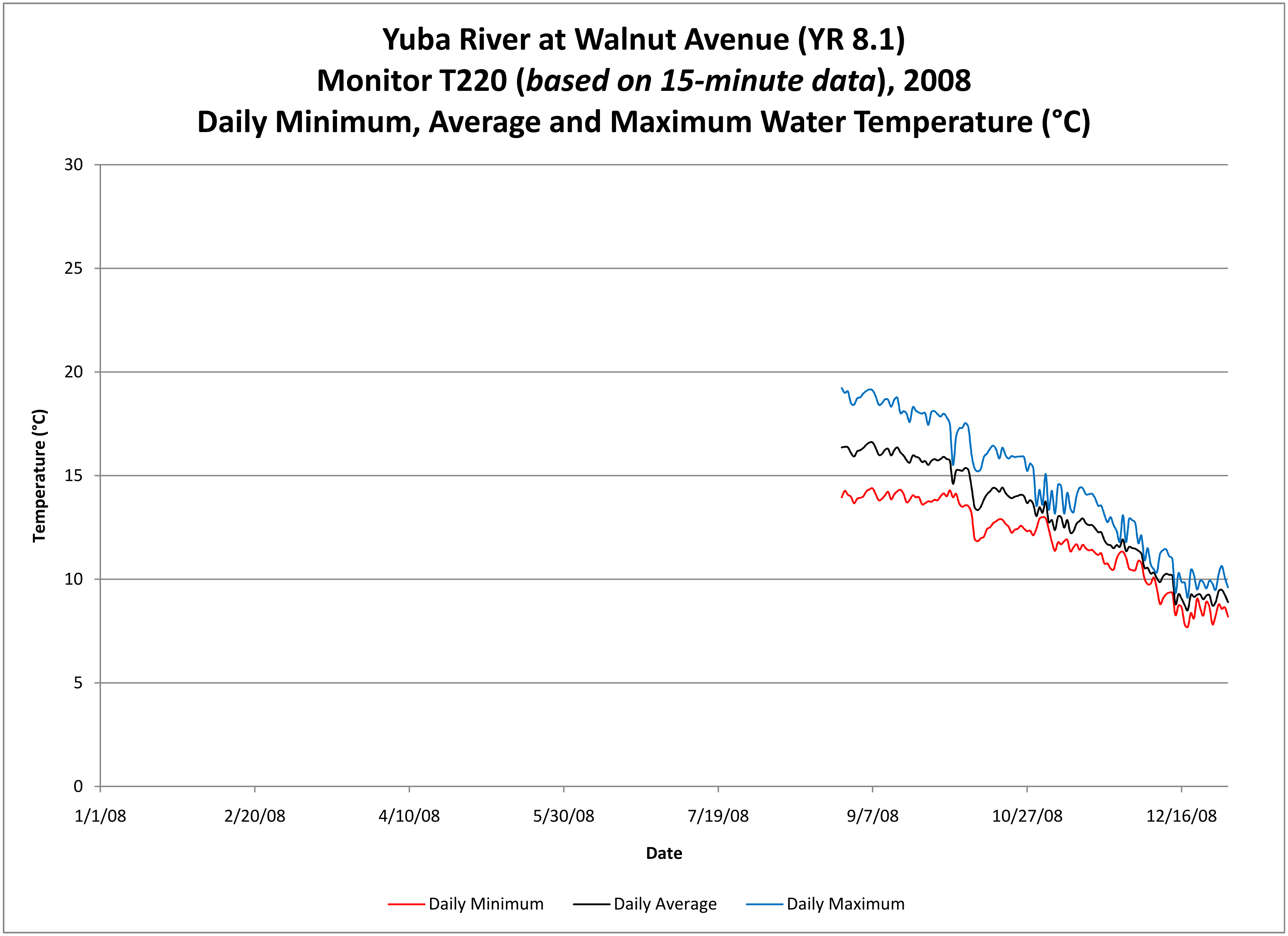

Yuba River at Daguerre Point Dam Fish Ladder (YR 11.4)
Monitor T210 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum

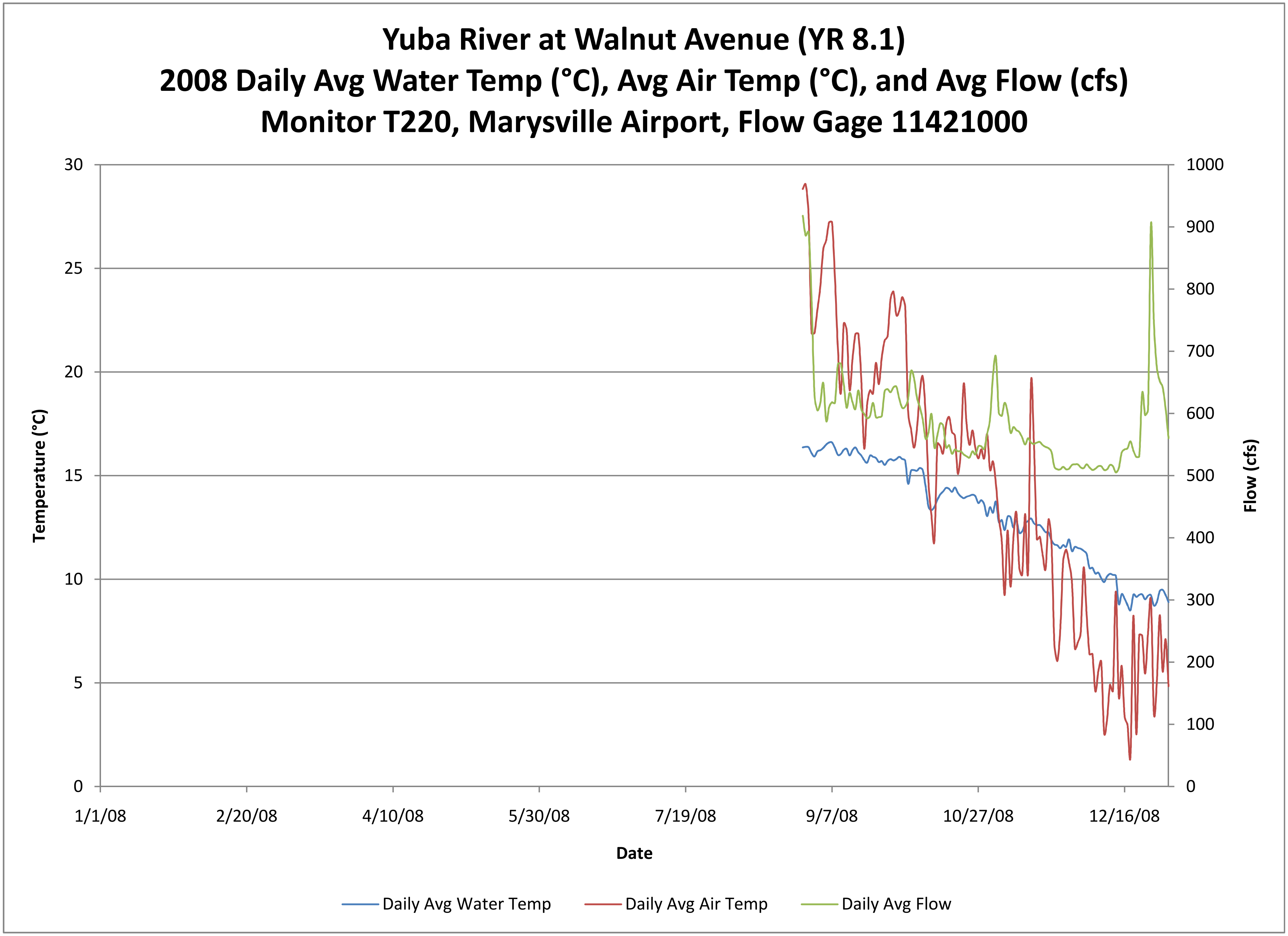

Yuba River at Daguerre Point Dam Fish Ladder (YR 11.4)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T210, Marysville Airport, Flow Gage 11421000
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
14000
12000
10000
8000
6000
4000
2000
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Yuba River at Daguerre Point Dam Fish Ladder (YR 11.4)
Monitor T210 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River at Daguerre Point Dam Fish Ladder (YR 11.4)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T210, Marysville Airport, Flow Gage 11421000
Temperature (°C)
0
5
10
15
20
25
30
Flow (cfs)
0
1000
2000
3000
4000
5000
6000
7000
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Yuba River at Daguerre Point Dam Fish Ladder (YR 11.4)
Daily Average Water Temperatures (C) for WY 2003 - 2007
Temperature (°C)
20
18
16
14
12
10
8
6
4
2
0
9/1
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26
10/26
Date
WY2003
WY2004
WY2005
WY2006
WY2007


Yuba River at Walnut Avenue (YR 8.1)
Monitor T220 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River at Walnut Avenue (YR 8.1)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T220, Marysville Airport, Flow Gage 11421000
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
1000
900
800
700
600
500
400
300
200
100
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow

Yuba River at Walnut Avenue (YR 8.1)
Monitor T220 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)

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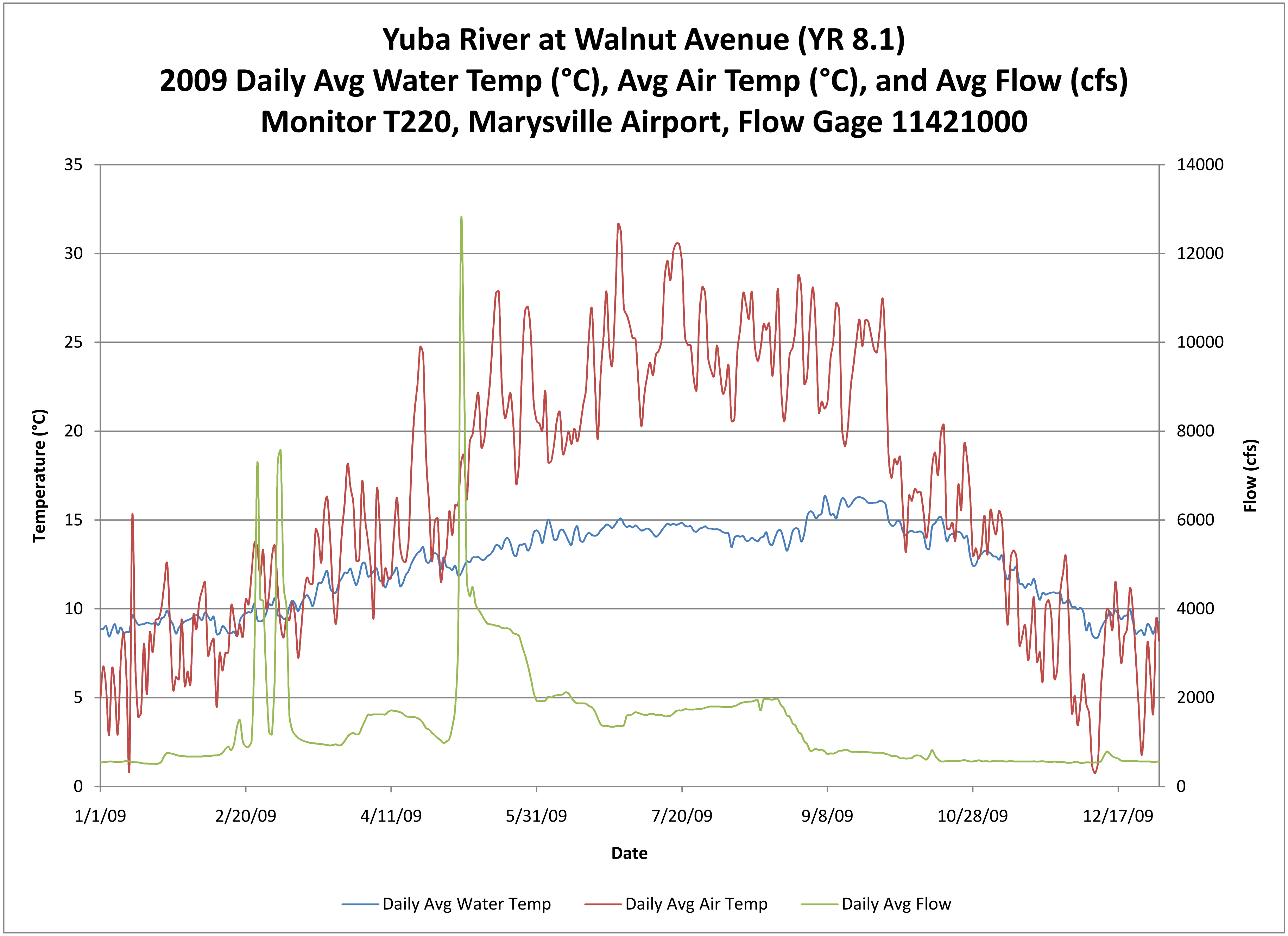
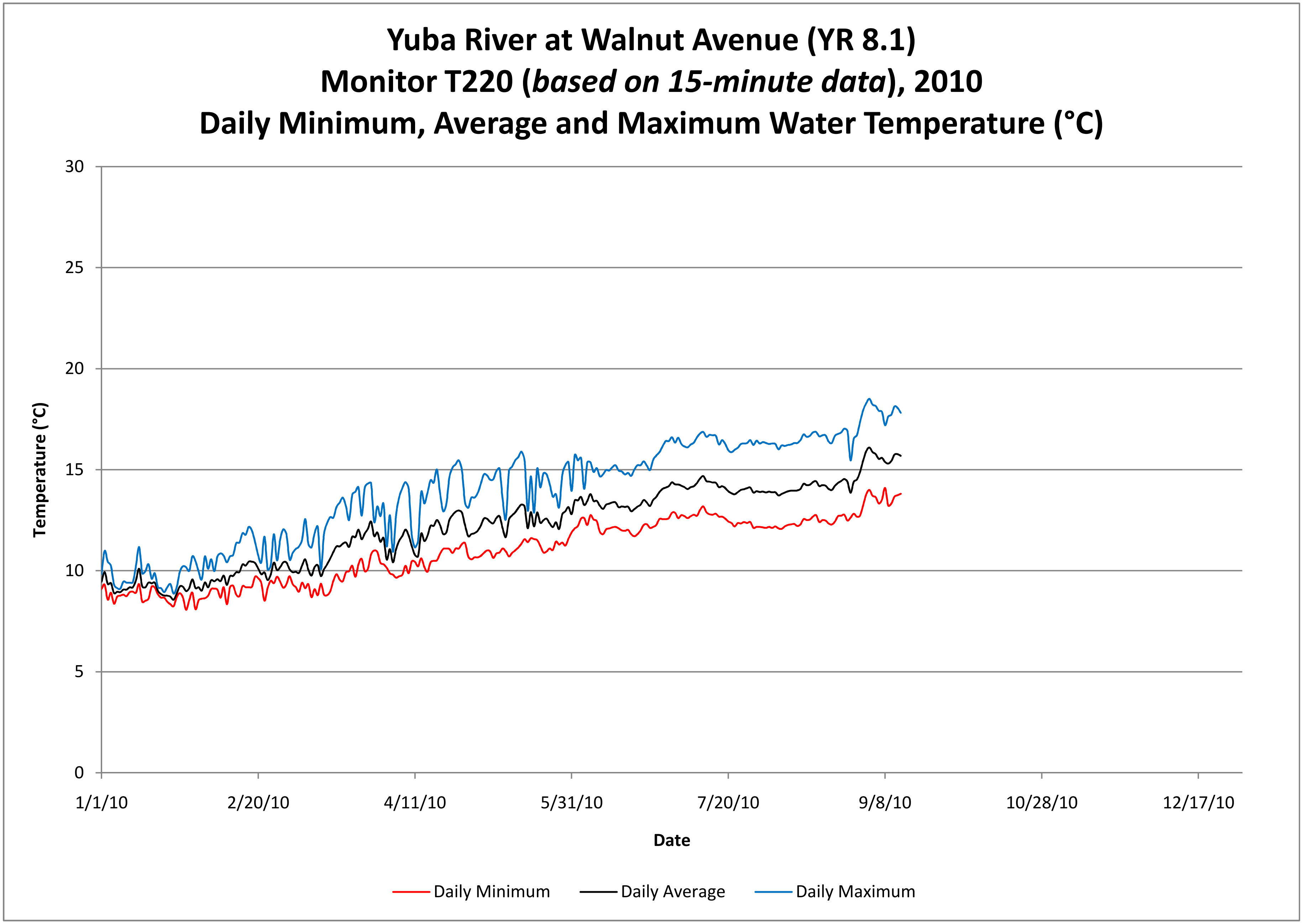
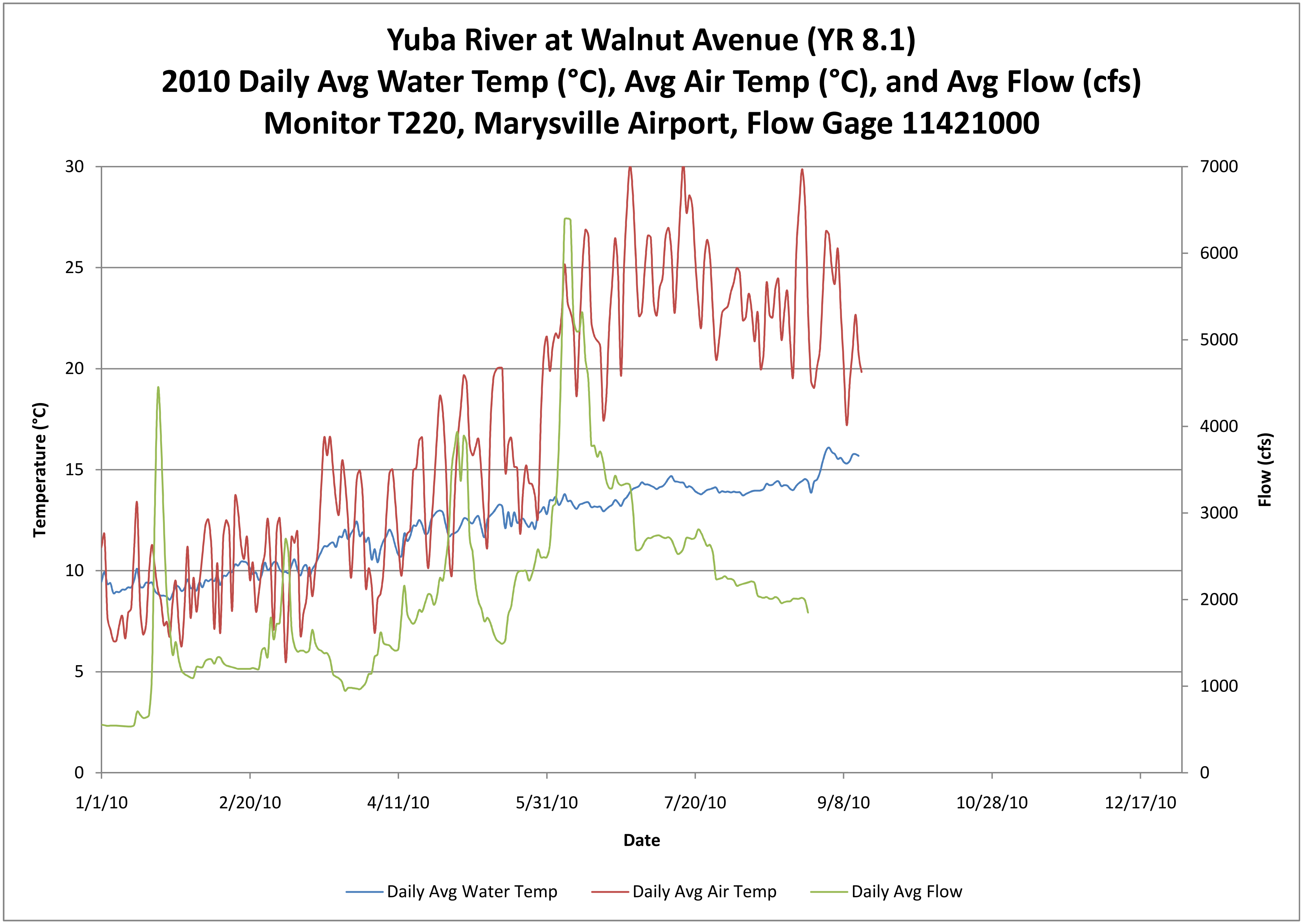
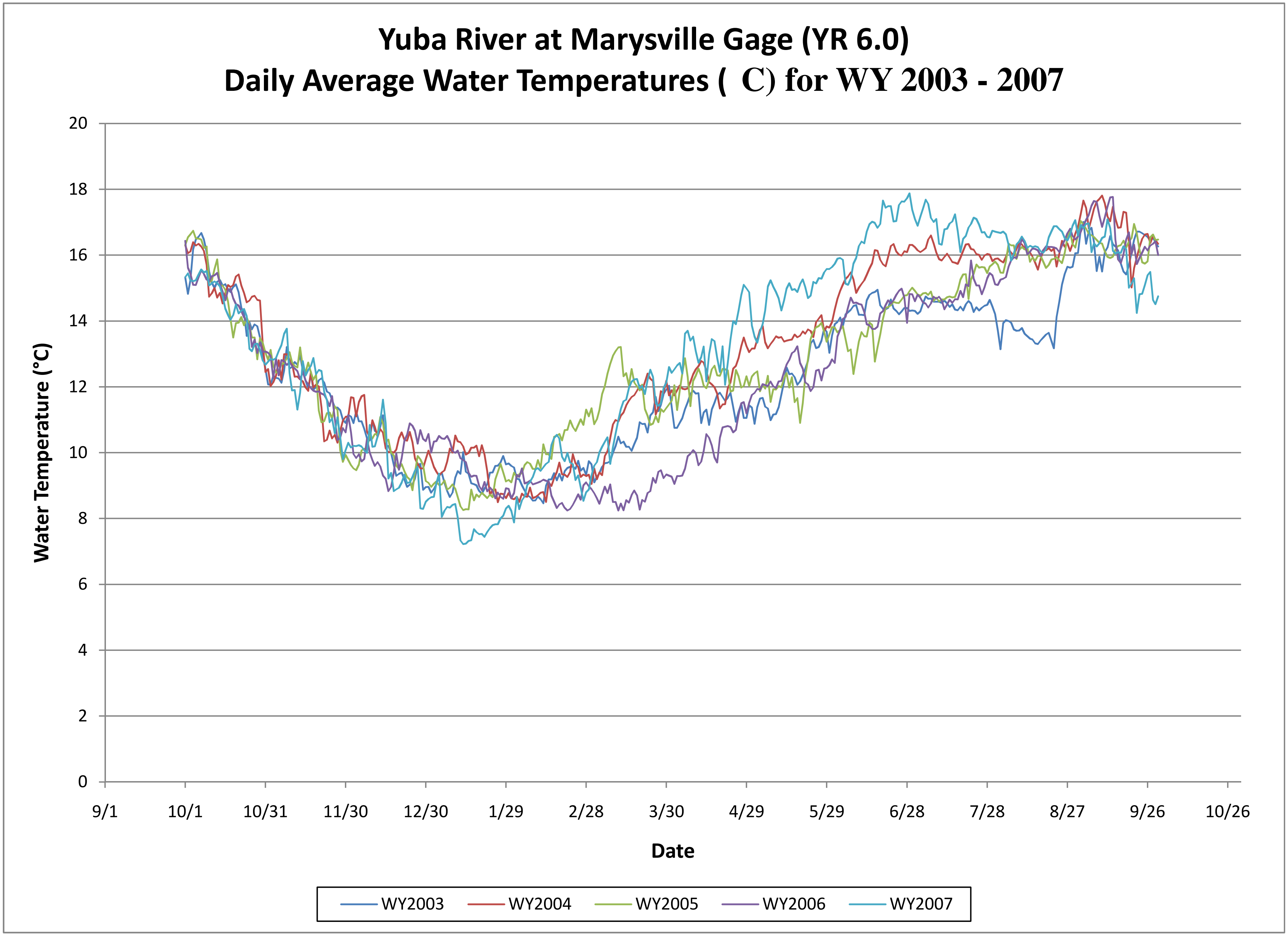
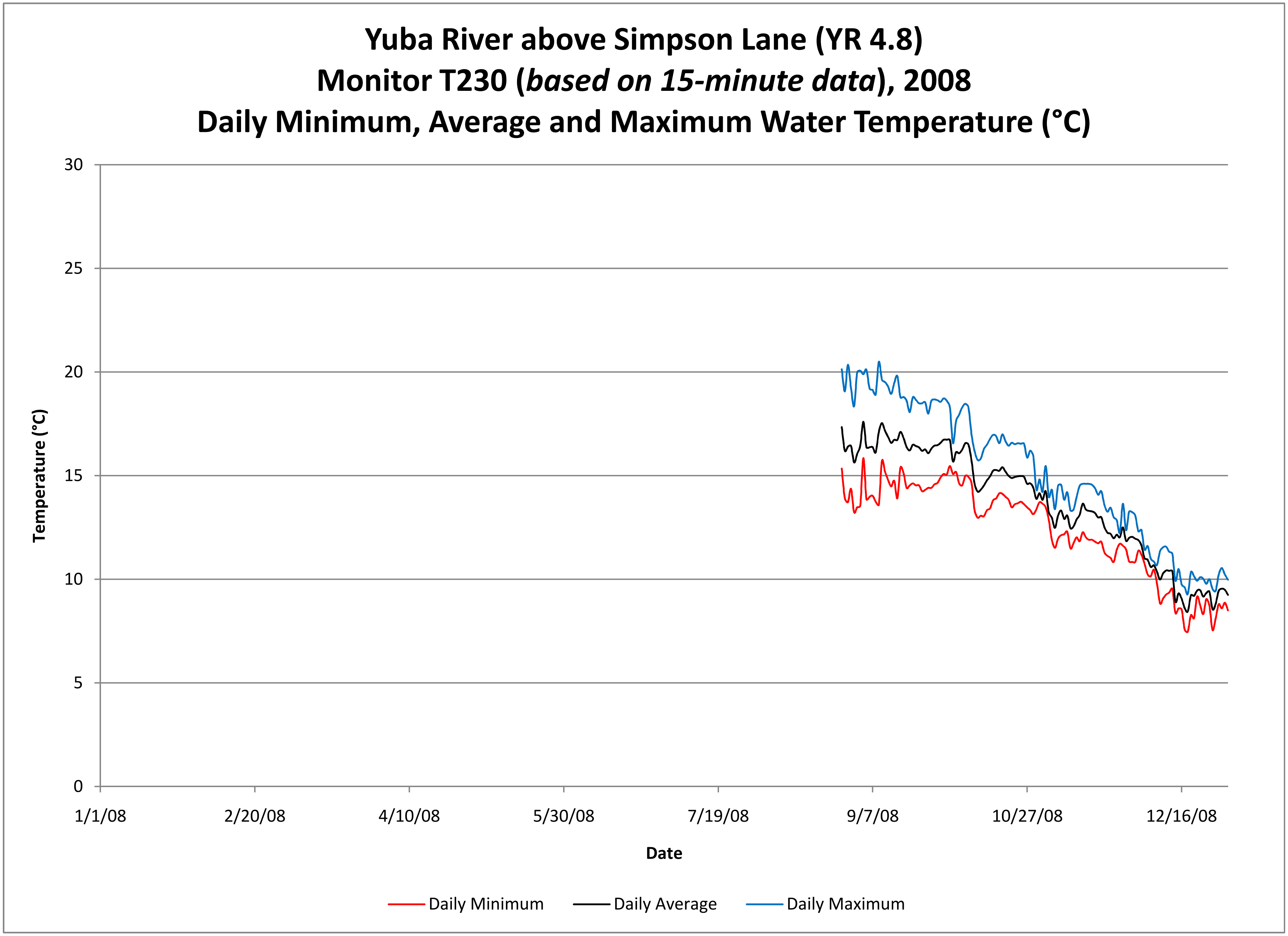
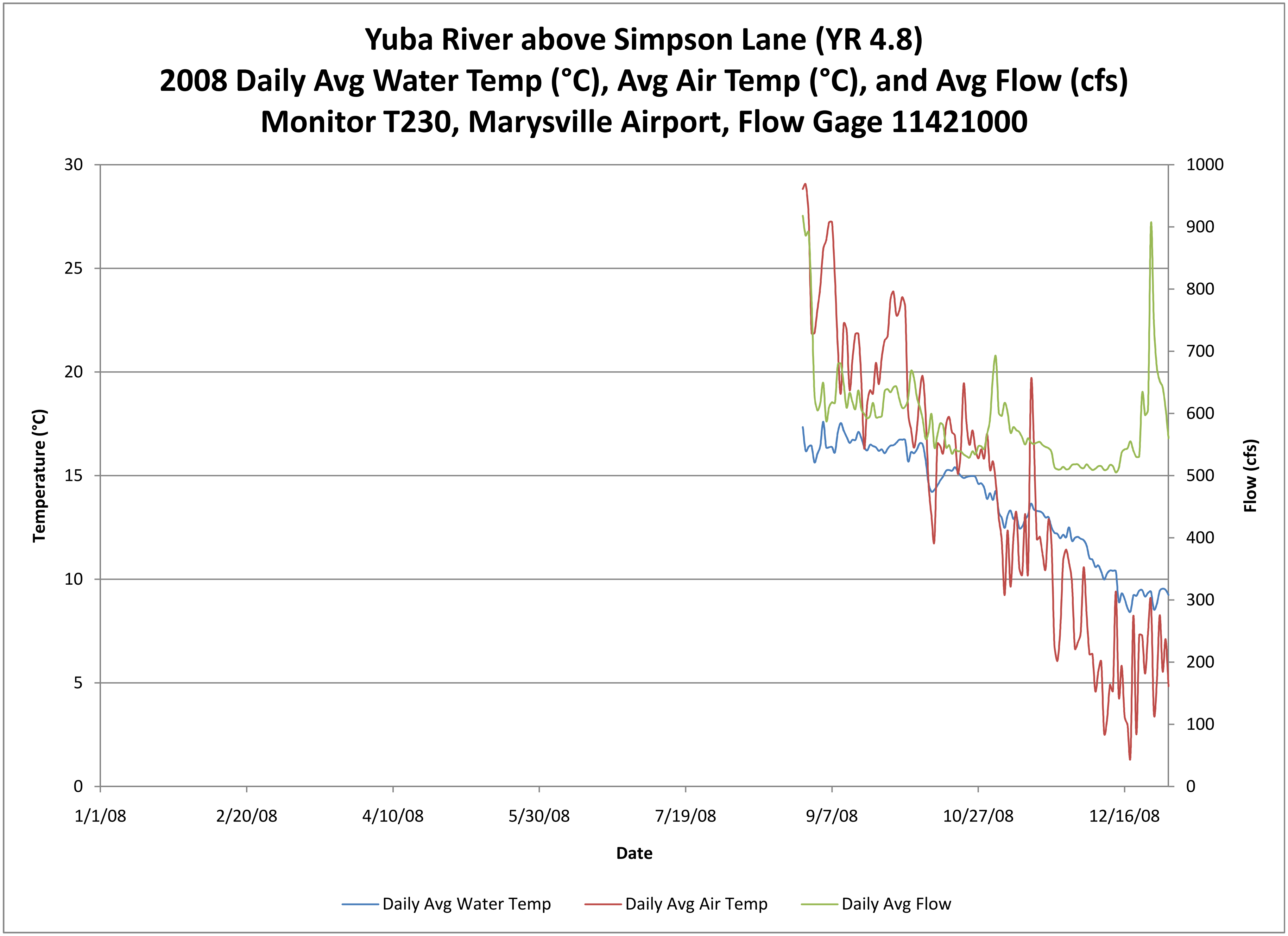

Yuba River at Walnut Avenue (YR 8.1)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T220, Marysville Airport, Flow Gage 11421000
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
14000
12000
10000
8000
6000
4000
2000
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Yuba River at Walnut Avenue (YR 8.1)
Monitor T220 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River at Walnut Avenue (YR 8.1)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T220, Marysville Airport, Flow Gage 11421000
Temperature (°C)
0
5
10
15
20
25
30
Flow (cfs)
0
1000
2000
3000
4000
5000
6000
7000
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Yuba River at Marysville Gage (YR 6.0)
Daily Average Water Temperatures (C) for WY 2003 - 2007
Water Temperature (°C)
20
18
16
14
12
10
8
6
4
2
0
9/1
10/1
10/31
11/30
12/30
1/29
2/28
3/30
4/29
5/29
6/28
7/28
8/27
9/26
10/26
Date
WY2003
WY2004
WY2005
WY2006
WY2007


Yuba River above Simpson Lane (YR 4.8)
Monitor T230 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum



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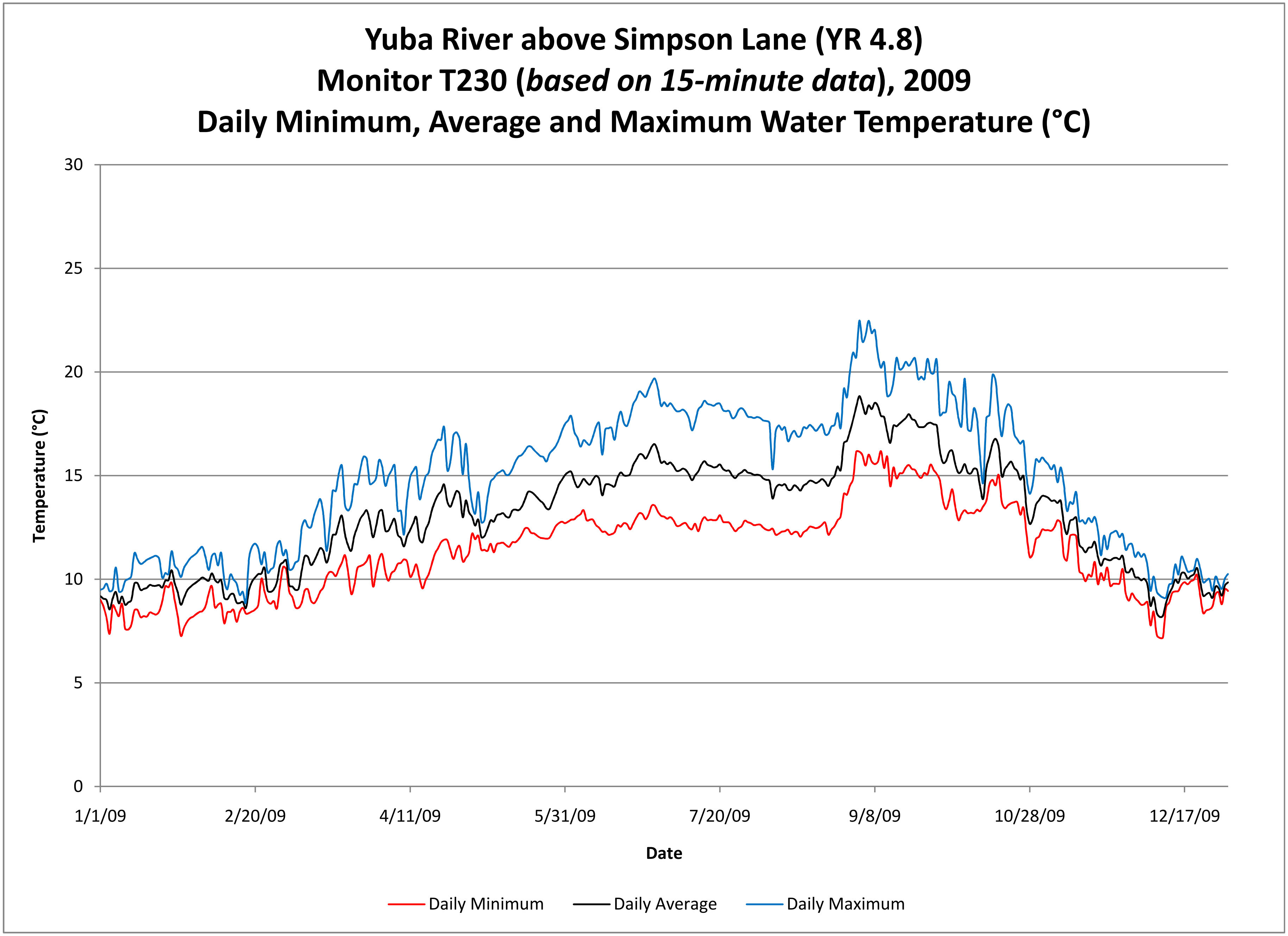

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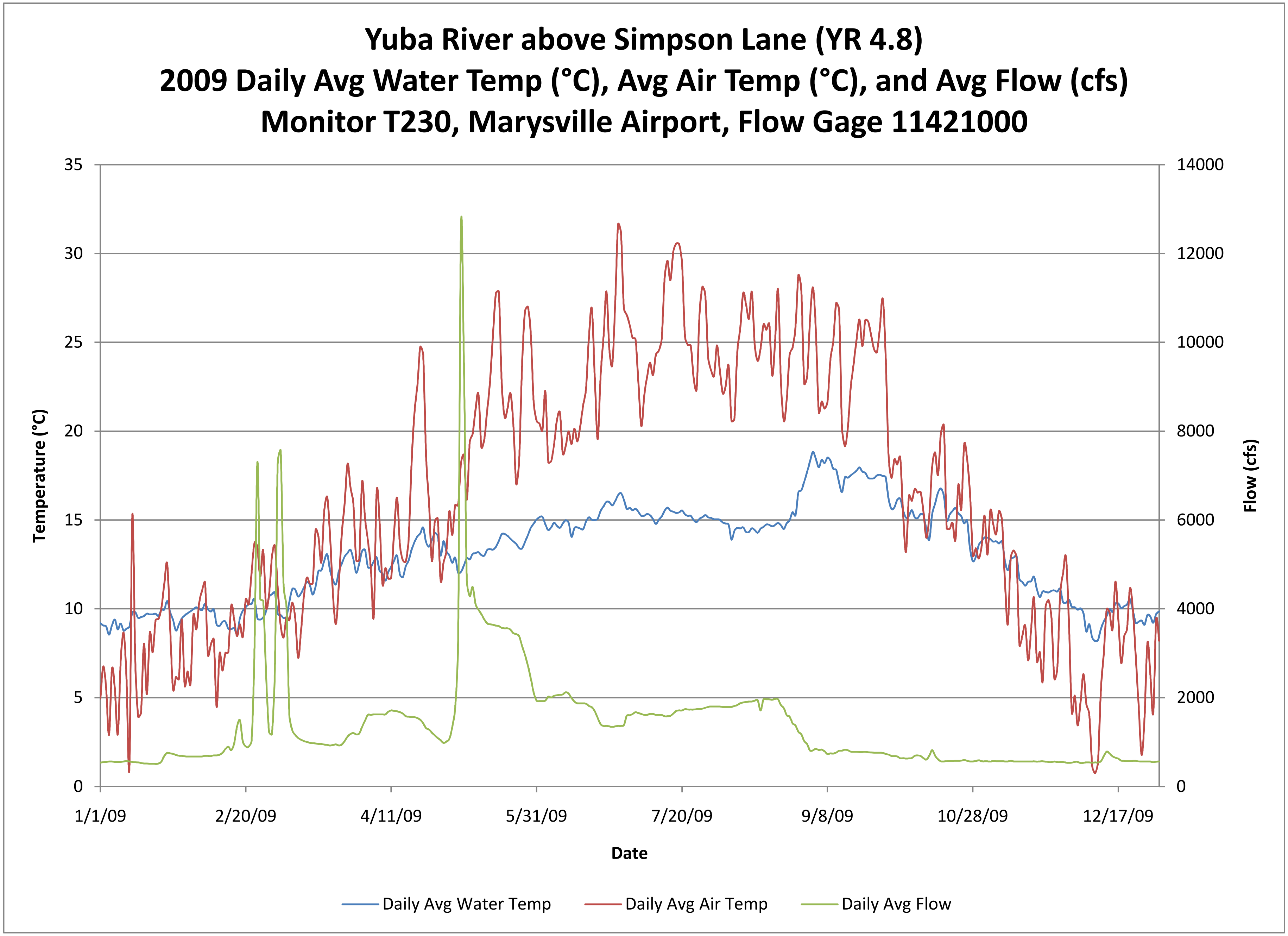
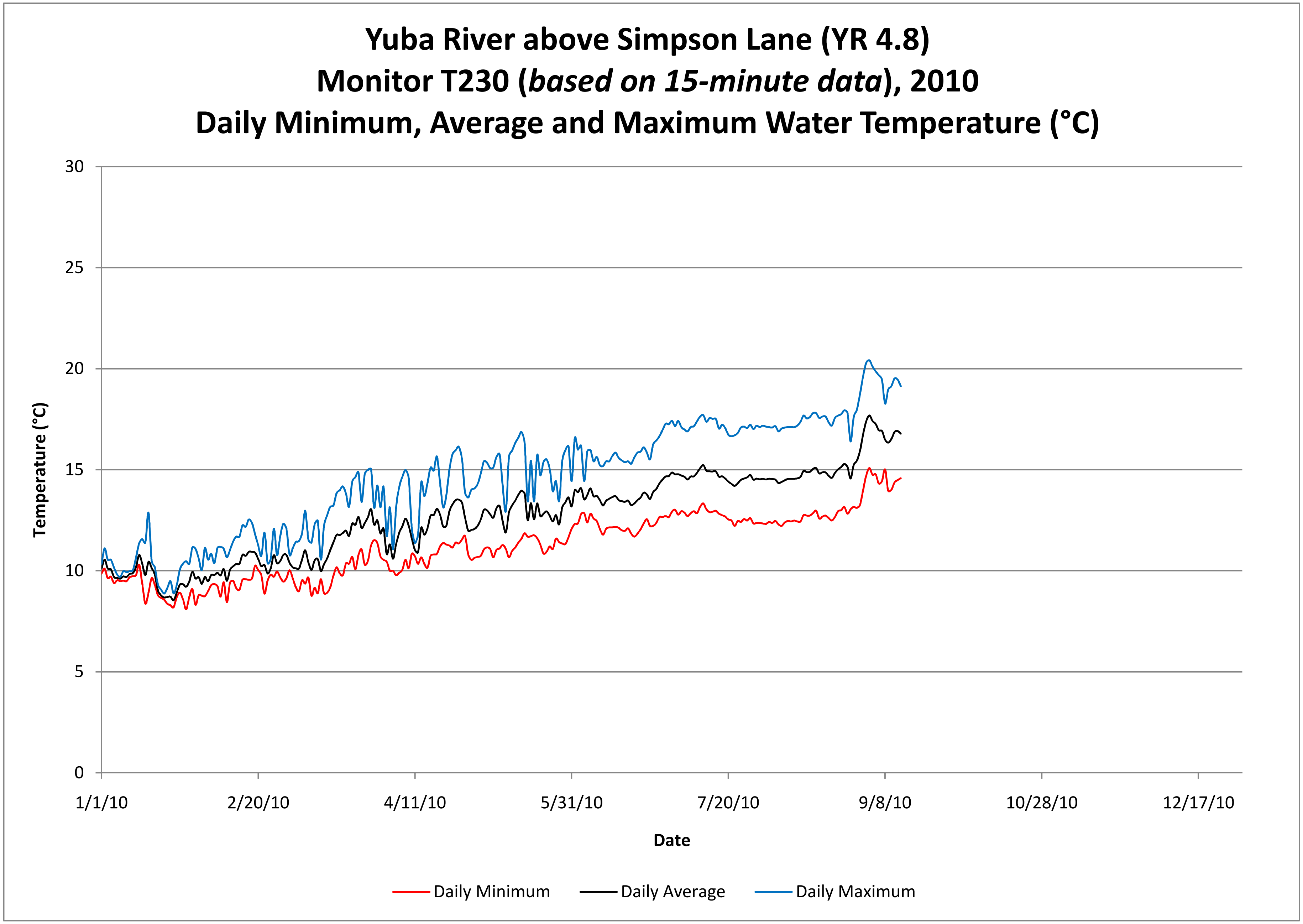

Yuba River above Simpson Lane (YR 4.8)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T230, Marysville Airport, Flow Gage 11421000
Temperature (°C)
0
5
10
15
20
25
30
35
Flow (cfs)
0
2000
4000
6000
8000
10000
12000
14000
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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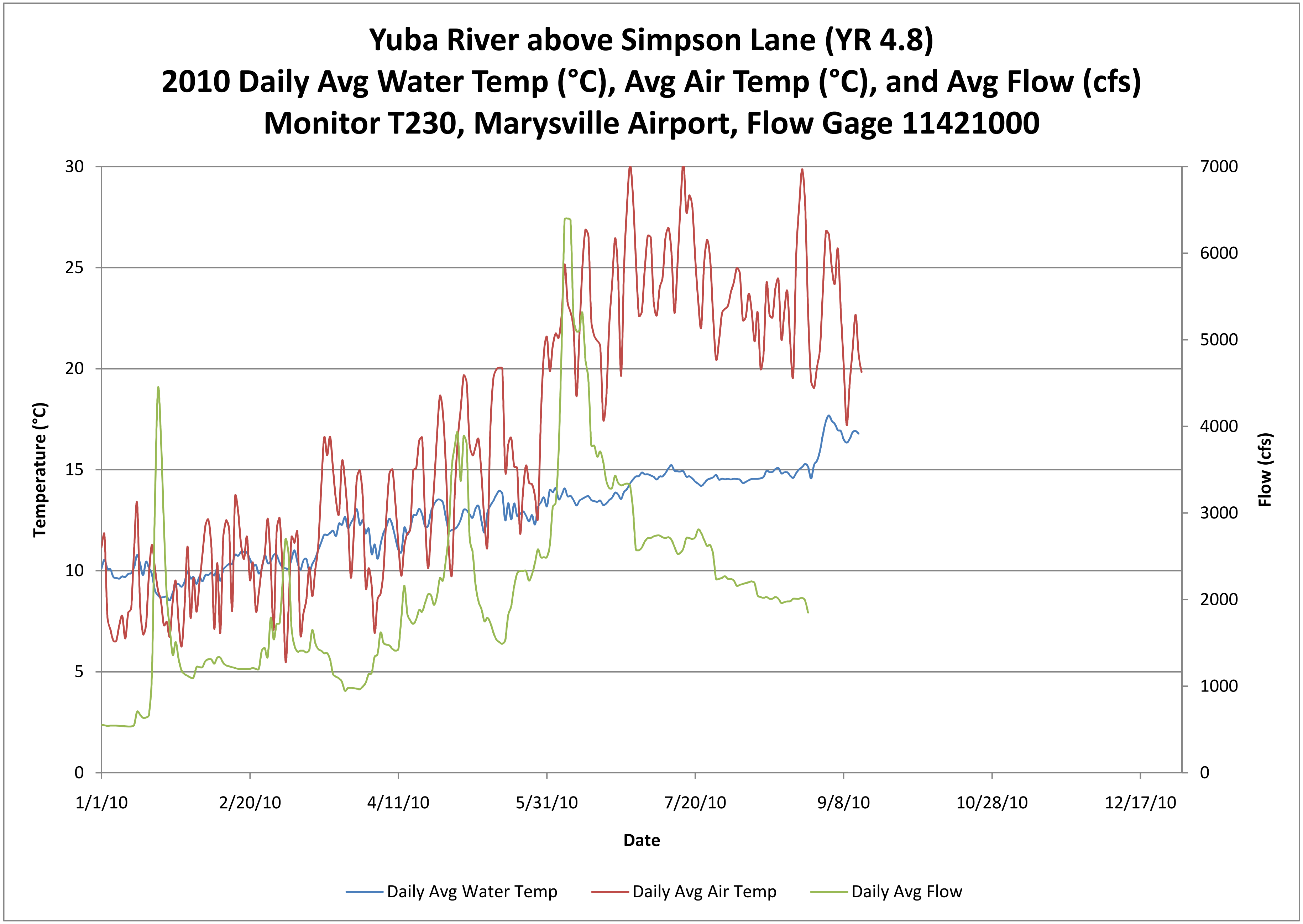
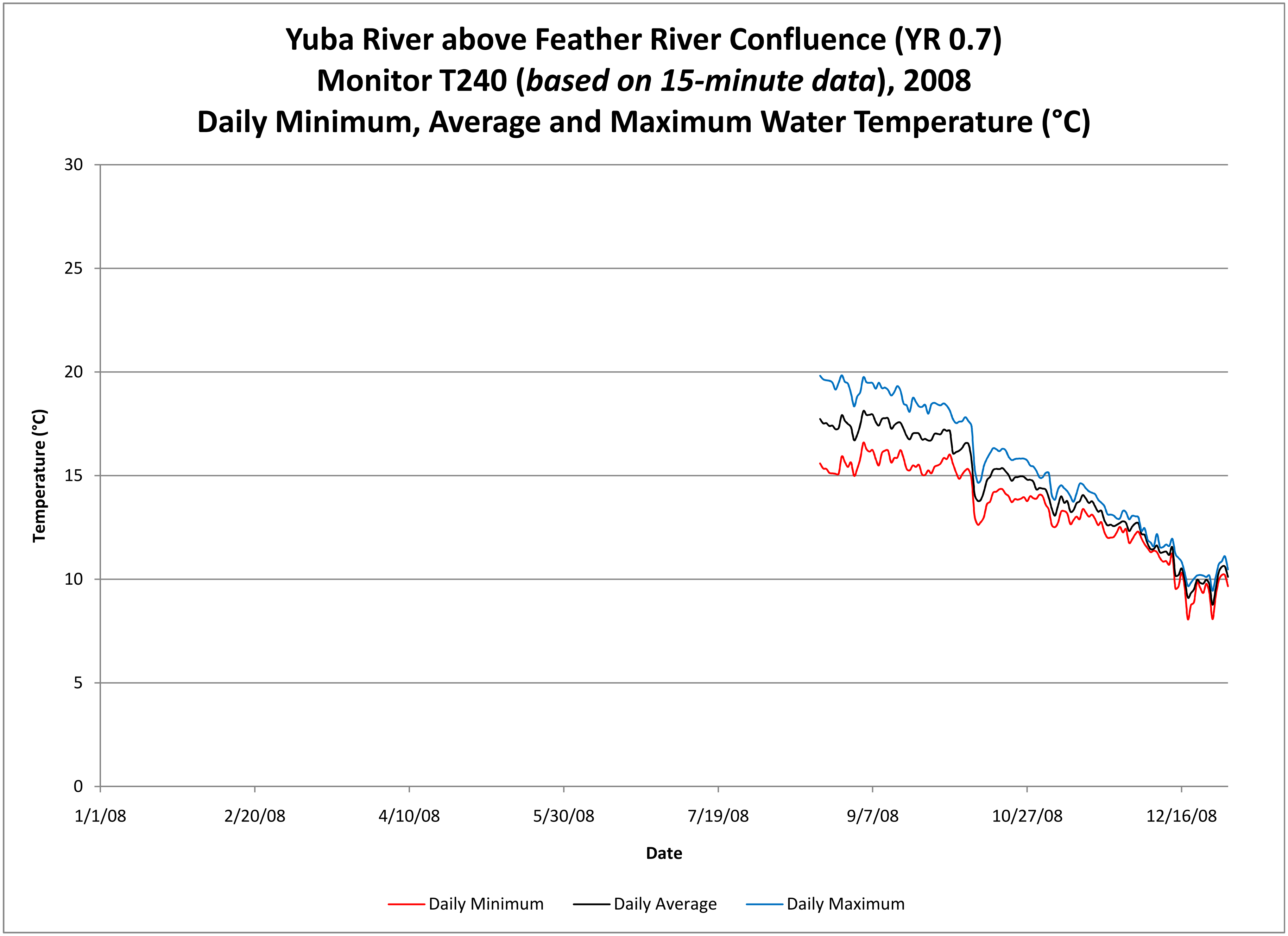

Yuba River above Simpson Lane (YR 4.8)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T230, Marysville Airport, Flow Gage 11421000
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
7000
6000
5000
4000
3000
2000
1000
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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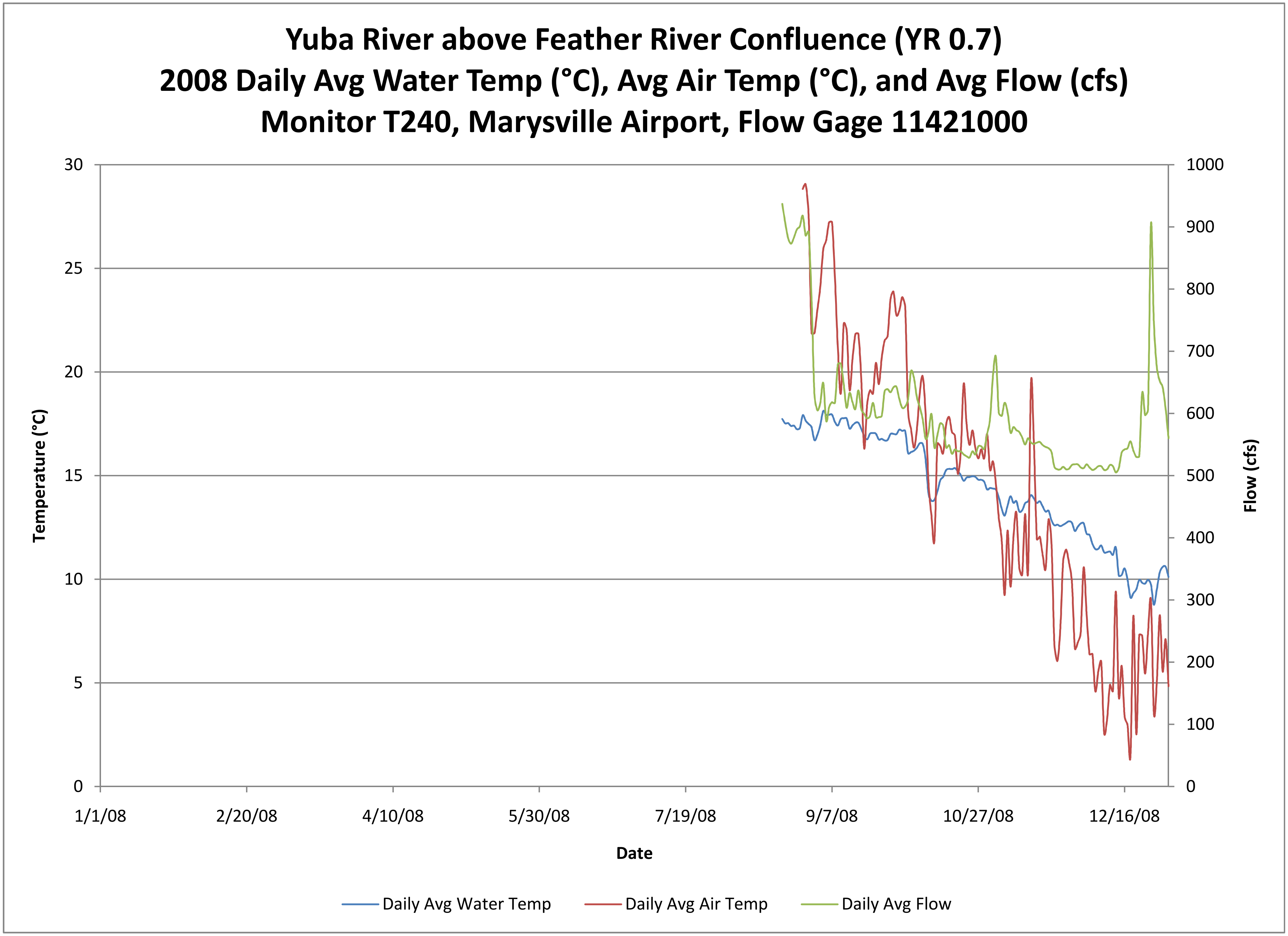
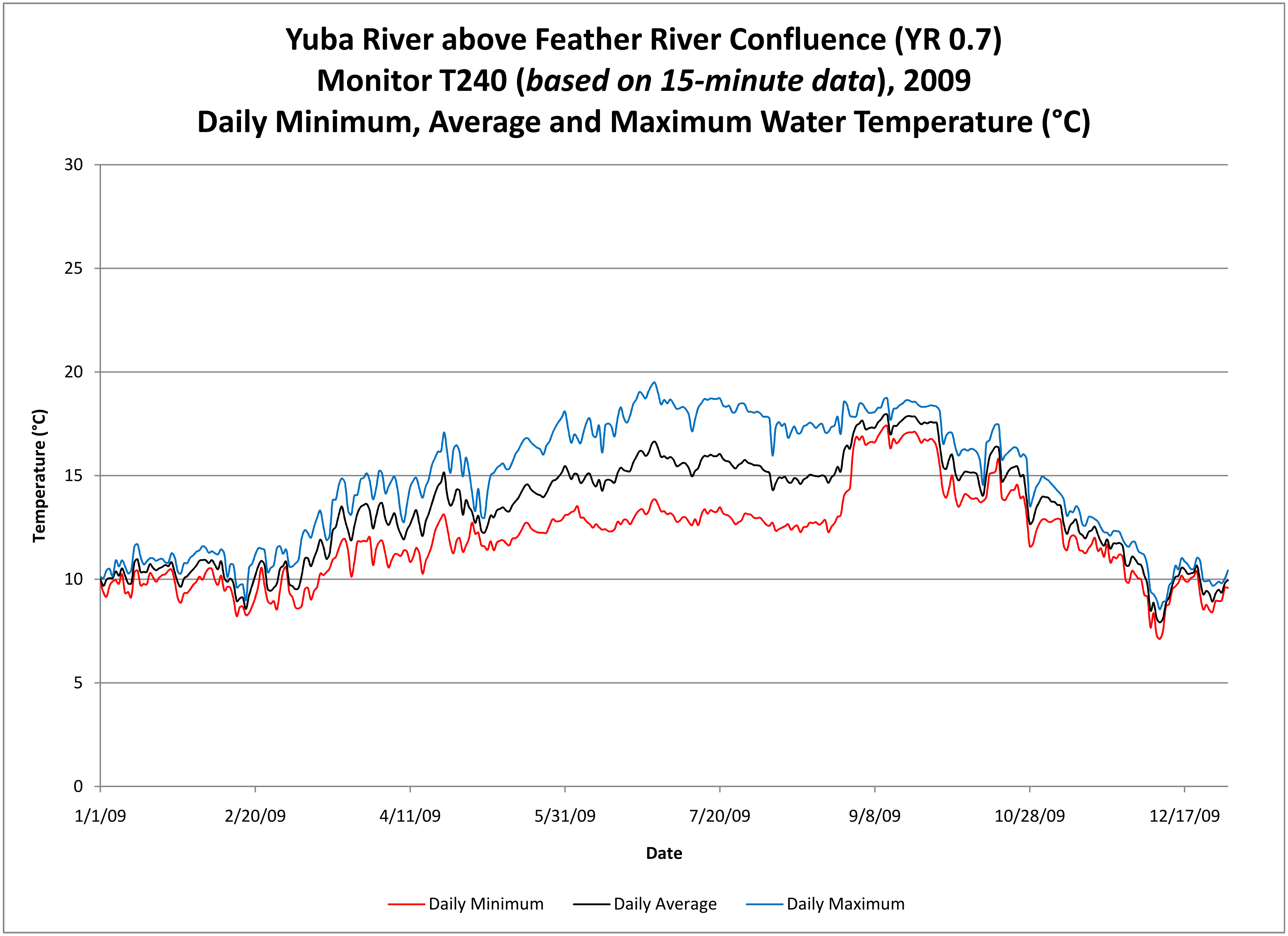
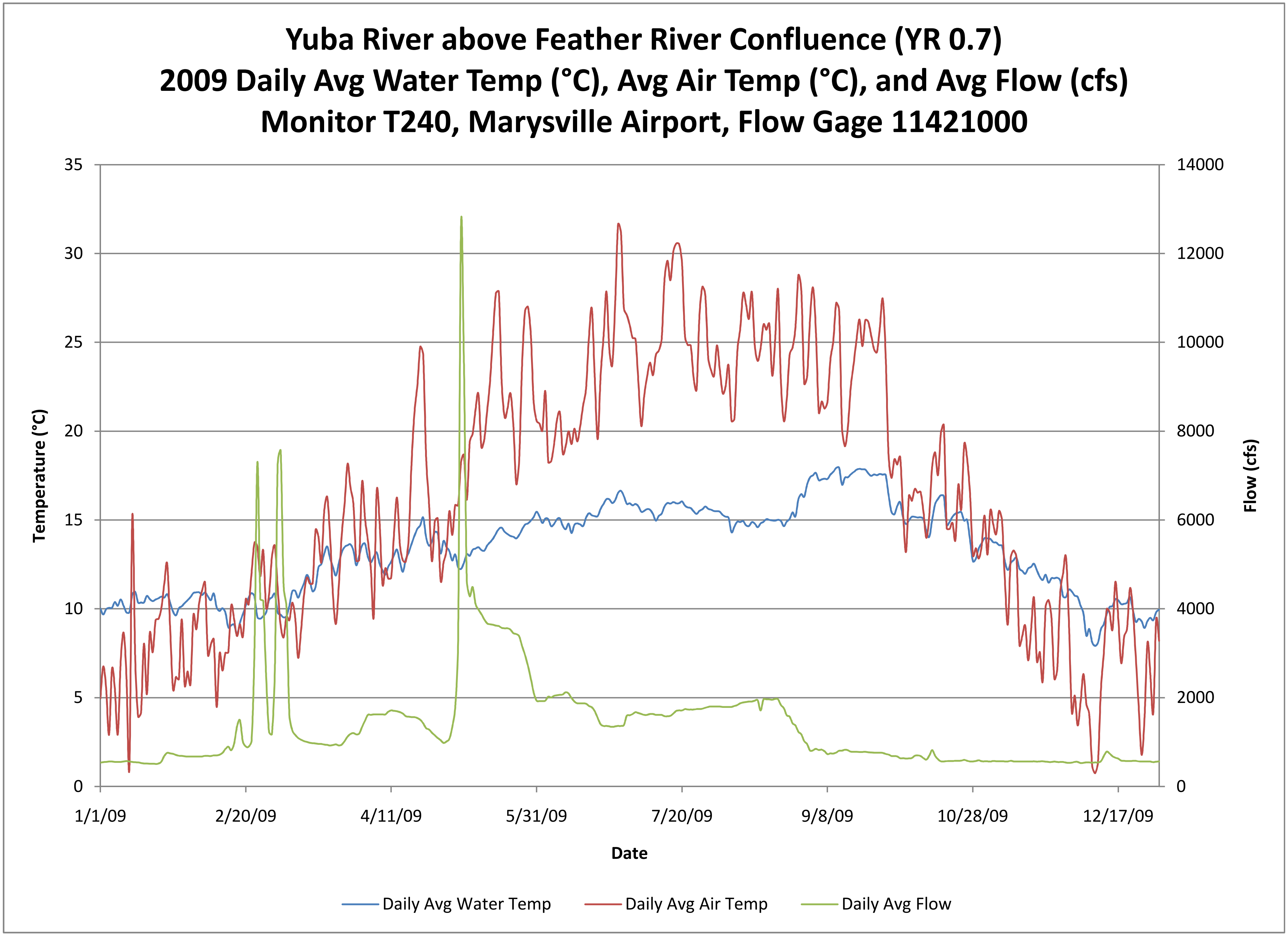
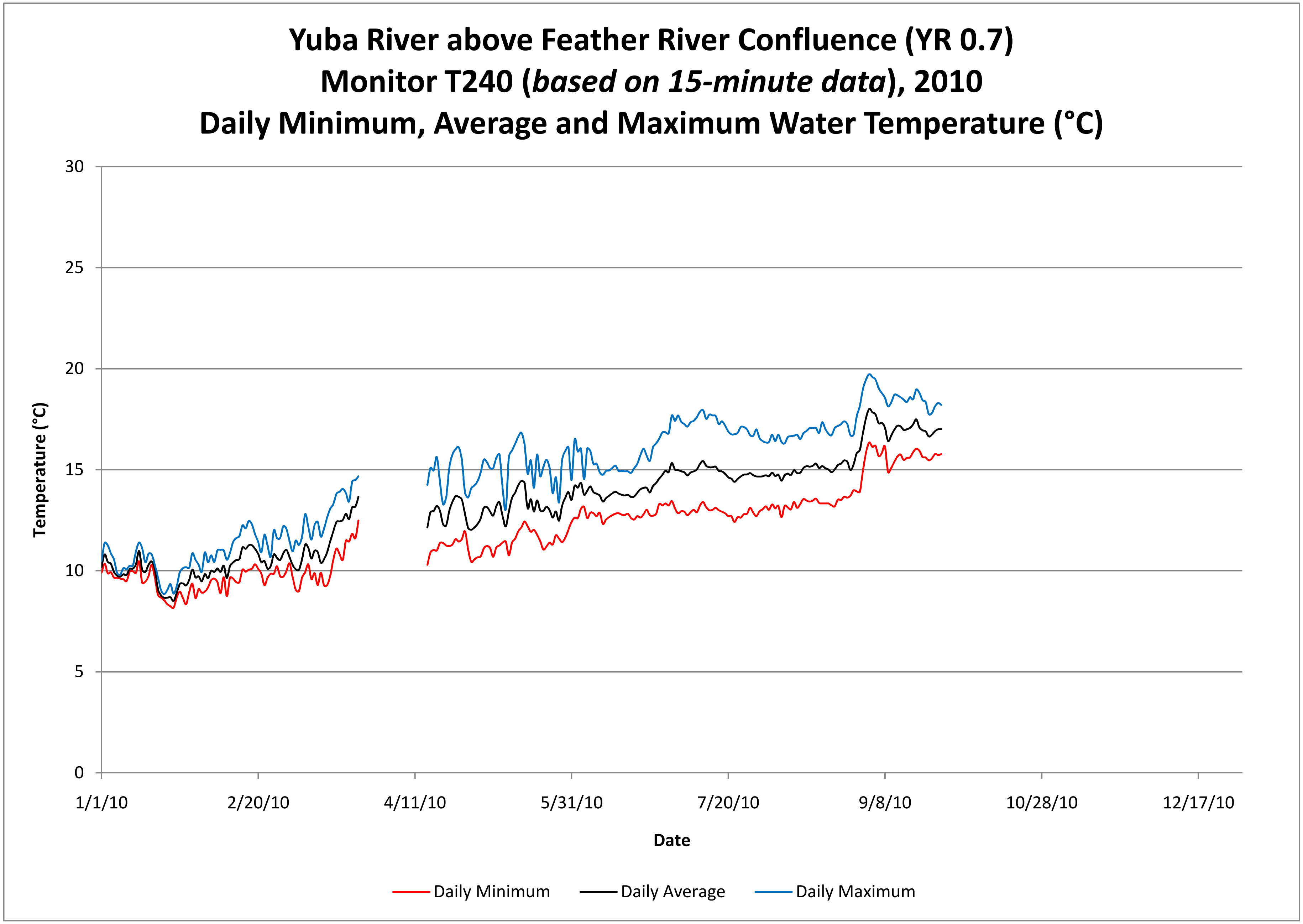

Yuba River above Feather River Confluence (YR 0.7)
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T240, Marysville Airport, Flow Gage 11421000
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
1000
900
800
700
600
500
400
300
200
100
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Yuba River above Feather River Confluence (YR 0.7)
Monitor T240 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Yuba River above Feather River Confluence (YR 0.7)
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T240, Marysville Airport, Flow Gage 11421000
Temperature (°C)
Flow (cfs)
Date
0
5
10
15
20
25
30
35
0
2000
4000
6000
8000
10000
12000
14000
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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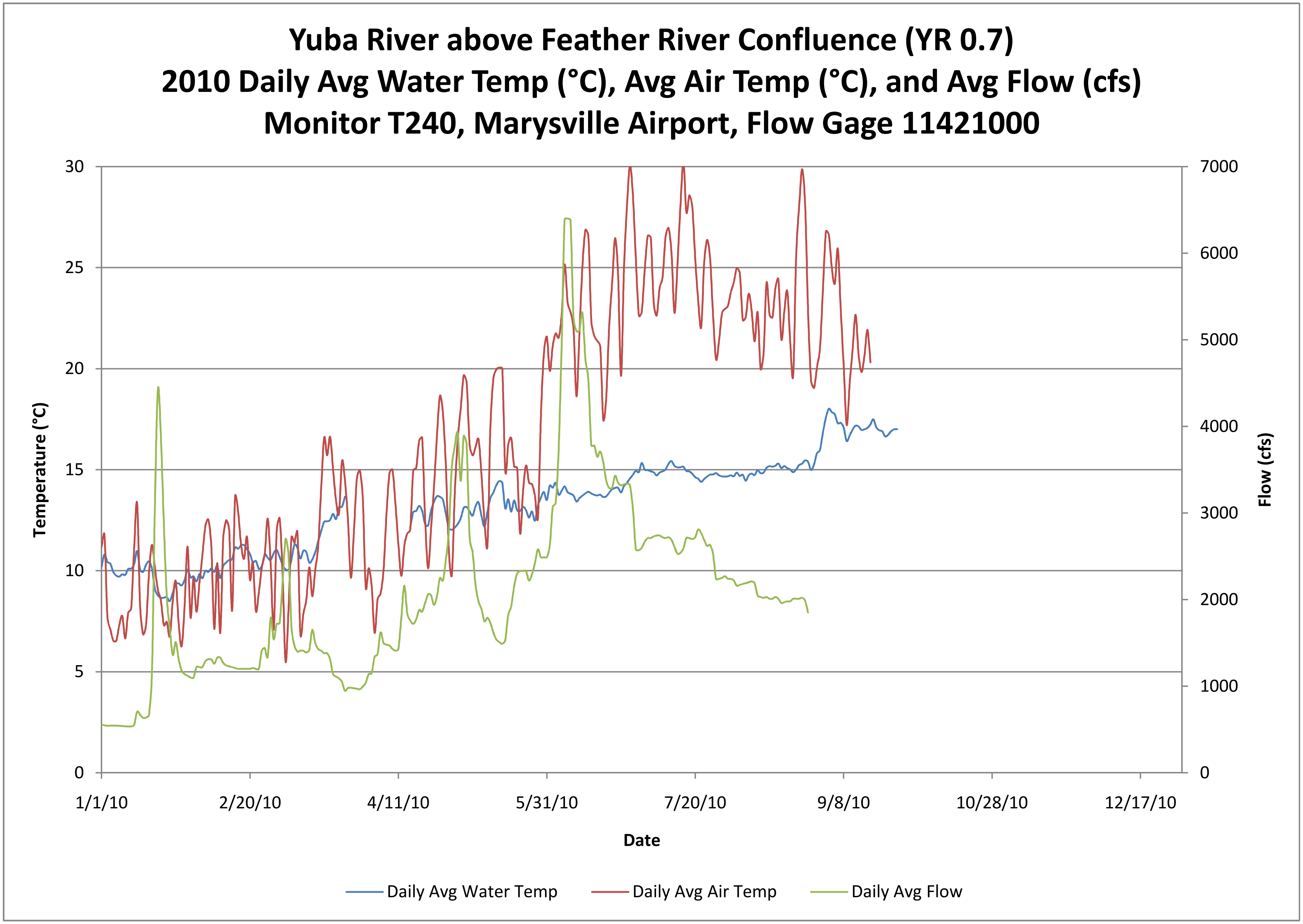
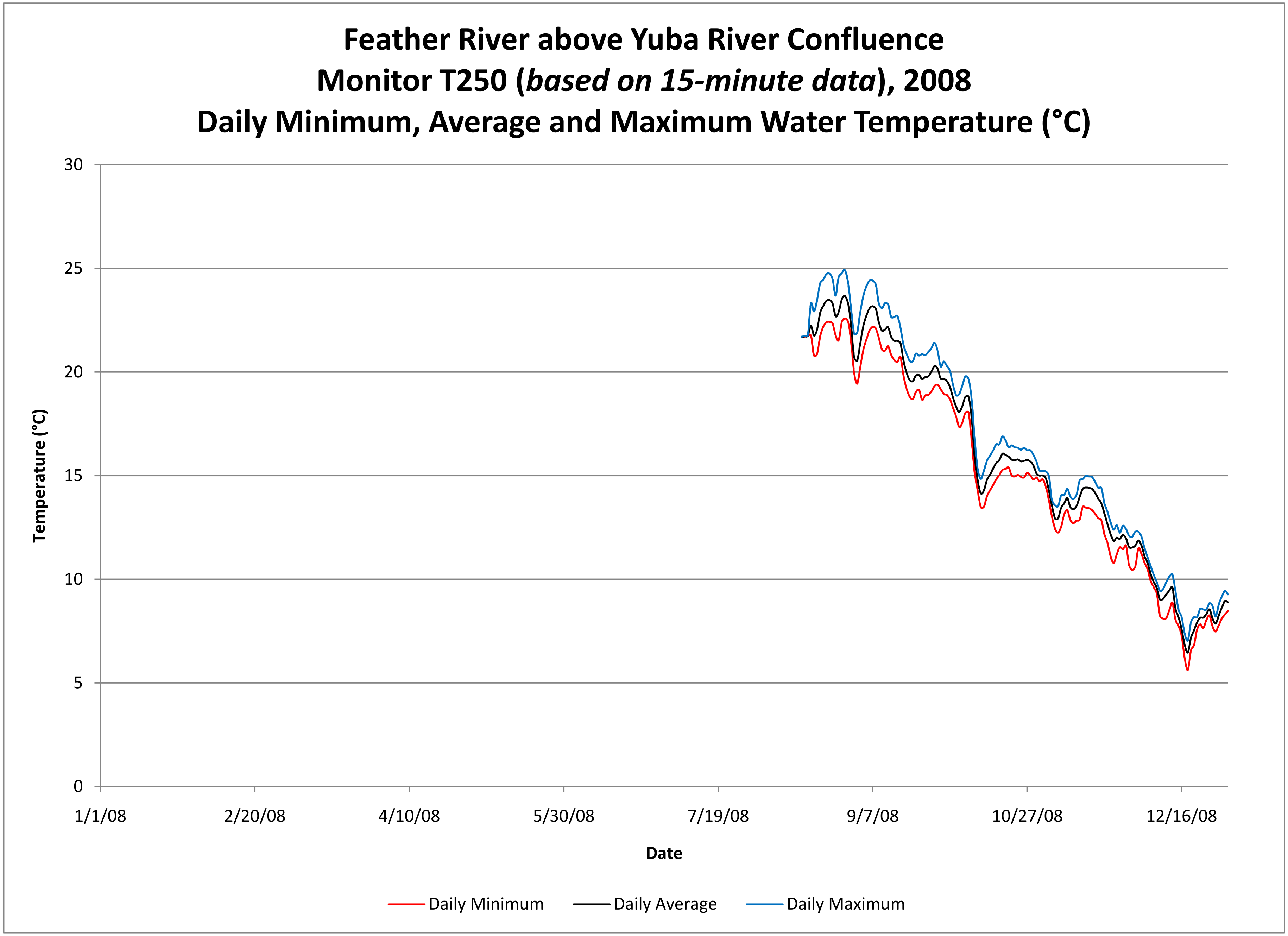
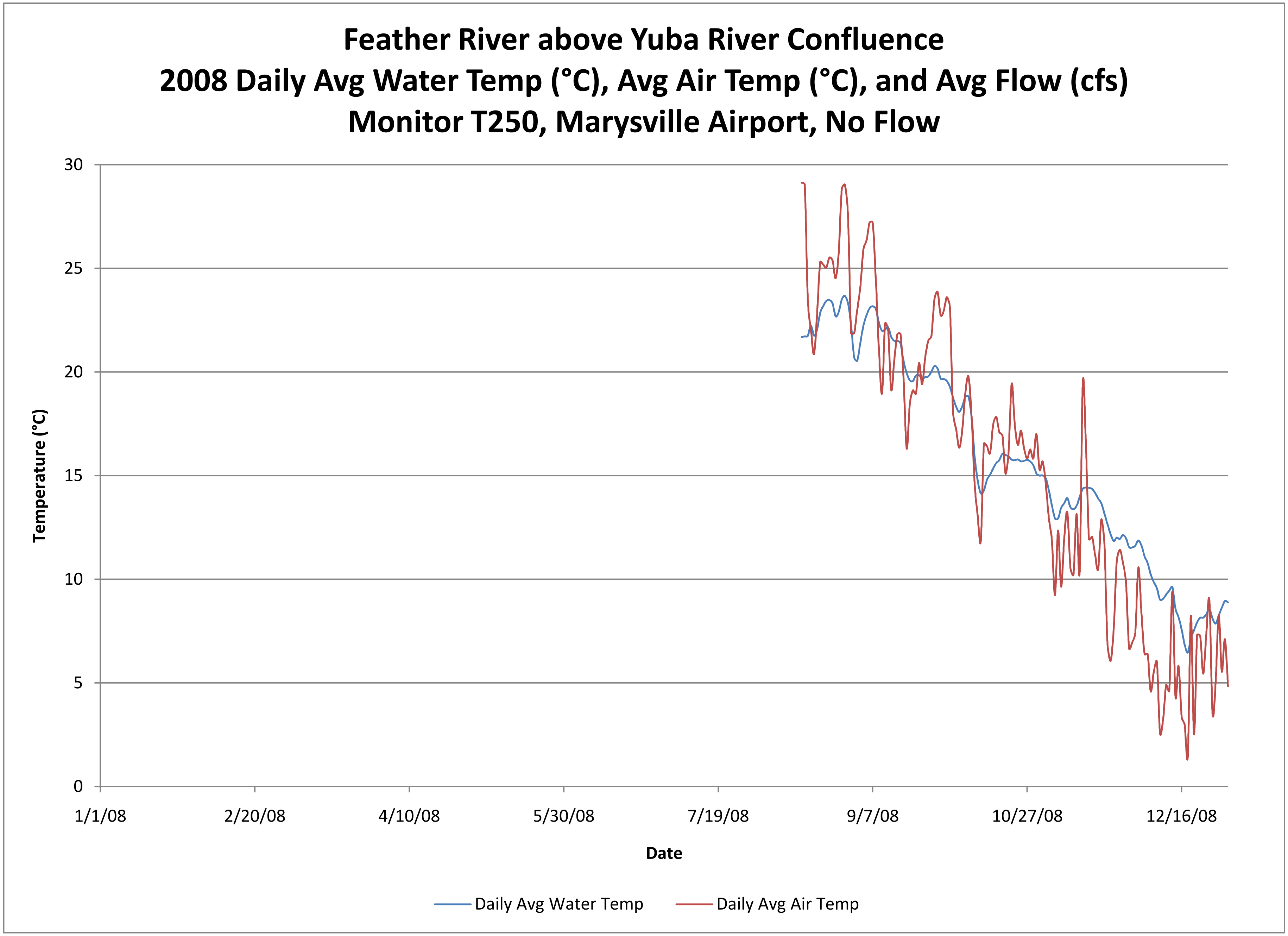
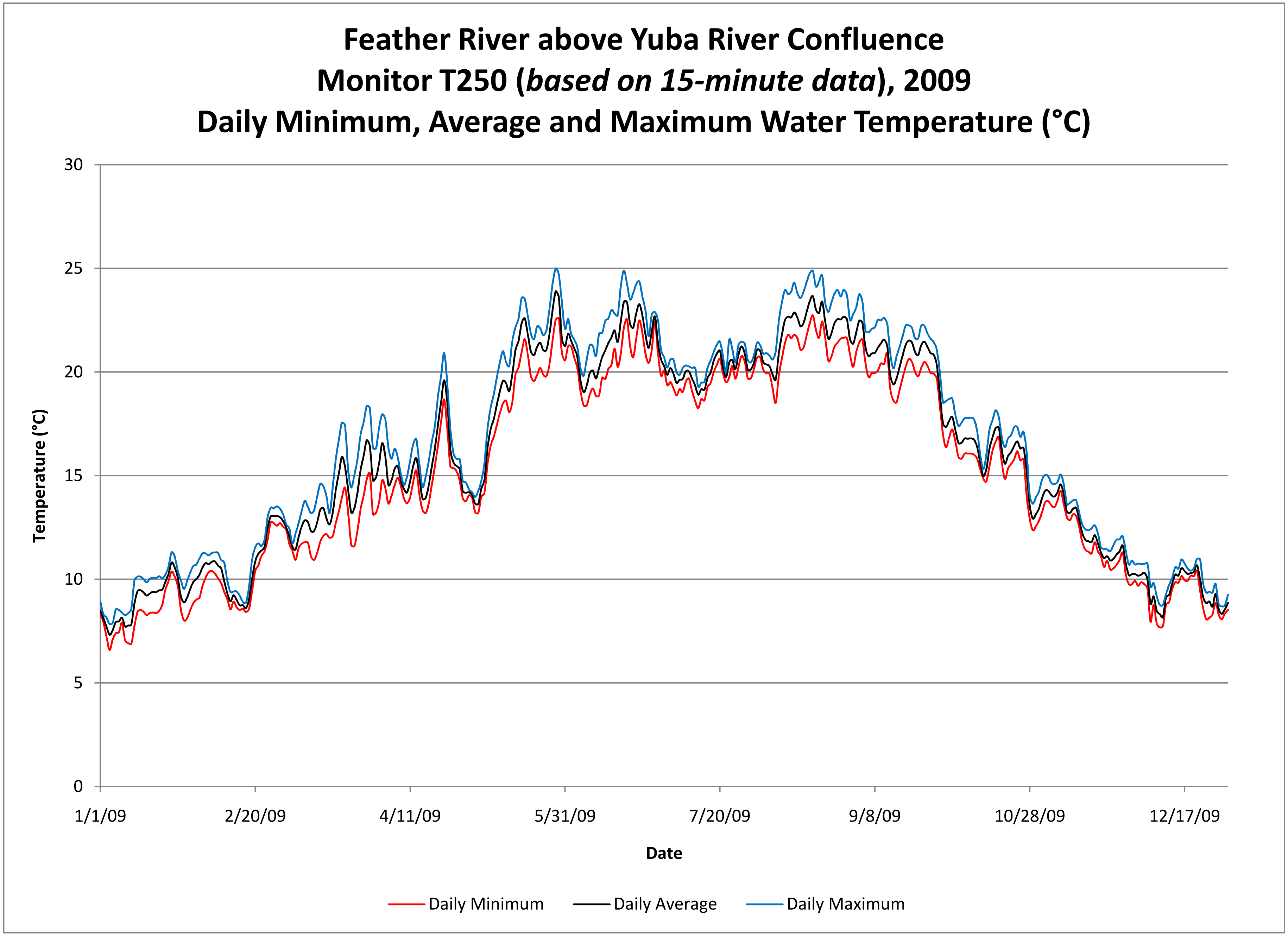

Yuba River above Feather River Confluence (YR 0.7)
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T240, Marysville Airport, Flow Gage 11421000
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
7000
6000
5000
4000
3000
2000
1000
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow


Feather River above Yuba River Confluence
Monitor T250 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


Feather River above Yuba River Confluence
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T250, Marysville Airport, No Flow
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp



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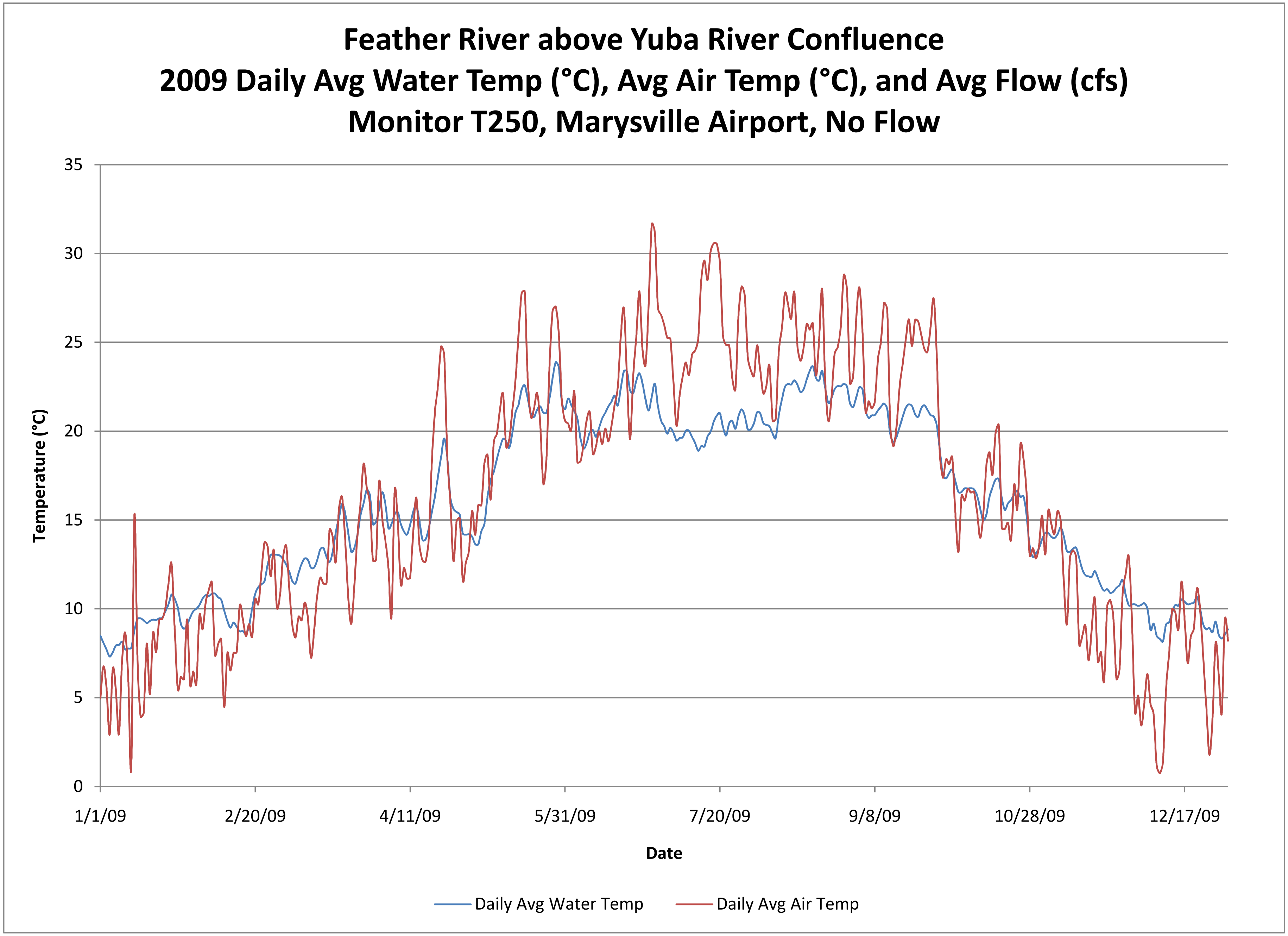

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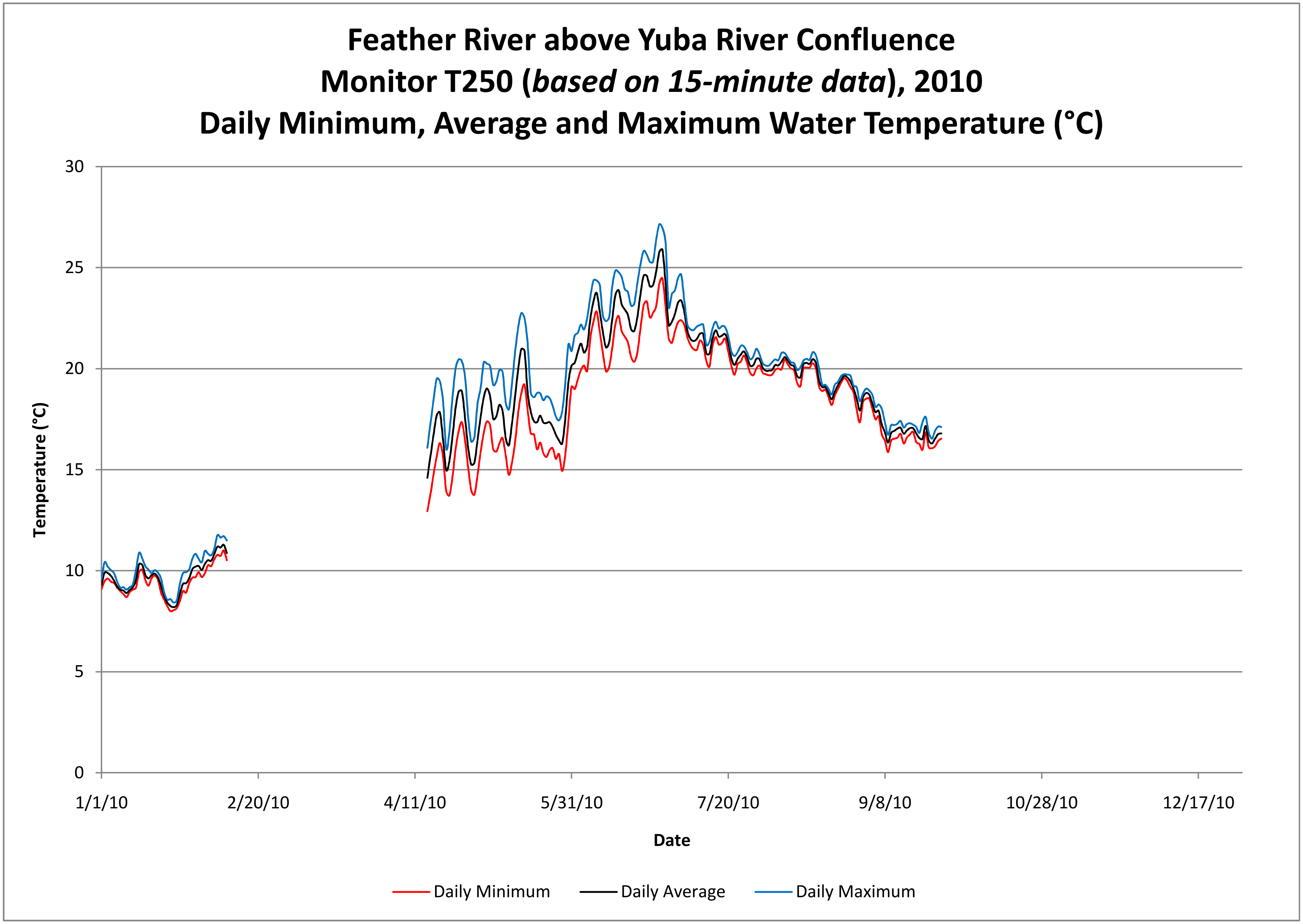
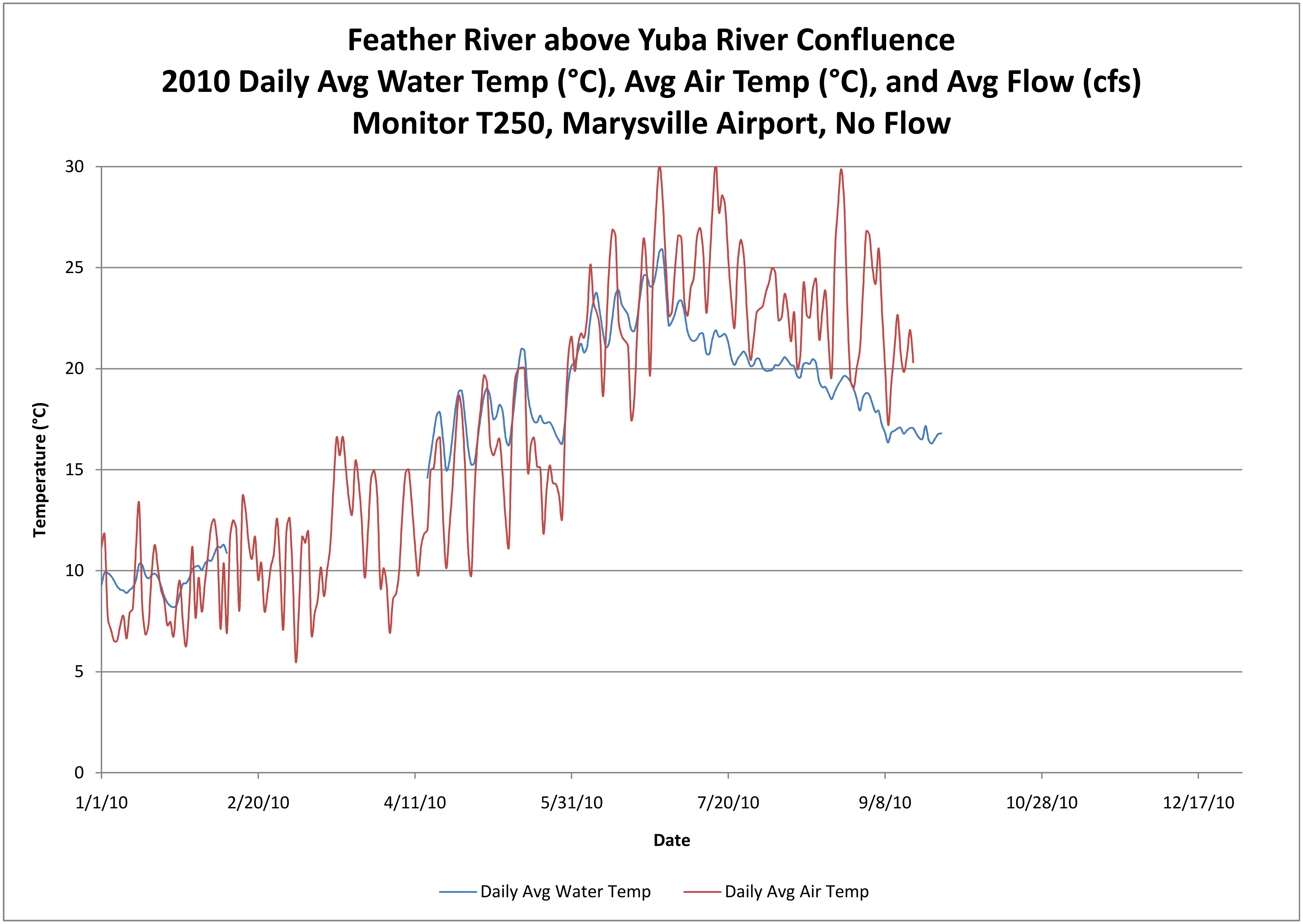

Feather River above Yuba River Confluence
Monitor T250 (*based on 15-minute data*), 2010
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Minimum
Daily Average
Daily Maximum



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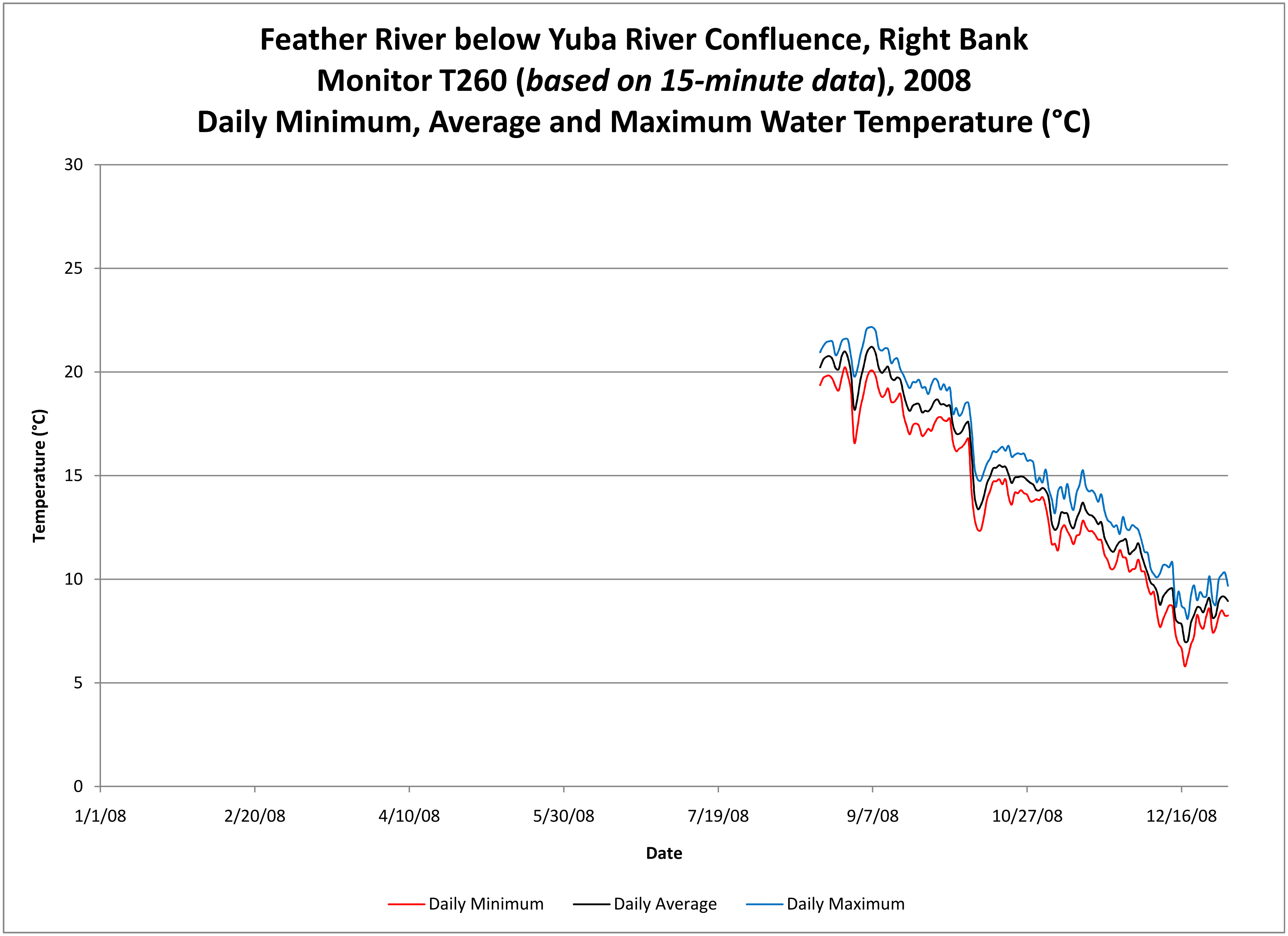

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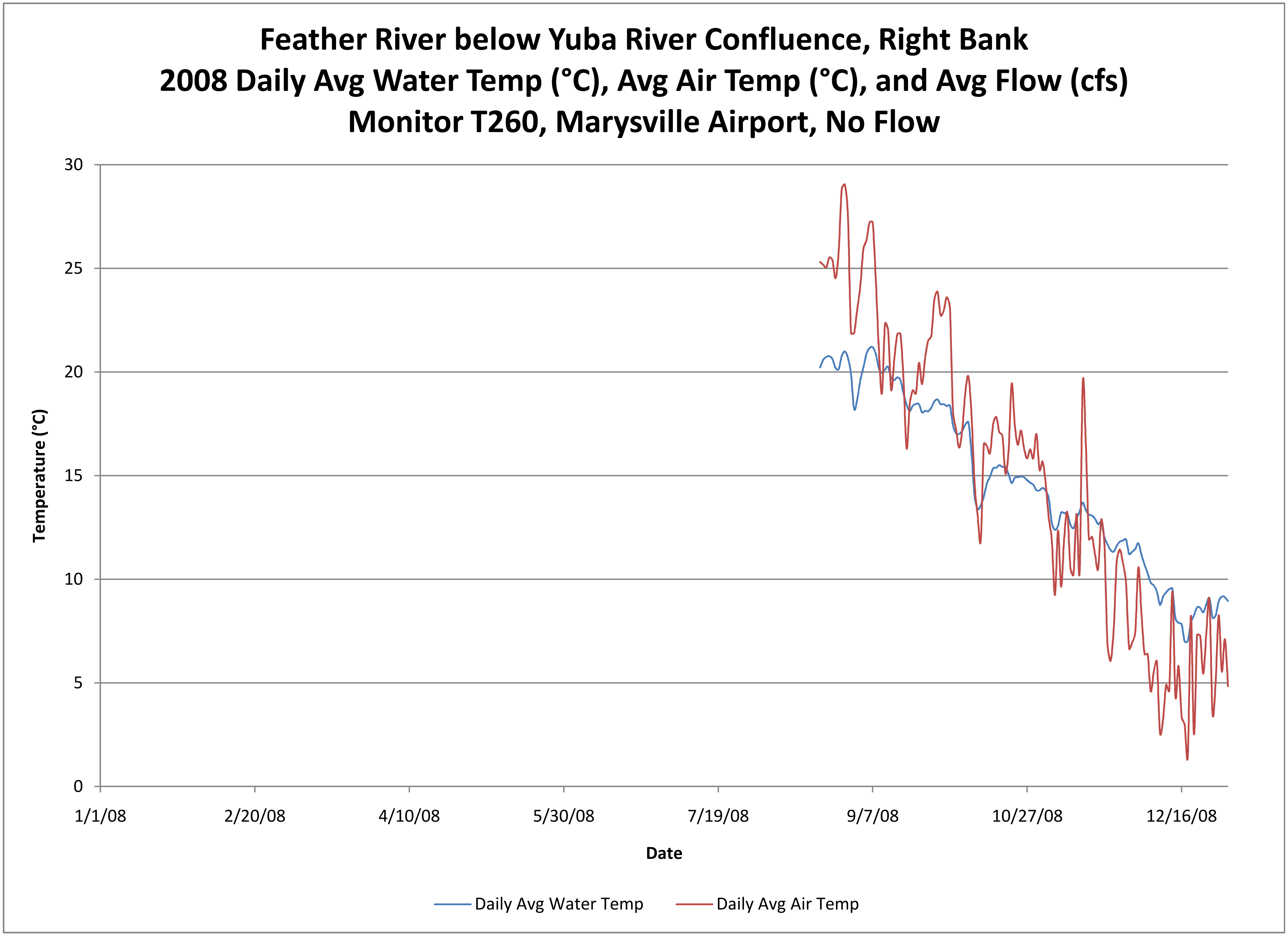

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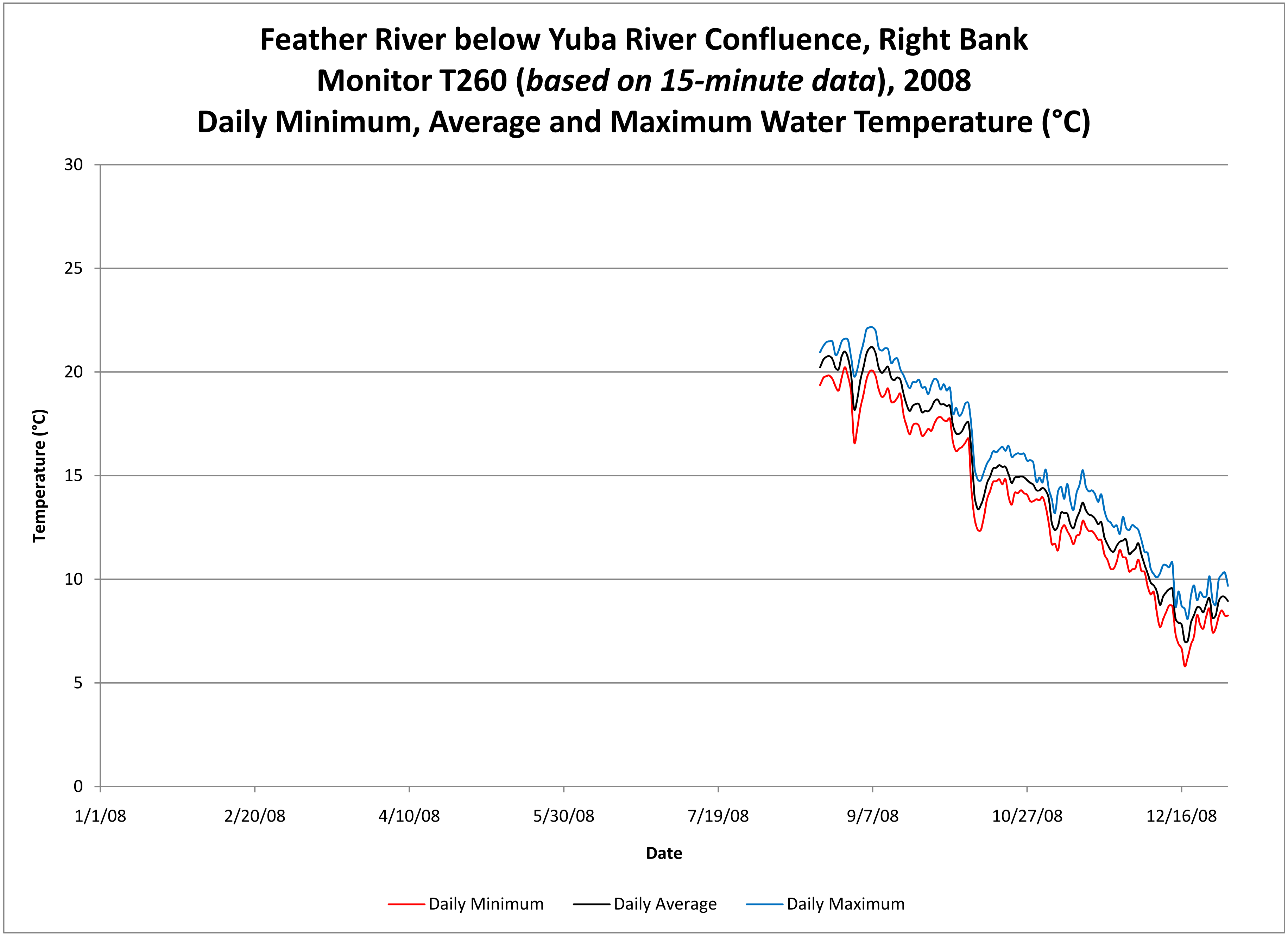
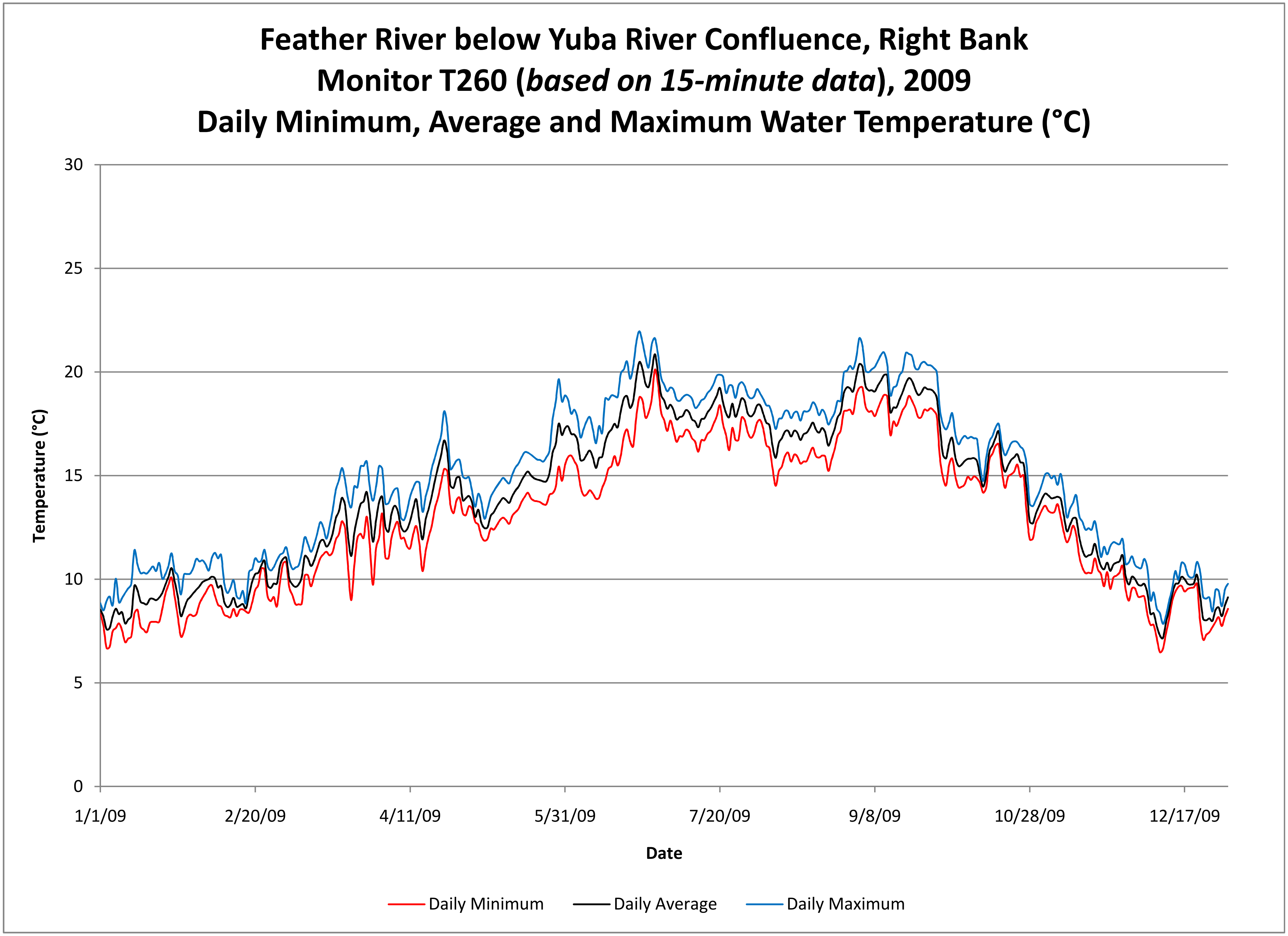
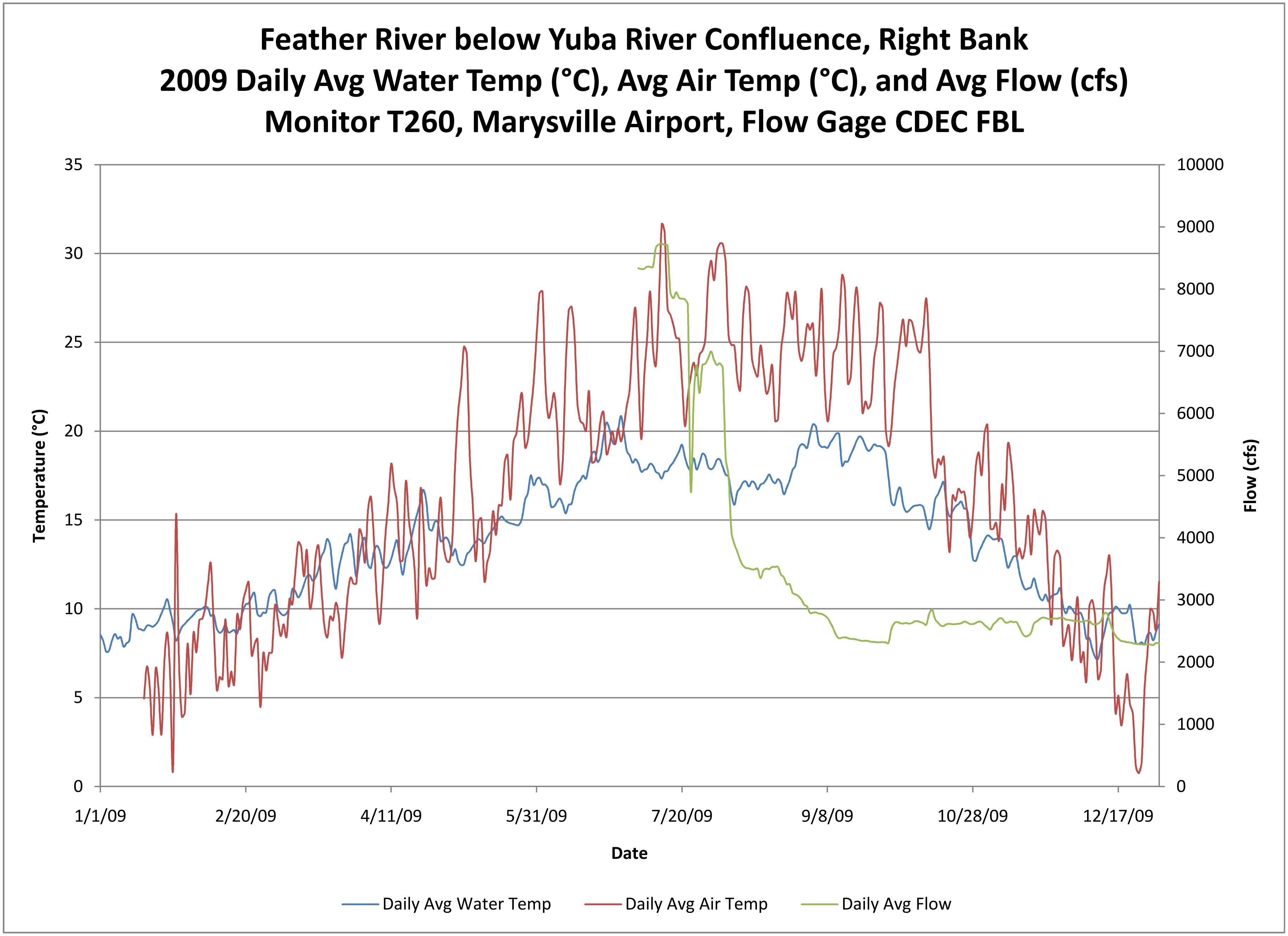
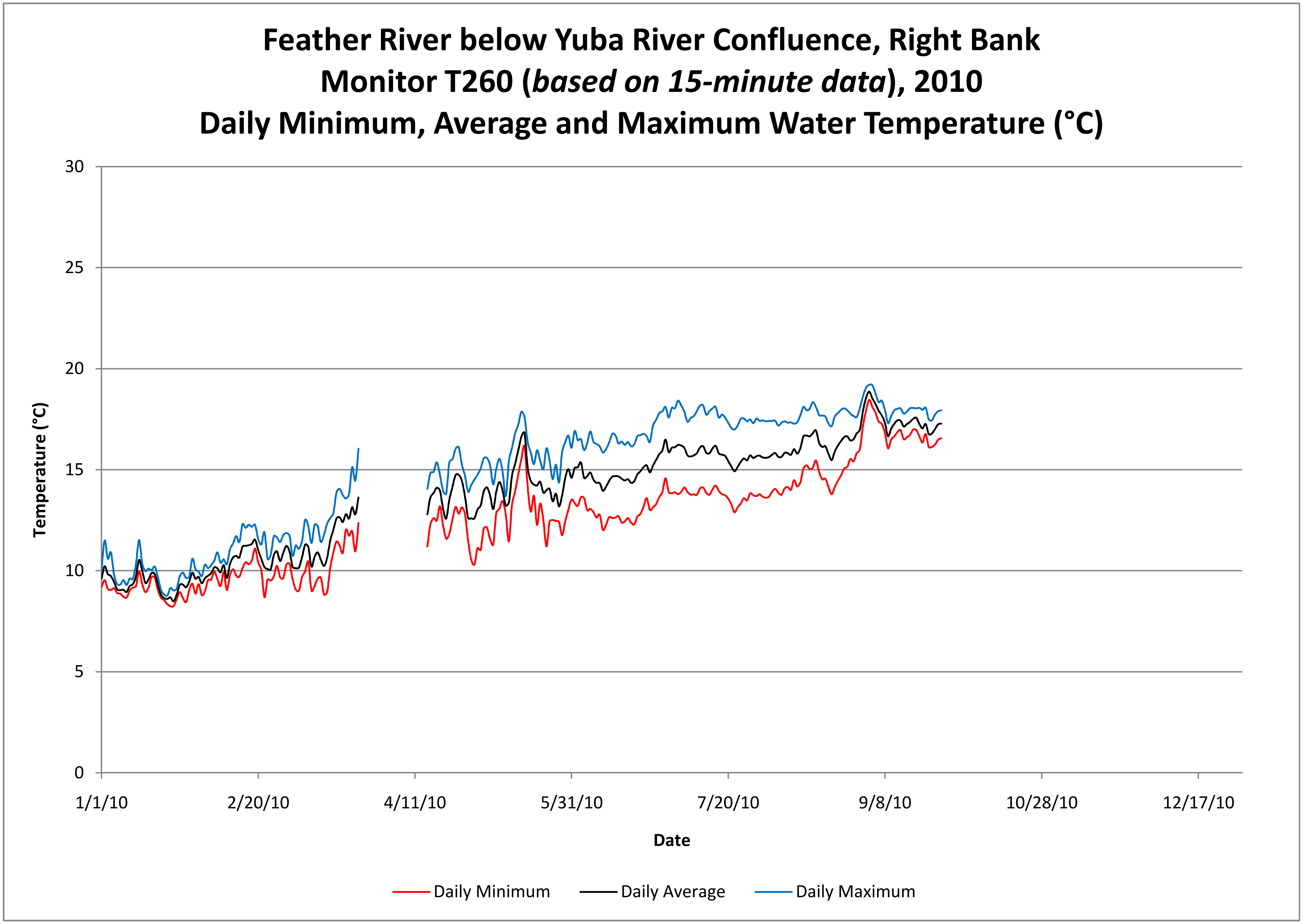

Feather River below Yuba River Confluence, Right Bank
Monitor T260 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


Feather River below Yuba River Confluence, Right Bank
Monitor T260 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Feather River below Yuba River Confluence, Right Bank
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T260, Marysville Airport, Flow Gage CDEC FBL
Temperature (°C)
0
5
10
15
20
25
30
35
Flow (cfs)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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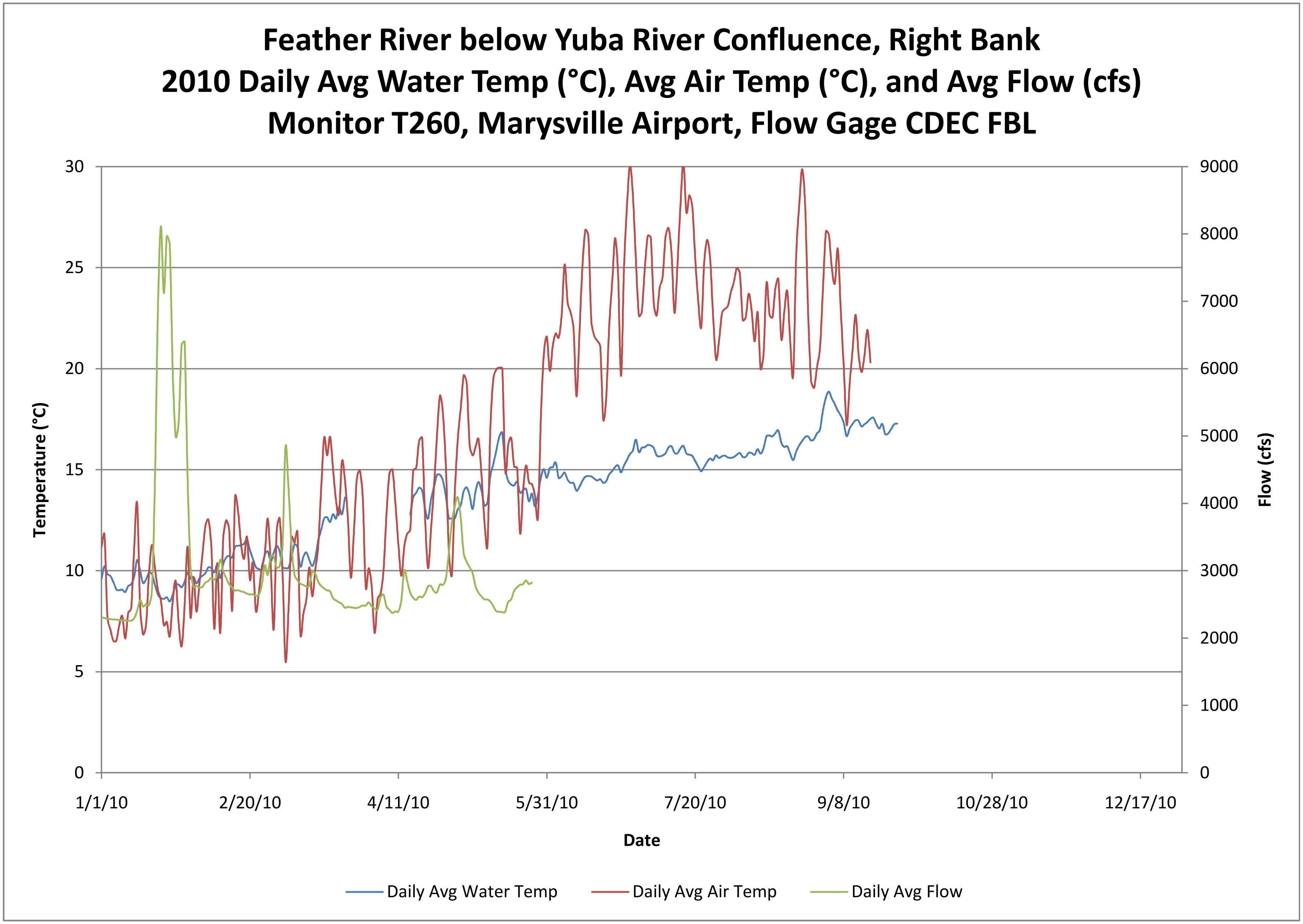

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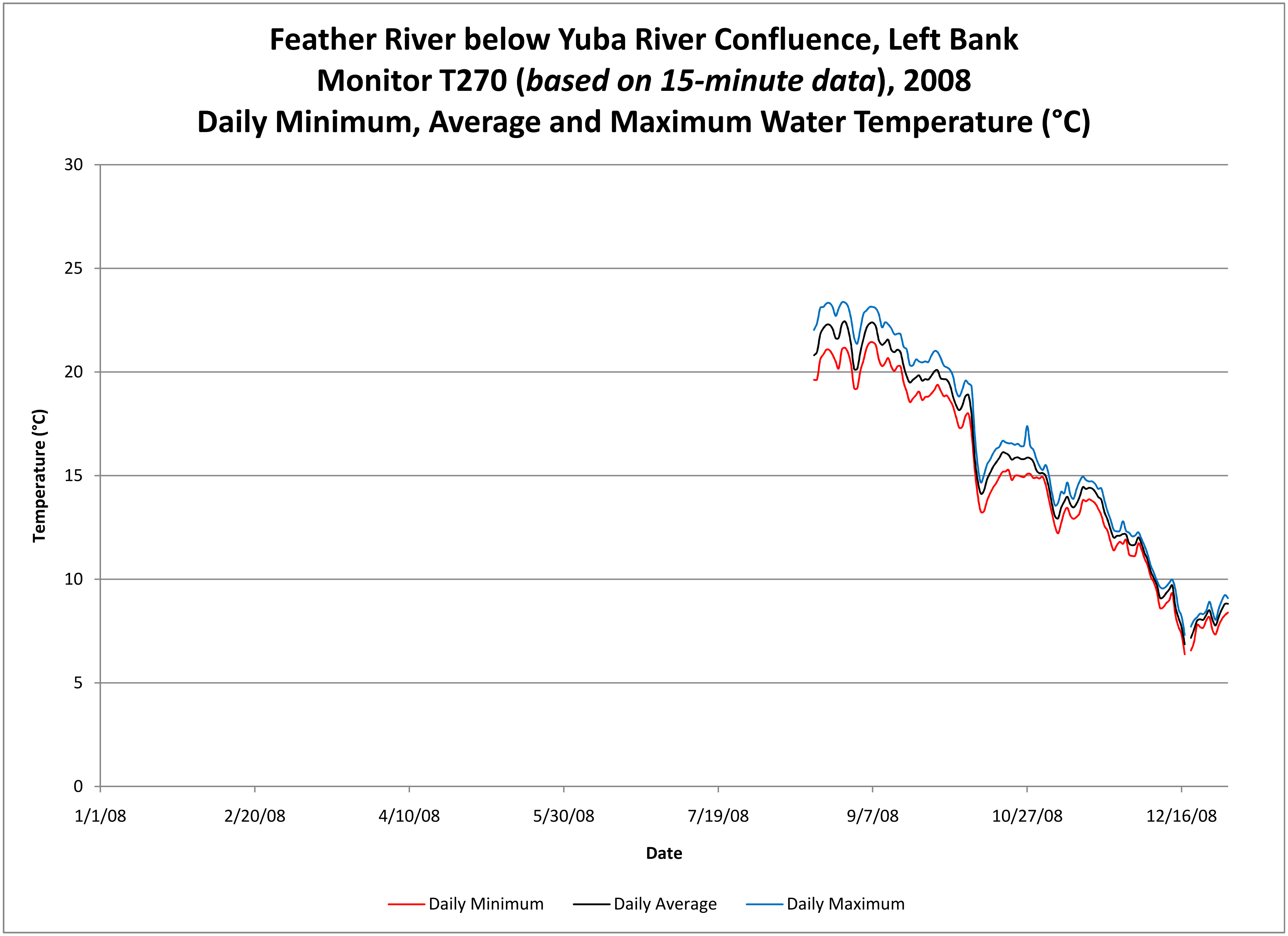
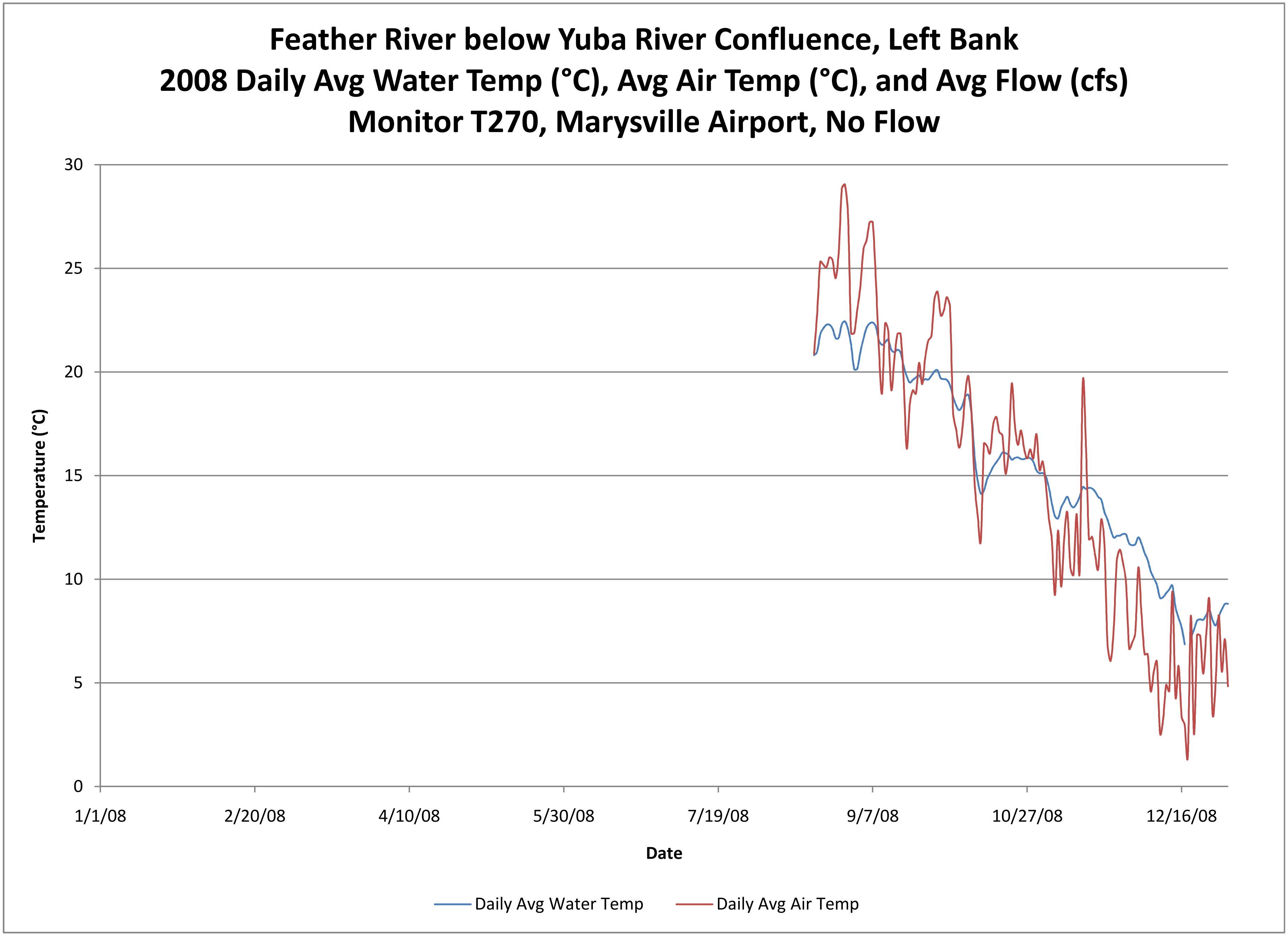
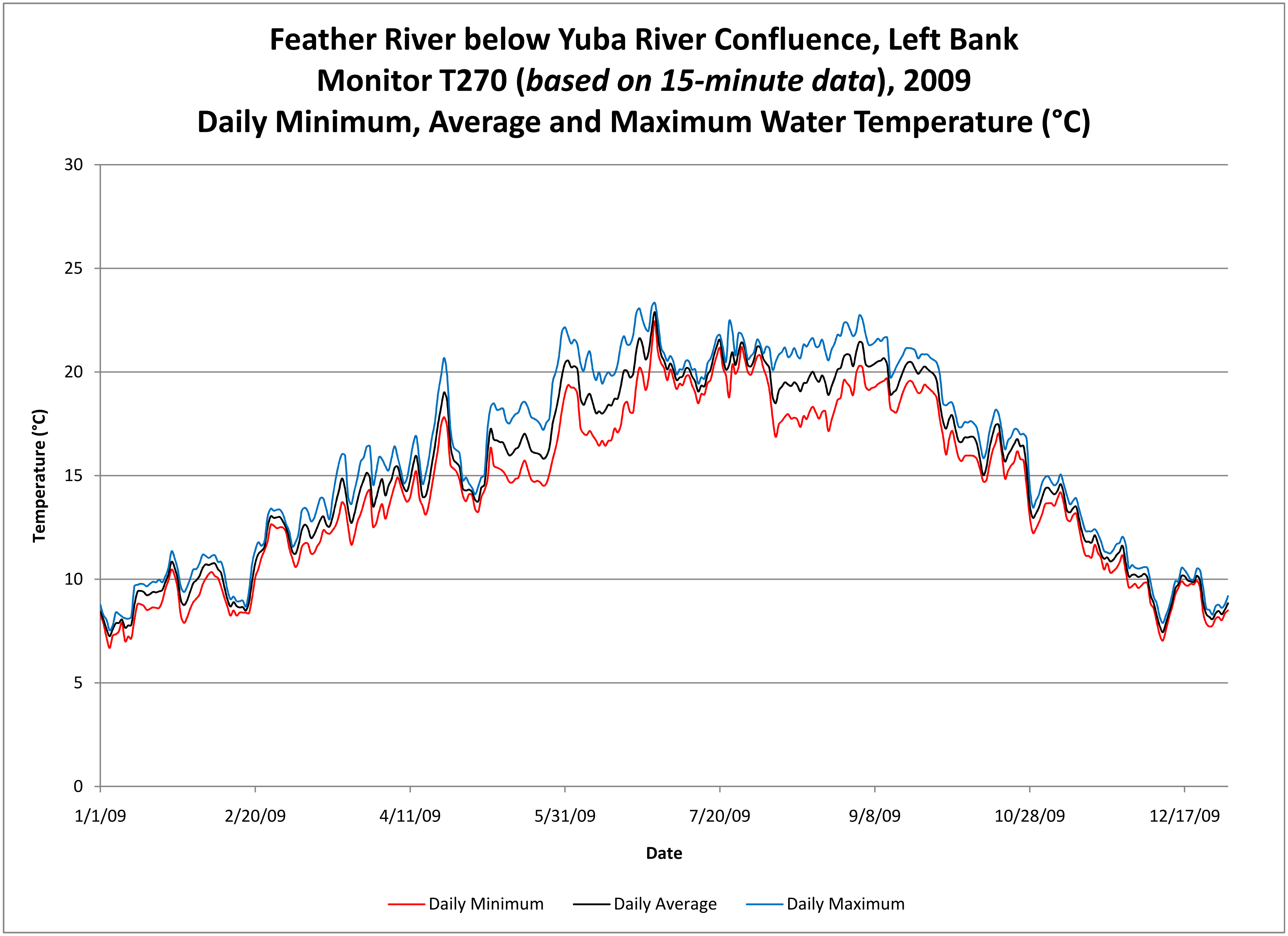
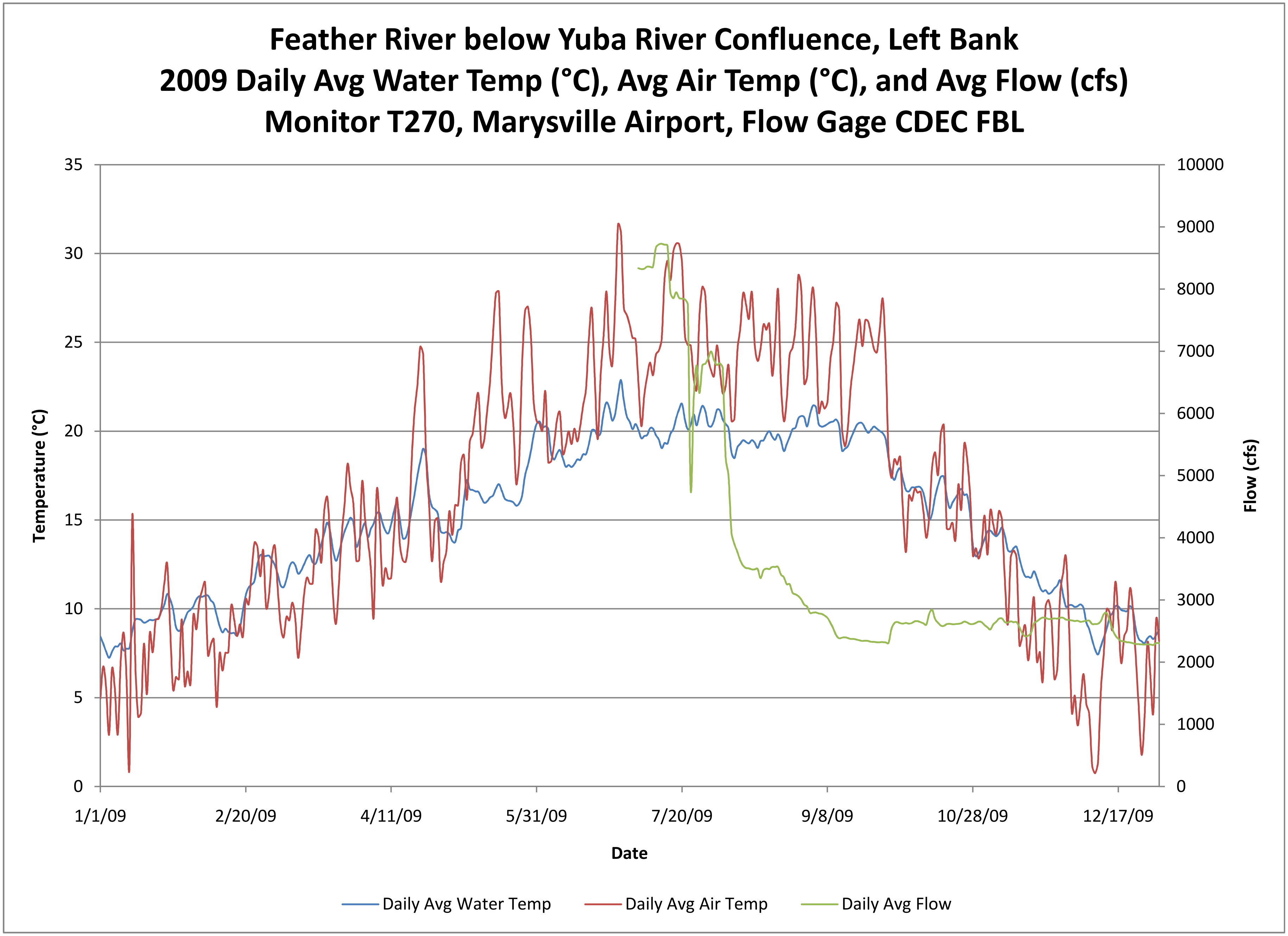
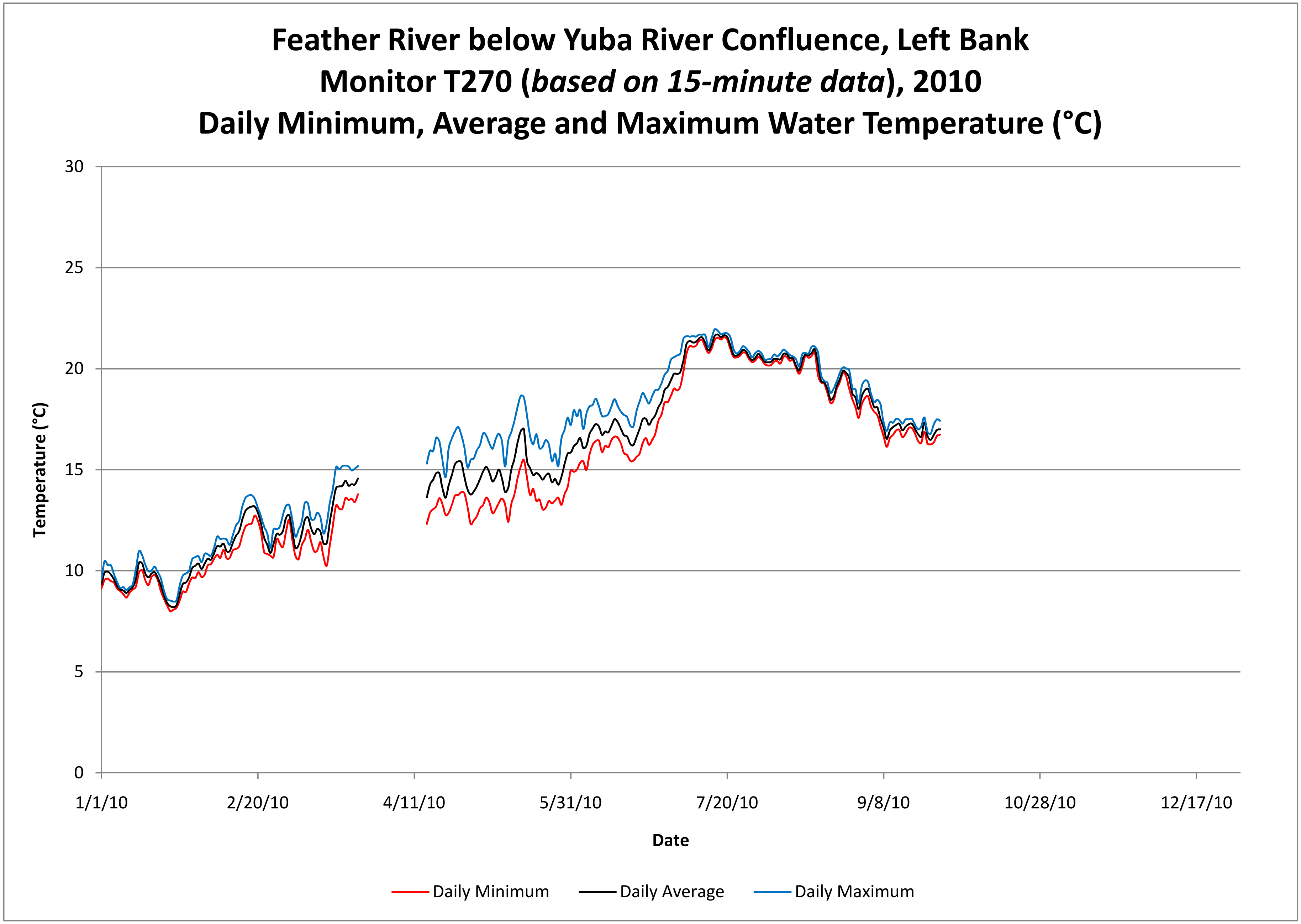

Feather River below Yuba River Confluence, Left Bank
Monitor T270 (*based on 15-minute data*), 2008
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Minimum
Daily Average
Daily Maximum


Feather River below Yuba River Confluence, Left Bank
2008 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T270, Marysville Airport, No Flow
Temperature (°C)
30
25
20
15
10
5
0
1/1/08
2/20/08
4/10/08
5/30/08
7/19/08
9/7/08
10/27/08
12/16/08
Date
Daily Avg Water Temp
Daily Avg Air Temp


Feather River below Yuba River Confluence, Left Bank
Monitor T270 (*based on 15-minute data*), 2009
Daily Minimum, Average and Maximum Water Temperature (°C)
Temperature (°C)
30
25
20
15
10
5
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Minimum
Daily Average
Daily Maximum


Feather River below Yuba River Confluence, Left Bank
2009 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T270, Marysville Airport, Flow Gage CDEC FBL
Temperature (°C)
35
30
25
20
15
10
5
0
Flow (cfs)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/09
2/20/09
4/11/09
5/31/09
7/20/09
9/8/09
10/28/09
12/17/09
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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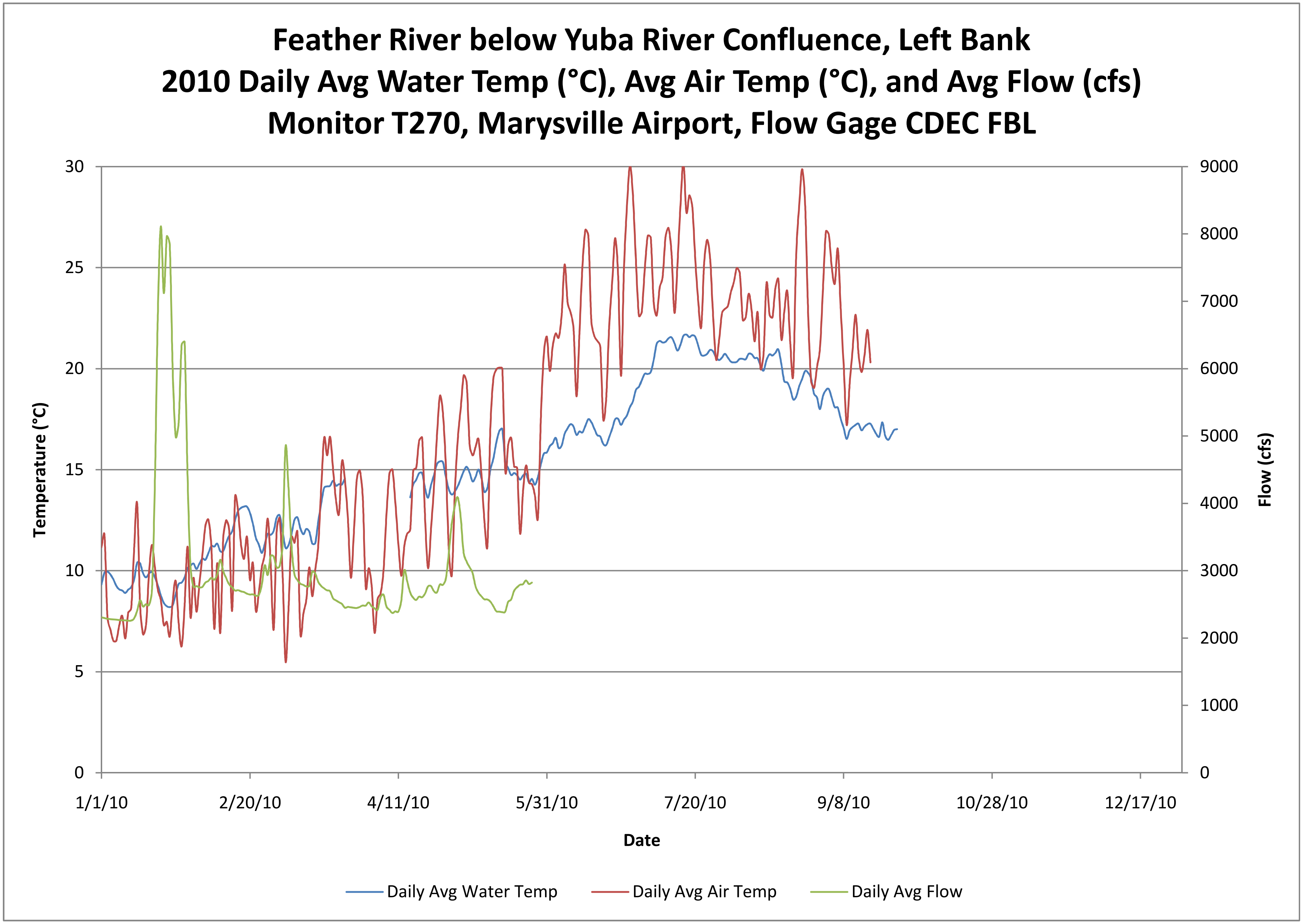
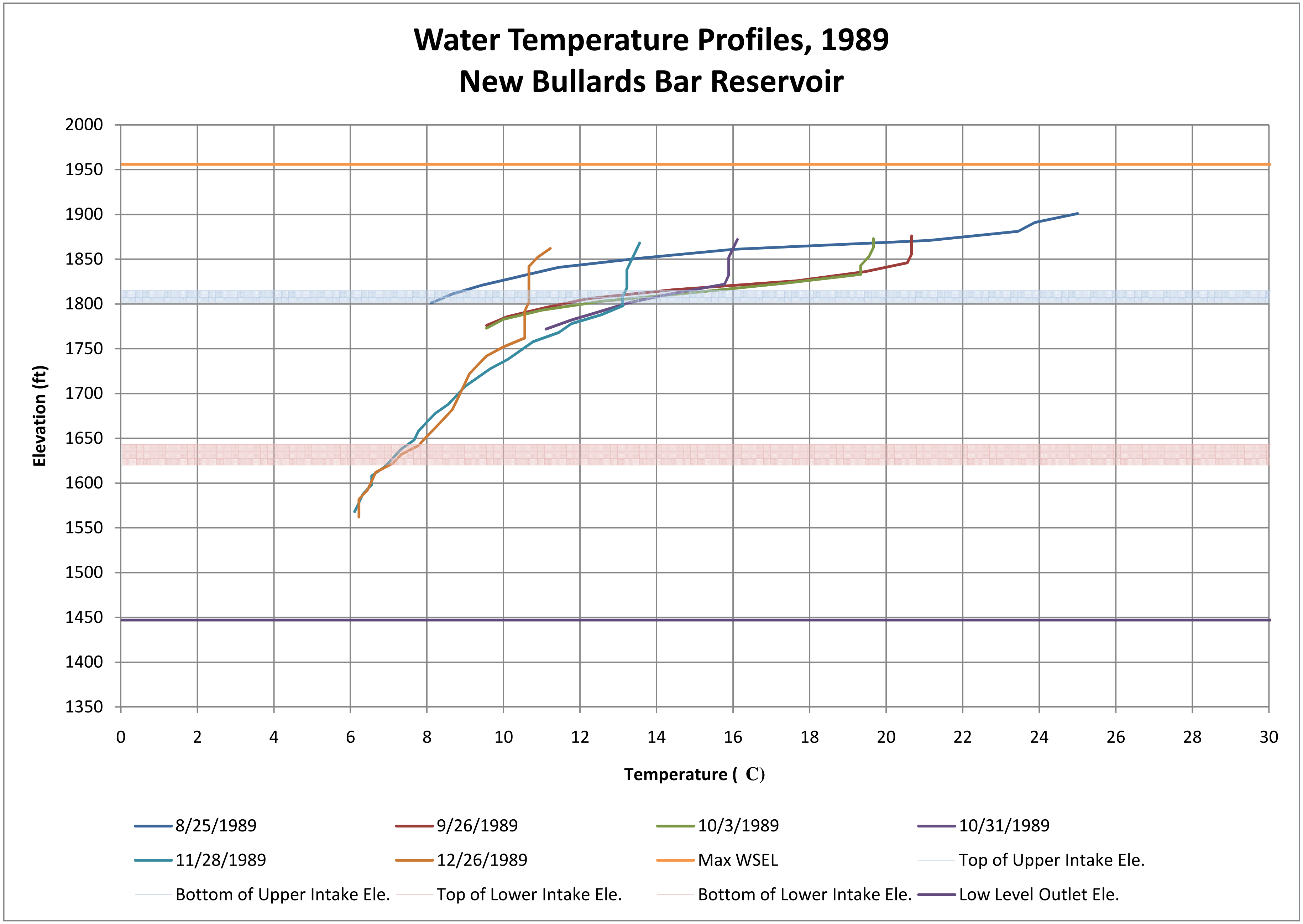

Feather River below Yuba River Confluence, Left Bank
2010 Daily Avg Water Temp (°C), Avg Air Temp (°C), and Avg Flow (cfs)
Monitor T270, Marysville Airport, Flow Gage CDEC FBL
Temperature (°C)
30
25
20
15
10
5
0
Flow (cfs)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/10
2/20/10
4/11/10
5/31/10
7/20/10
9/8/10
10/28/10
12/17/10
Date
Daily Avg Water Temp
Daily Avg Air Temp
Daily Avg Flow



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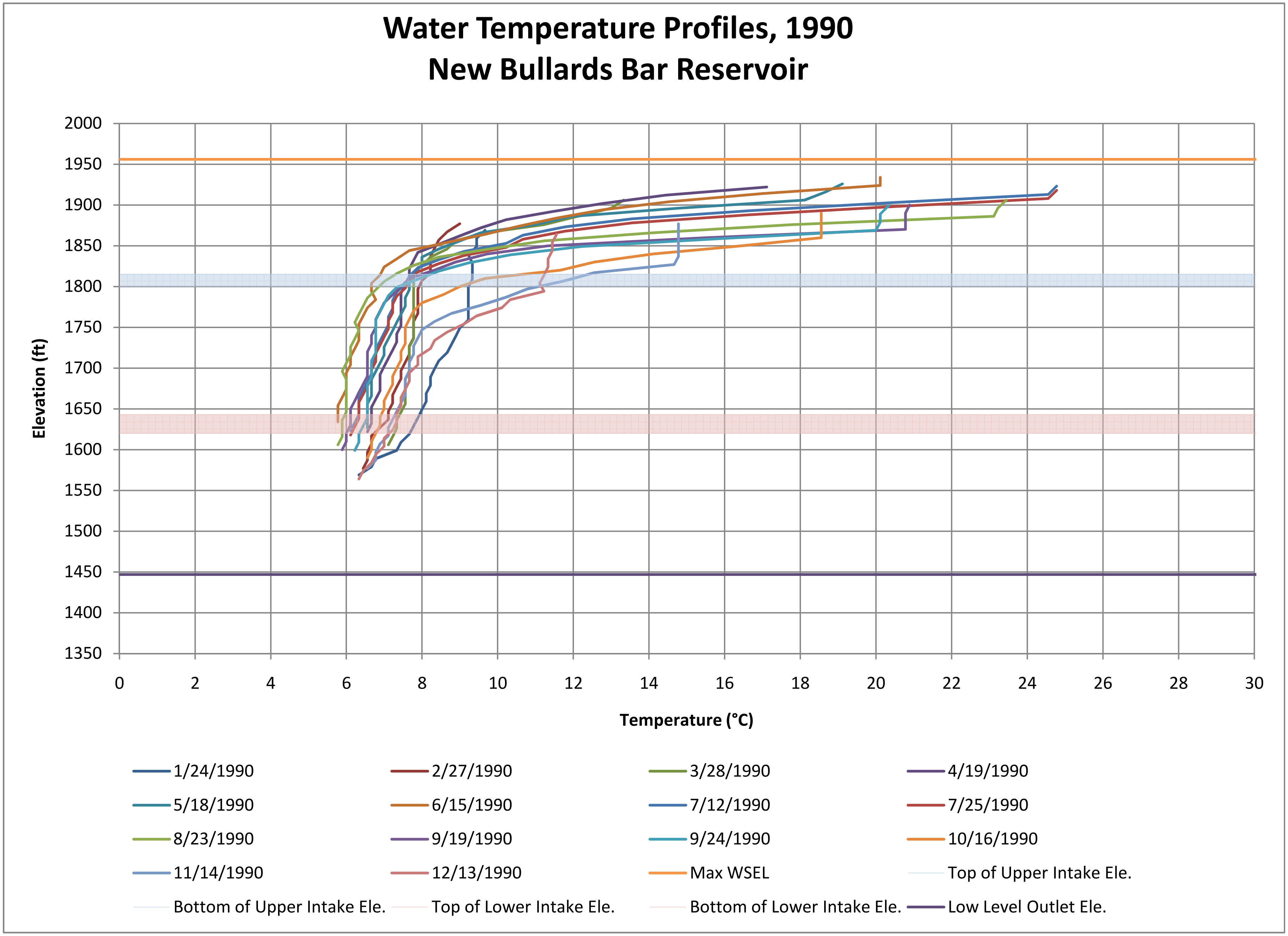
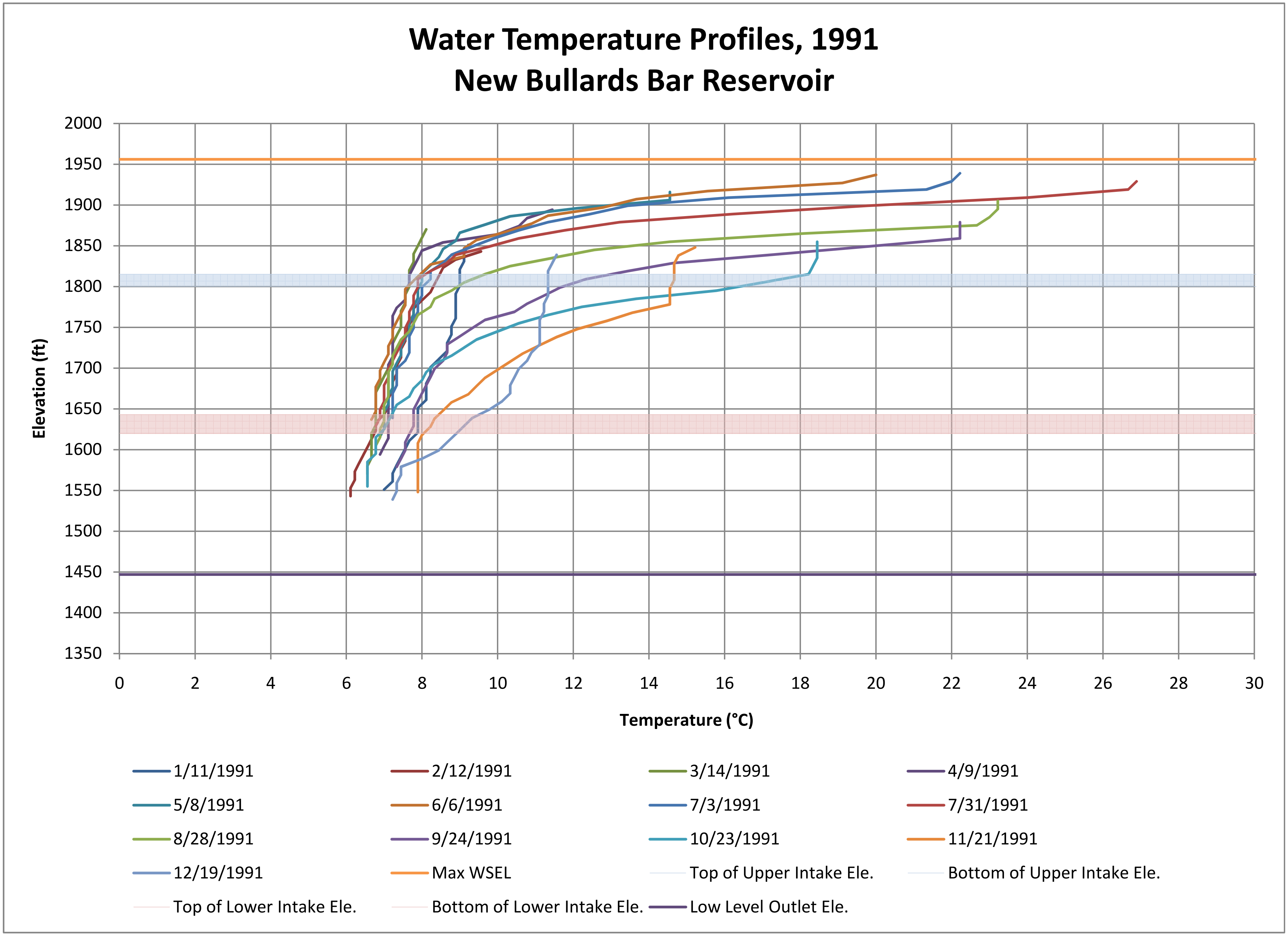
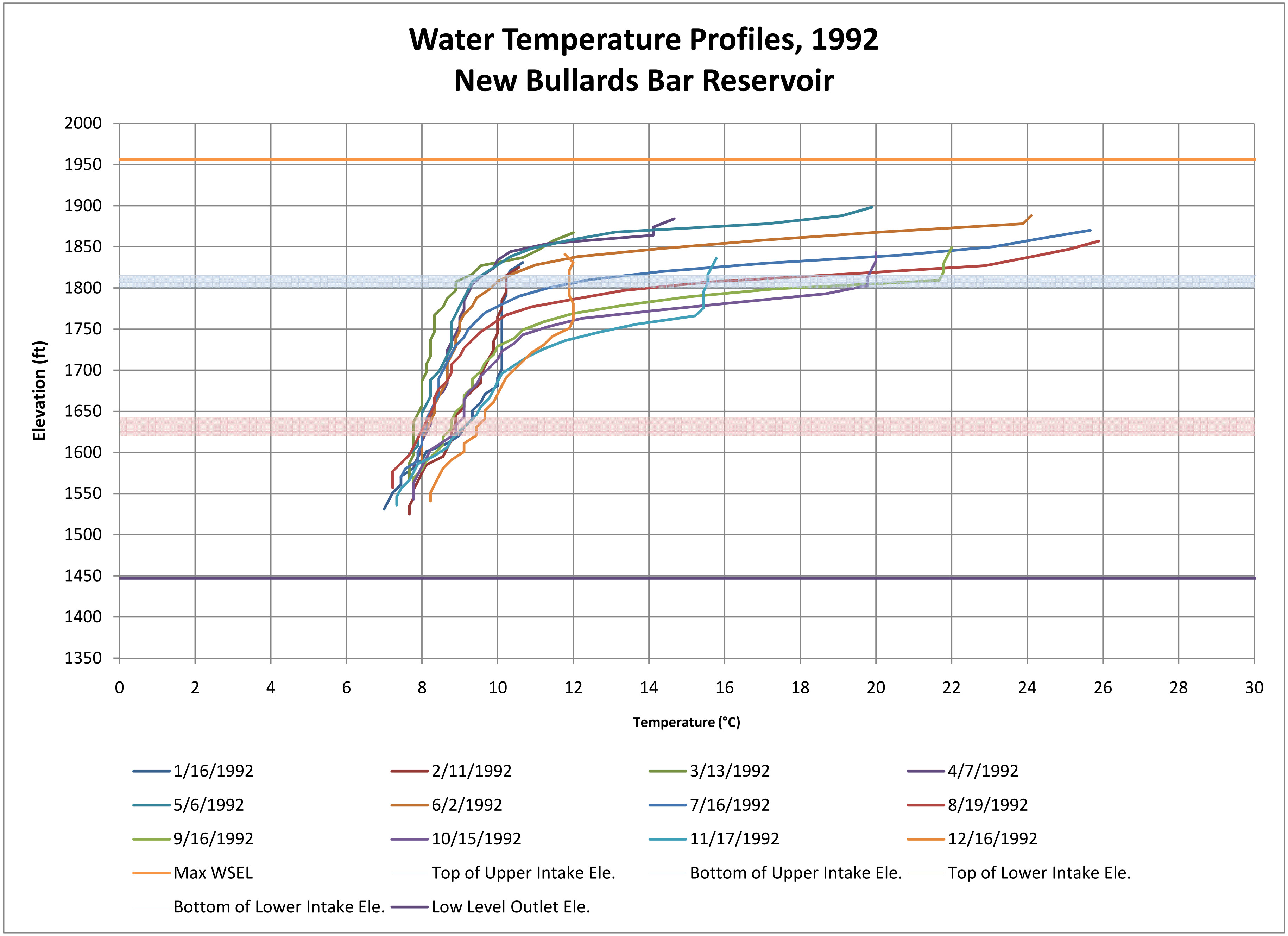
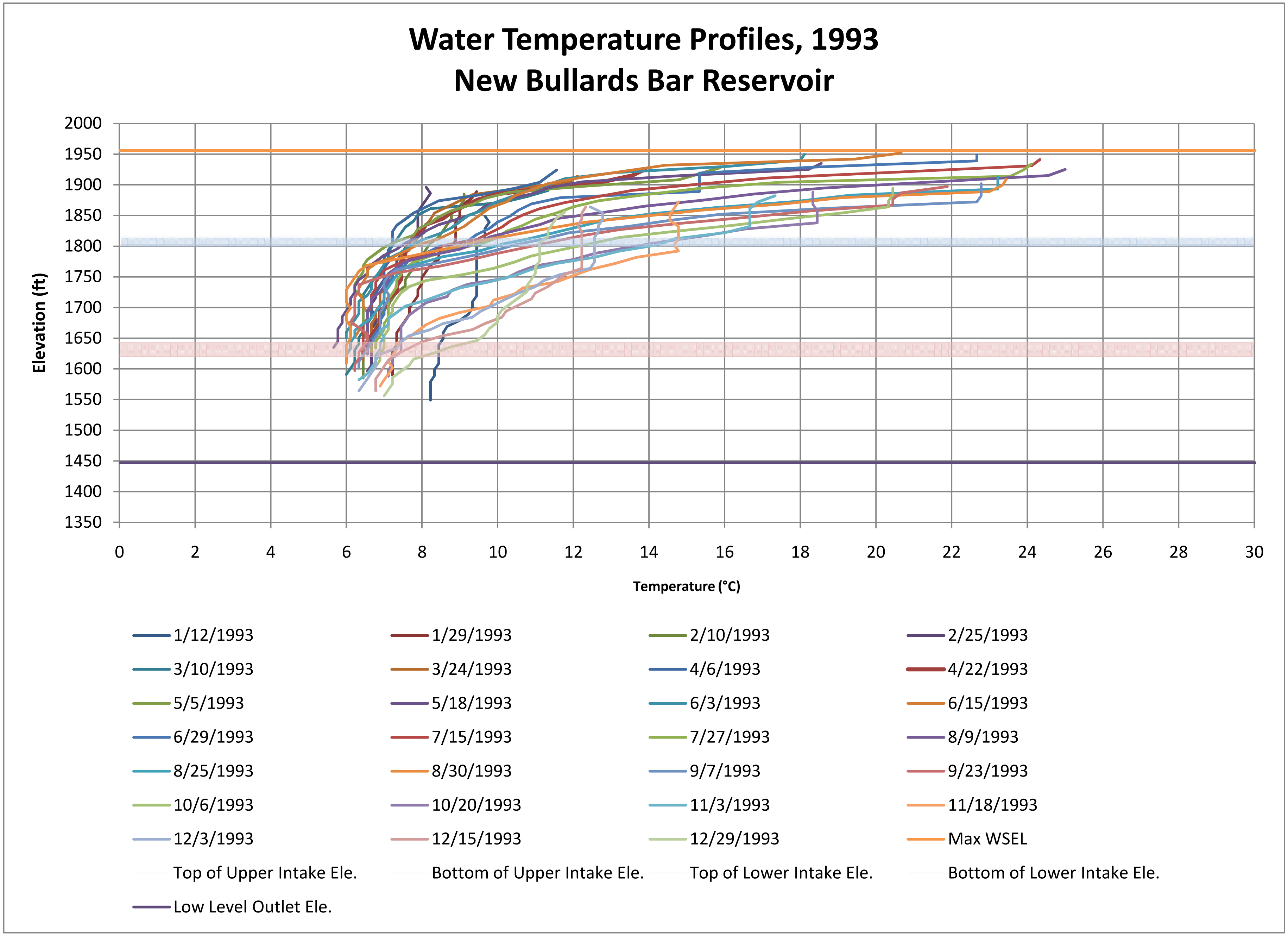
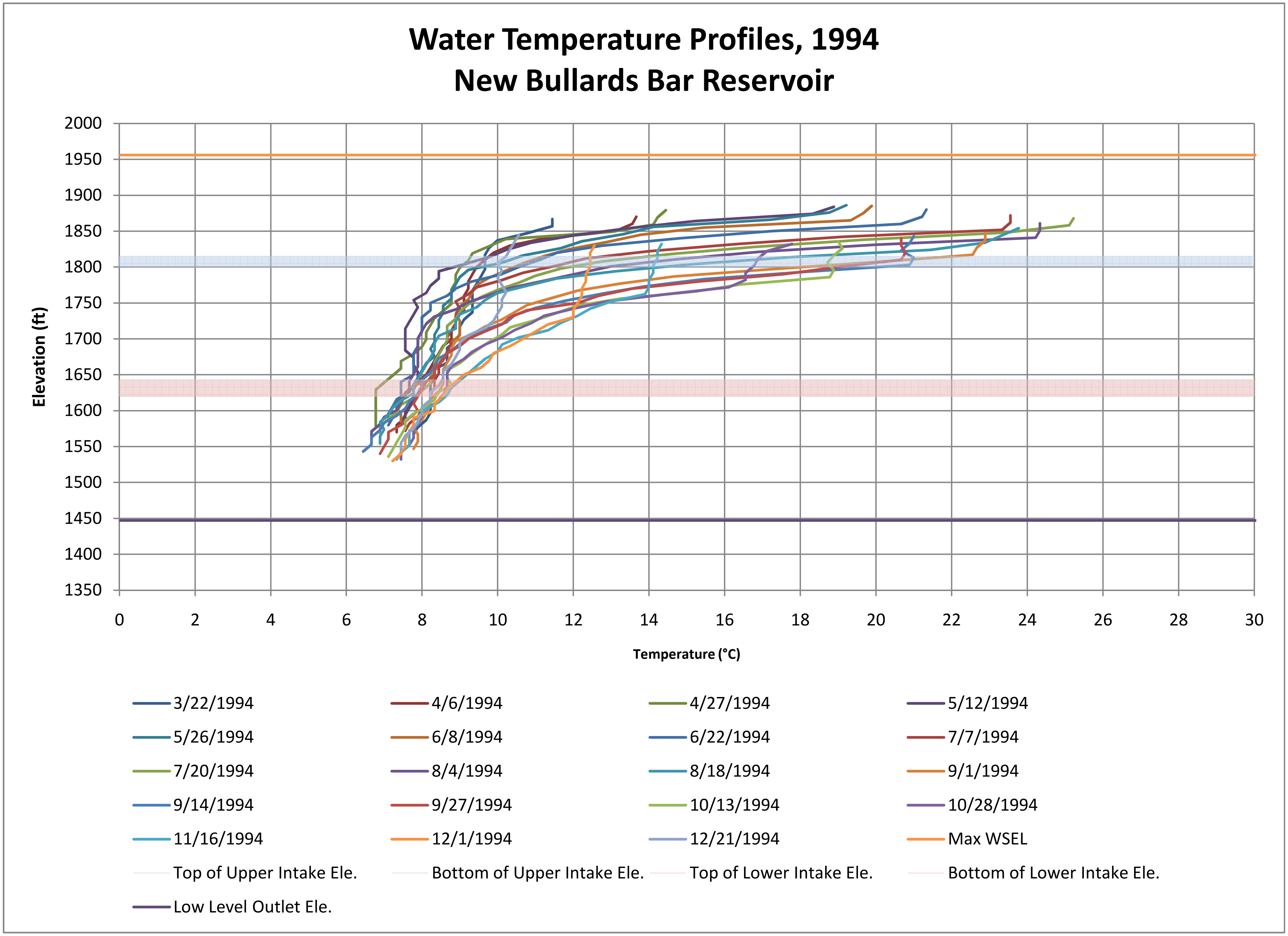
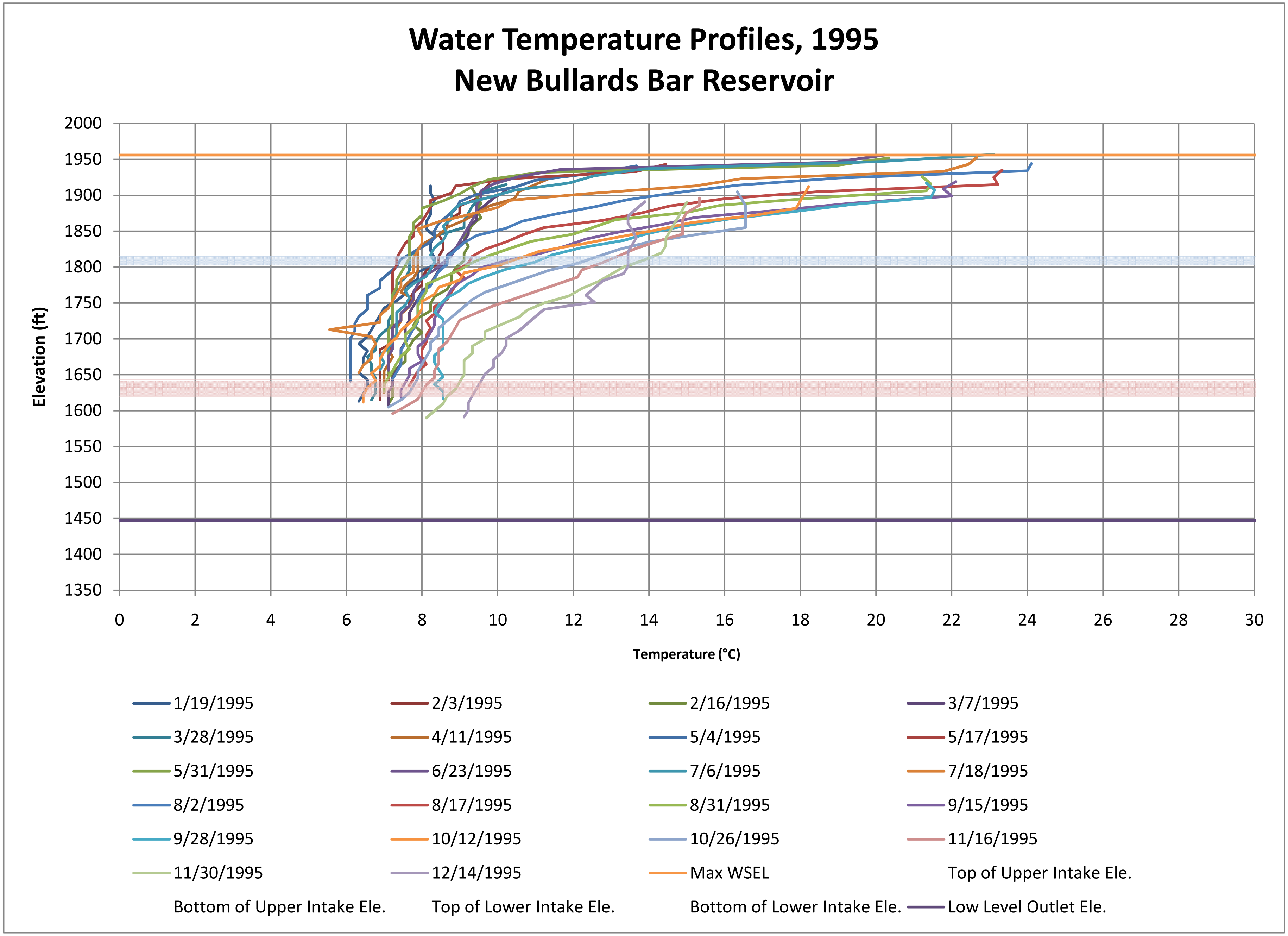

Water Temperature Profiles, 1990
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/24/1990
2/27/1990
3/28/1990
4/19/1990
5/18/1990
6/15/1990
7/12/1990
7/25/1990
8/23/1990
9/19/1990
9/24/1990
10/16/1990
11/14/1990
12/13/1990
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.

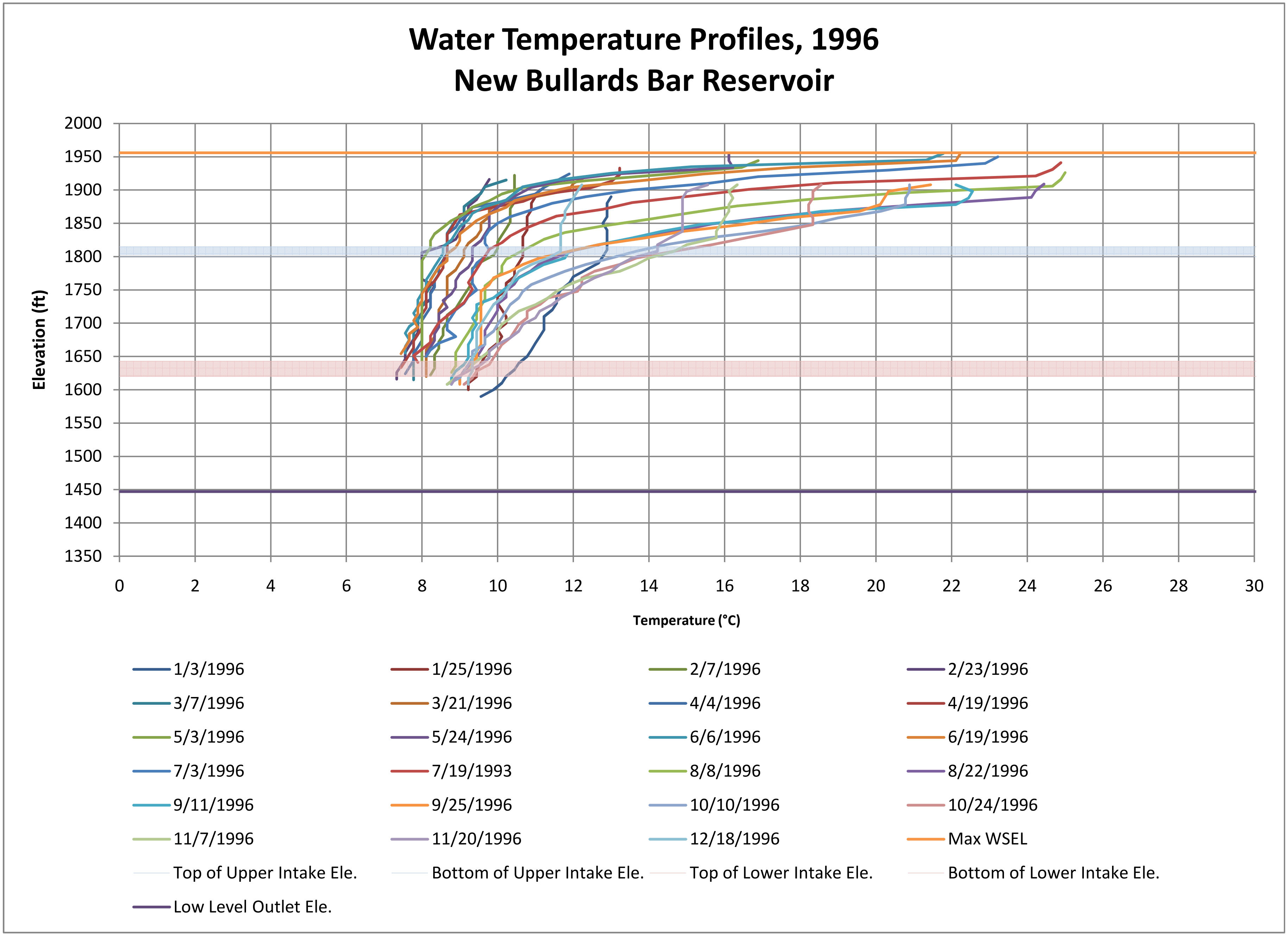

Water Temperature Profiles, 1991
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/11/1991
2/12/1991
3/14/1991
4/9/1991
5/8/1991
6/6/1991
7/3/1991
7/31/1991
8/28/1991
9/24/1991
10/23/1991
11/21/1991
12/19/1991
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.

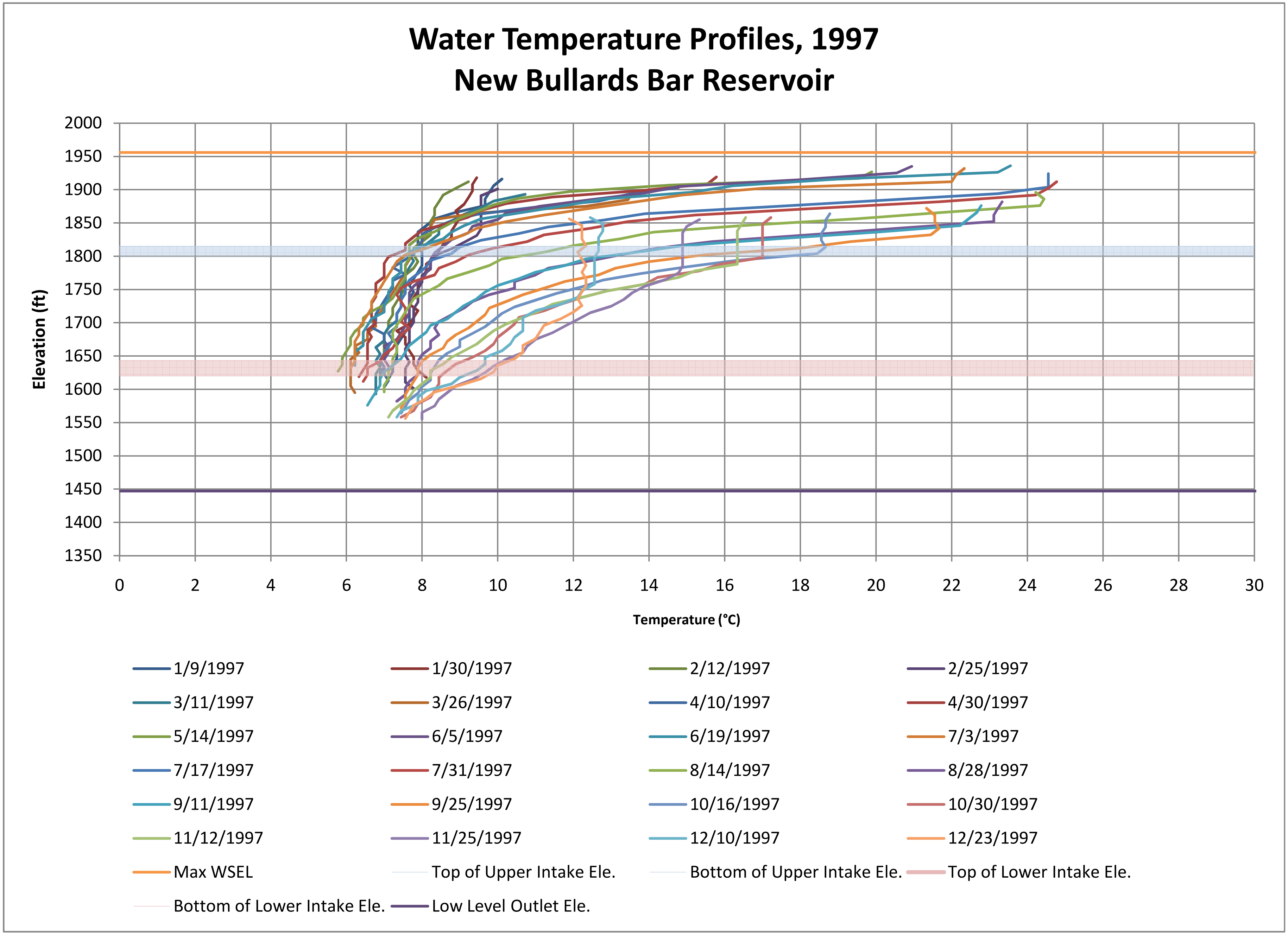

Water Temperature Profiles, 1992
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/16/1992
2/11/1992
3/13/1992
4/7/1992
5/6/1992
6/2/1992
7/16/1992
8/19/1992
9/16/1992
10/15/1992
11/17/1992
12/16/1992
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.

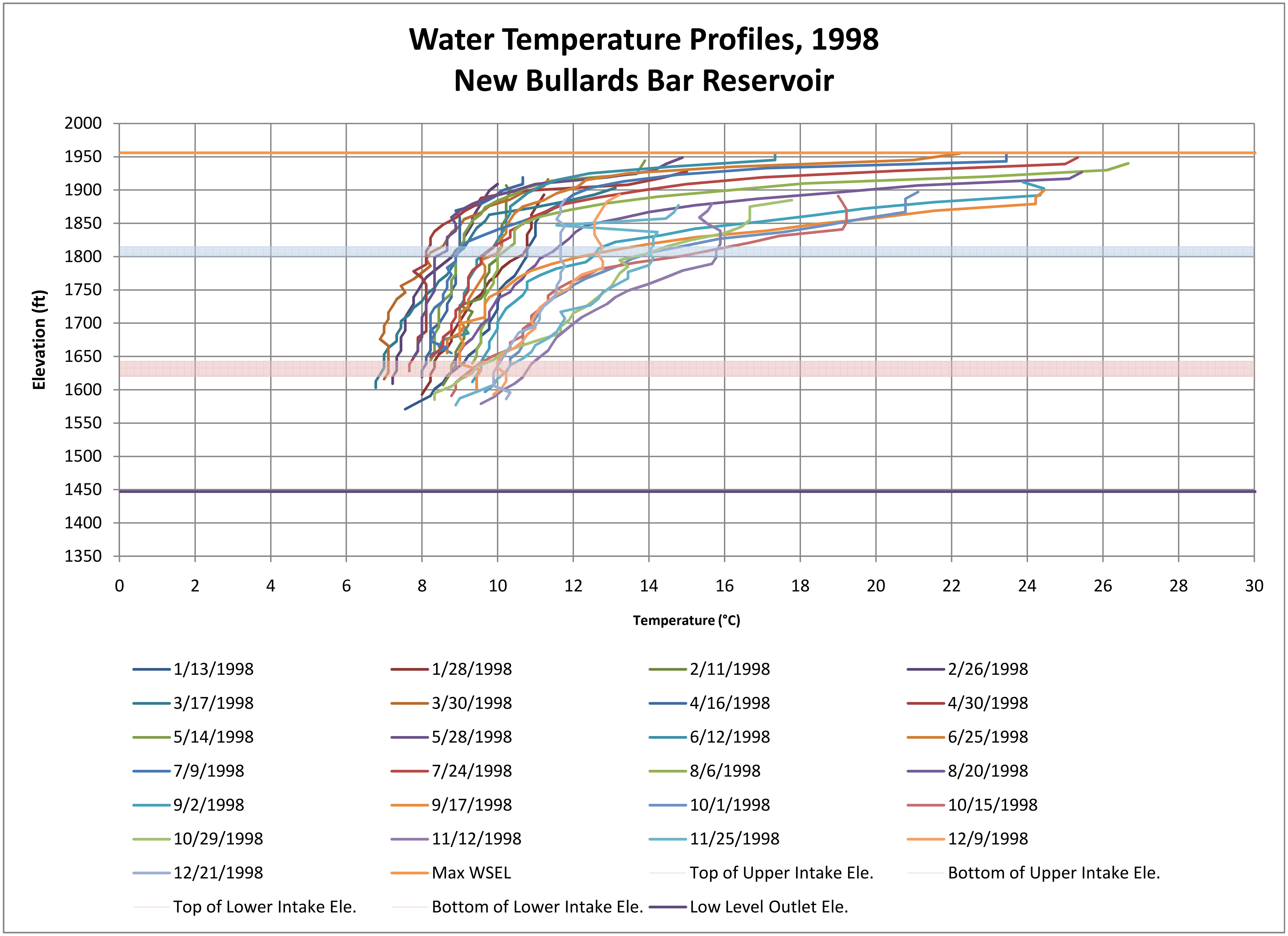

Water Temperature Profiles, 1993
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/12/1993
1/29/1993
2/10/1993
2/25/1993
3/10/1993
3/24/1993
4/6/1993
4/22/1993
5/5/1993
5/18/1993
6/3/1993
6/15/1993
6/29/1993
7/15/1993
7/27/1993
8/9/1993
8/25/1993
8/30/1993
9/7/1993
9/23/1993
10/6/1993
10/20/1993
11/3/1993
11/18/1993
12/3/1993
12/15/1993
12/29/1993
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.

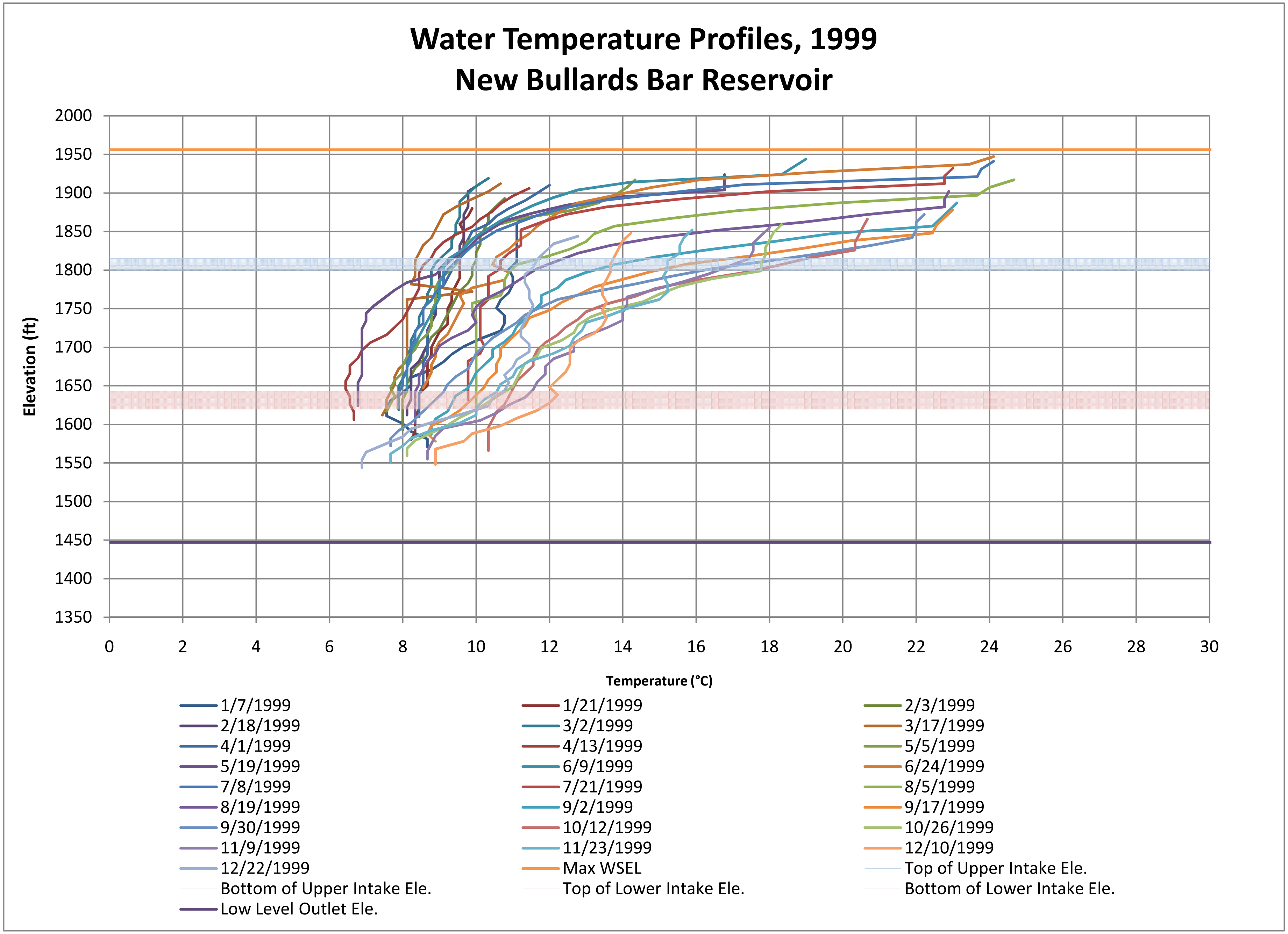

Water Temperature Profiles, 1994
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
3/22/1994
4/6/1994
4/27/1994
5/12/1994
5/26/1994
6/8/1994
6/22/1994
7/7/1994
7/20/1994
8/4/1994
8/18/1994
9/1/1994
9/14/1994
9/27/1994
10/13/1994
10/28/1994
11/16/1994
12/1/1994
12/21/1994
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.

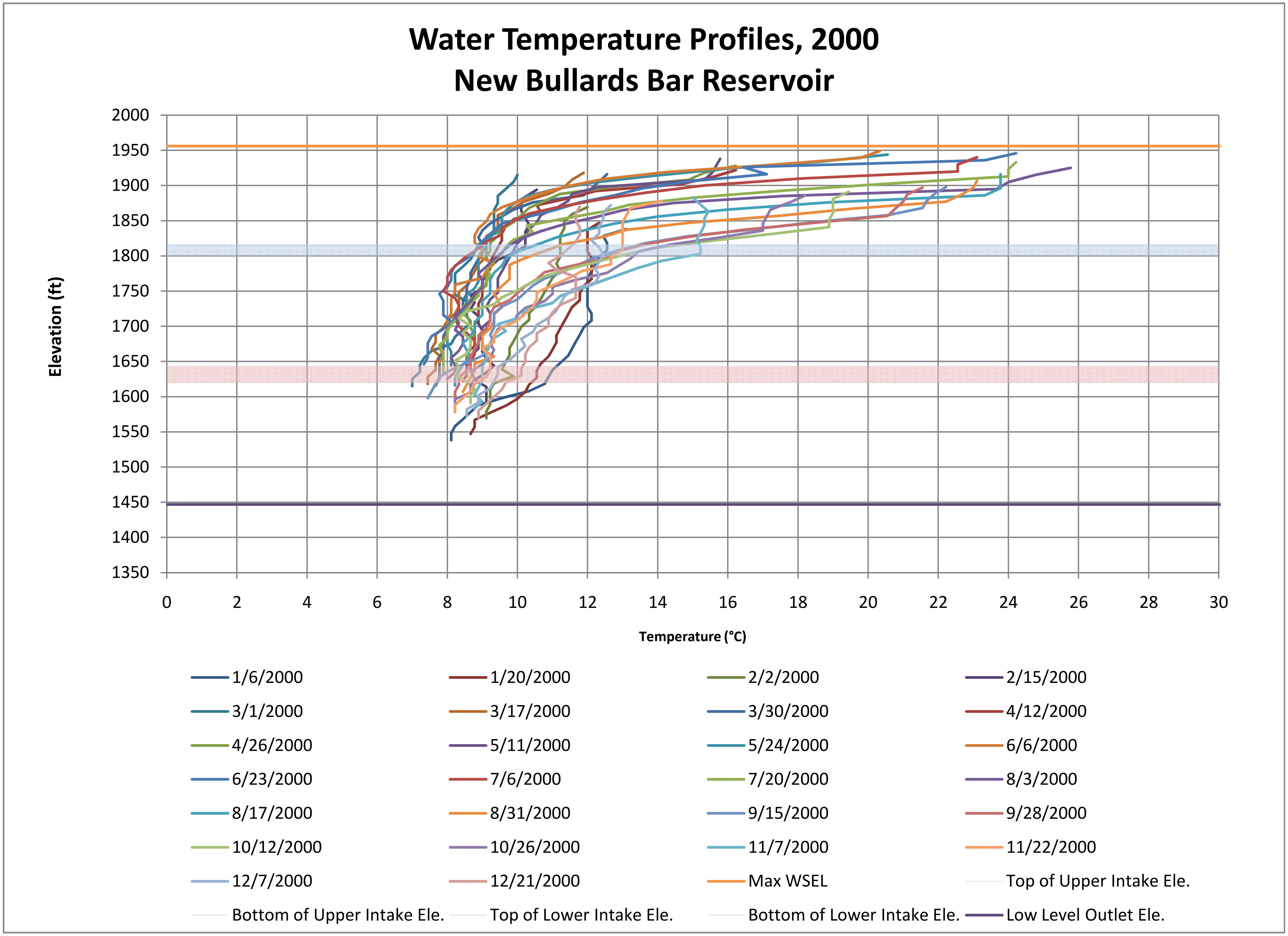

Water Temperature Profiles, 1995
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/19/1995
2/3/1995
2/16/1995
3/7/1995
3/28/1995
4/11/1995
5/4/1995
5/17/1995
5/31/1995
6/23/1995
7/6/1995
7/18/1995
8/2/1995
8/17/1995
8/31/1995
9/15/1995
9/28/1995
10/12/1995
10/26/1995
11/16/1995
11/30/1995
12/14/1995
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.

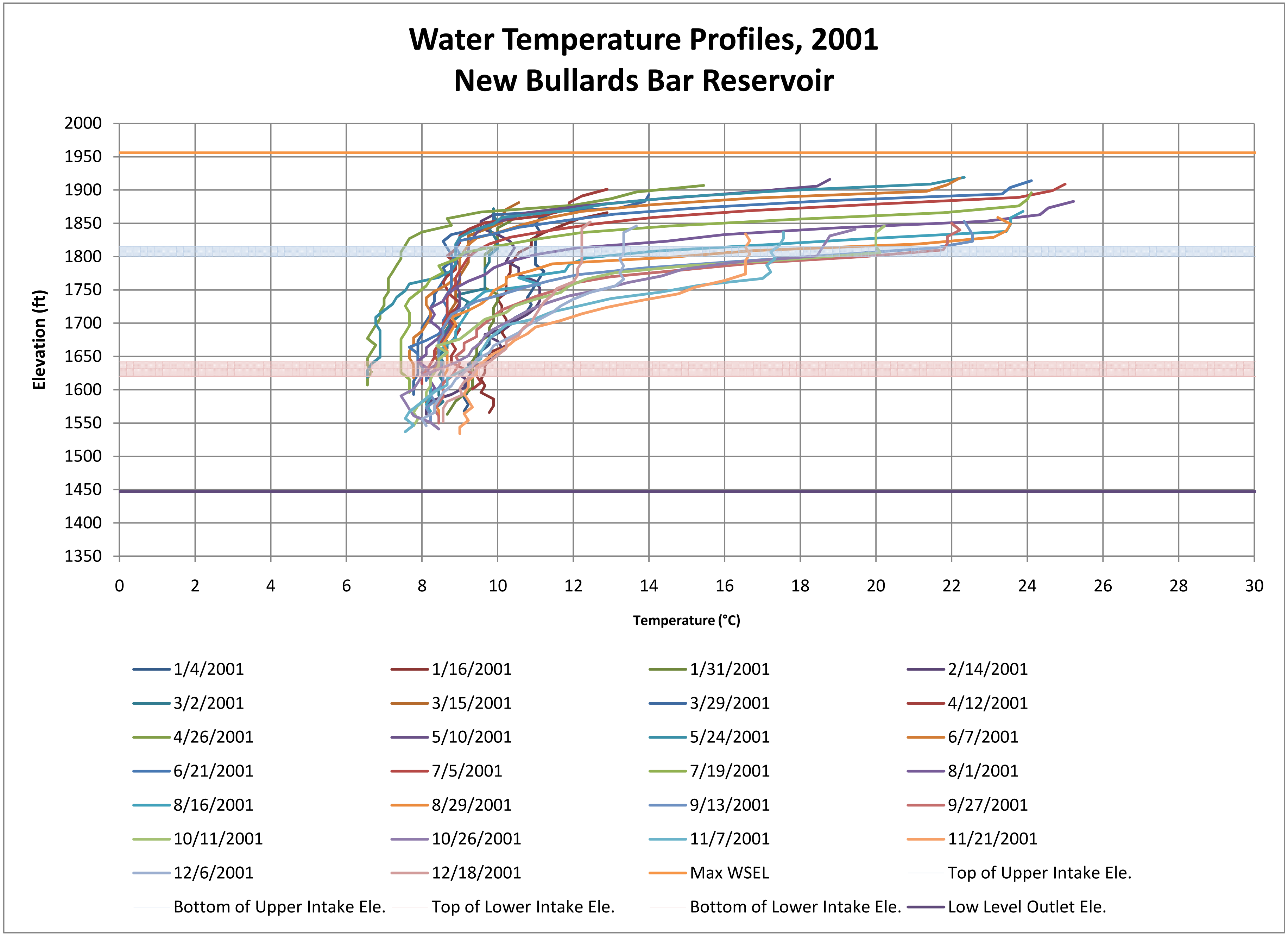

Water Temperature Profiles, 1996
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/3/1996
1/25/1996
2/7/1996
2/23/1996
3/7/1996
3/21/1996
4/4/1996
4/19/1996
5/3/1996
5/24/1996
6/6/1996
6/19/1996
7/3/1996
7/19/1993
8/8/1996
8/22/1996
9/11/1996
9/25/1996
10/10/1996
10/24/1996
11/7/1996
11/20/1996
12/18/1996
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 1997
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/9/1997
1/30/1997
2/12/1997
2/25/1997
3/11/1997
3/26/1997
4/10/1997
4/30/1997
5/14/1997
6/5/1997
6/19/1997
7/3/1997
7/17/1997
7/31/1997
8/14/1997
8/28/1997
9/11/1997
9/25/1997
10/16/1997
10/30/1997
11/12/1997
11/25/1997
12/10/1997
12/23/1997
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 1998
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/13/1998
1/28/1998
2/11/1998
2/26/1998
3/17/1998
3/30/1998
4/16/1998
4/30/1998
5/14/1998
5/28/1998
6/12/1998
6/25/1998
7/9/1998
7/24/1998
8/6/1998
8/20/1998
9/2/1998
9/17/1998
10/1/1998
10/15/1998
10/29/1998
11/12/1998
11/25/1998
12/9/1998
12/21/1998
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 1999
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/7/1999
1/21/1999
2/3/1999
2/18/1999
3/2/1999
3/17/1999
4/1/1999
4/13/1999
5/5/1999
5/19/1999
6/9/1999
6/24/1999
7/8/1999
7/21/1999
8/5/1999
8/19/1999
9/2/1999
9/17/1999
9/30/1999
10/12/1999
10/26/1999
11/9/1999
11/23/1999
12/10/1999
12/22/1999
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 2000
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/6/2000
1/20/2000
2/2/2000
2/15/2000
3/1/2000
3/17/2000
3/30/2000
4/12/2000
4/26/2000
5/11/2000
5/24/2000
6/6/2000
6/23/2000
7/6/2000
7/20/2000
8/3/2000
8/17/2000
8/31/2000
9/15/2000
9/28/2000
10/12/2000
10/26/2000
11/7/2000
11/22/2000
12/7/2000
12/21/2000
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 2001
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Elevation (ft)
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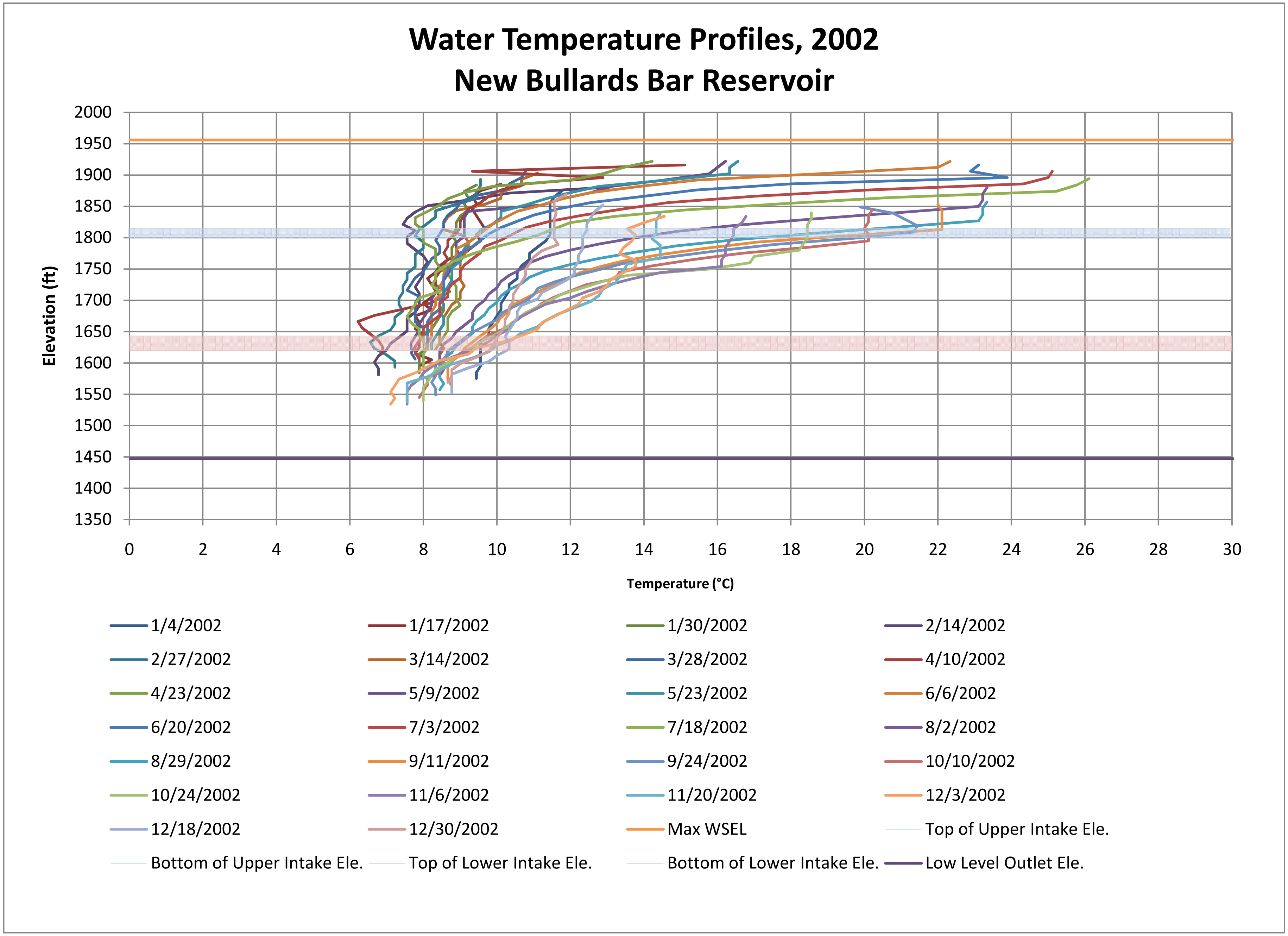
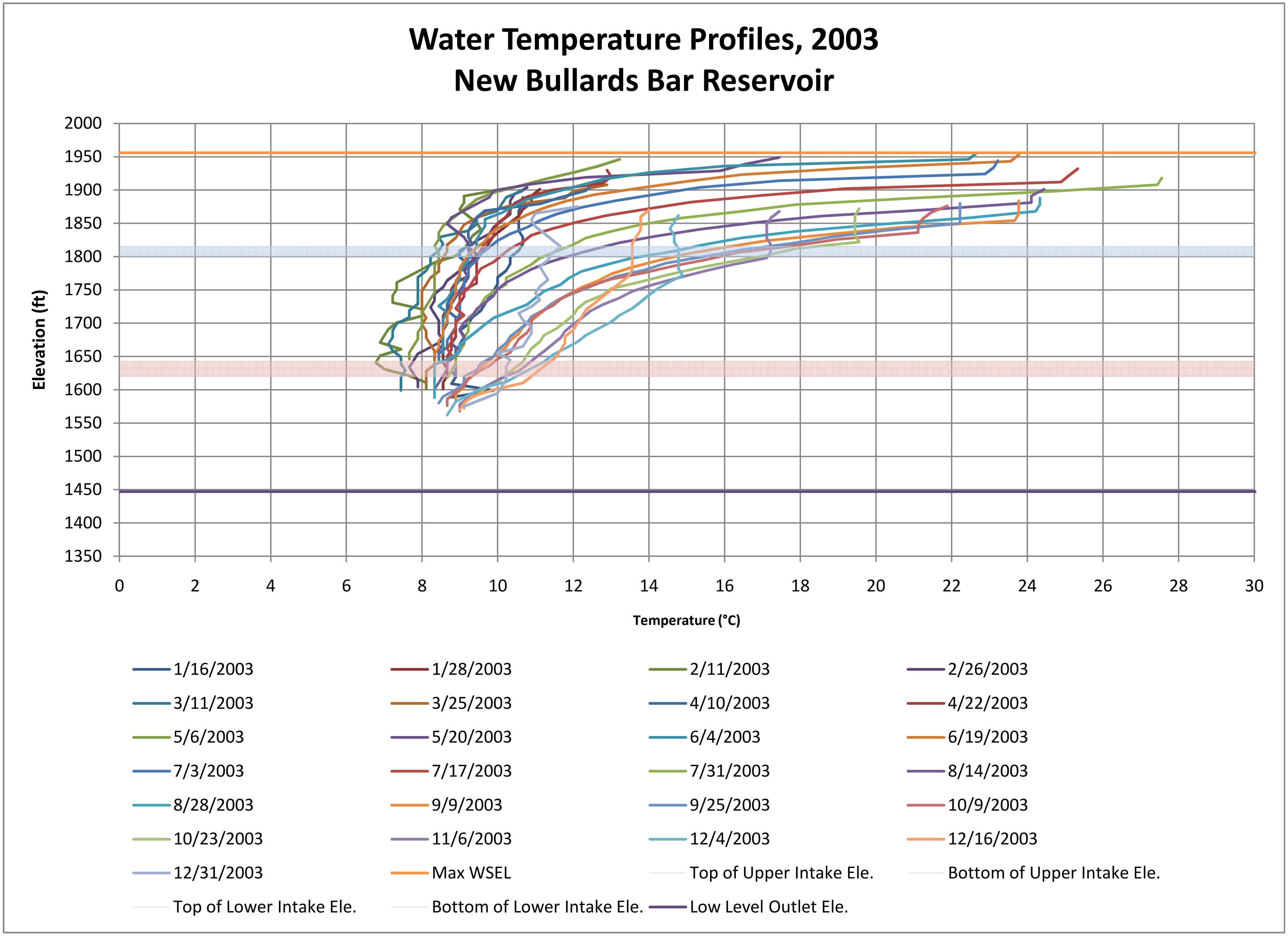
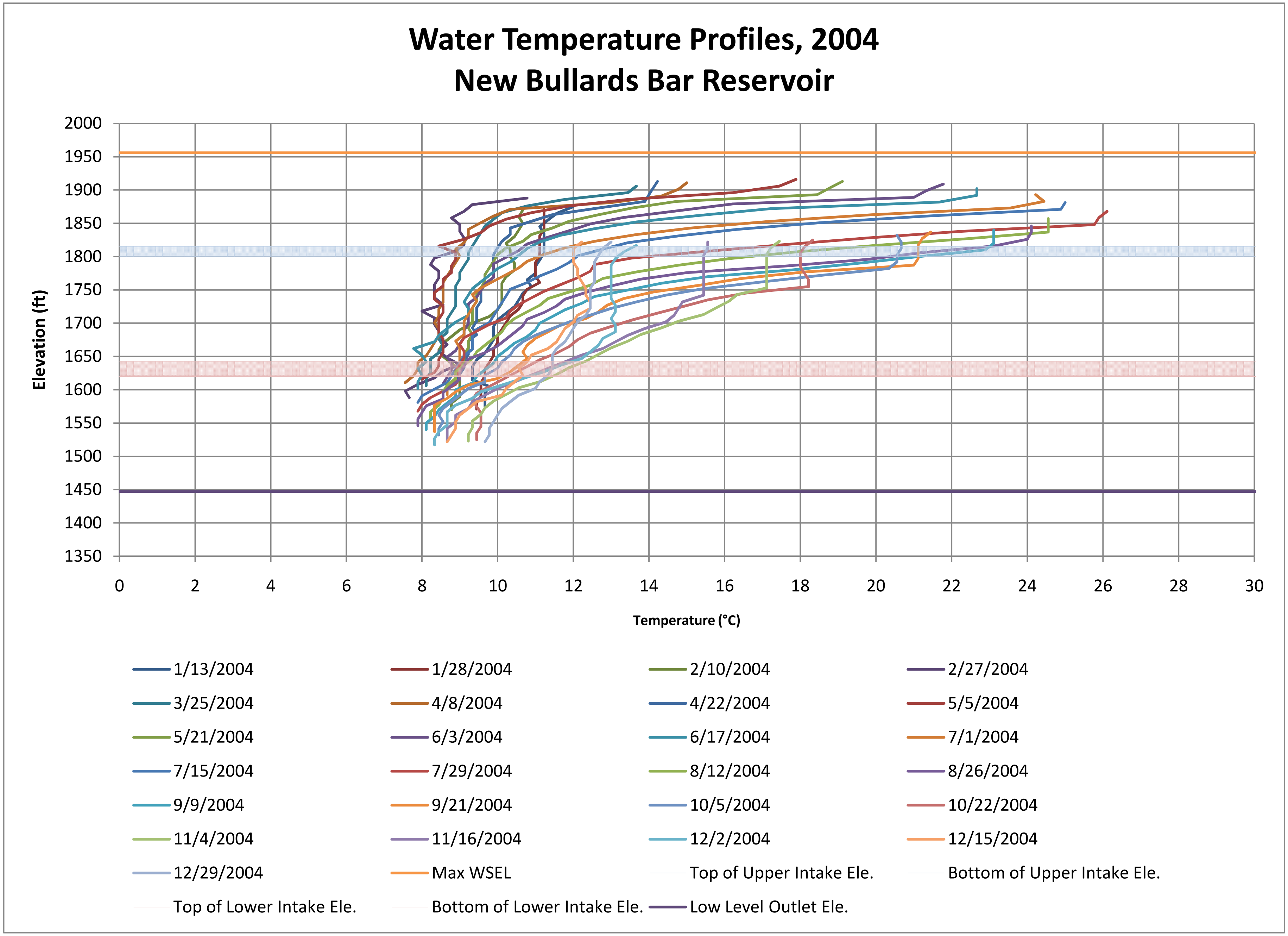
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
Temperature (°C)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
1/4/2001
1/16/2001
1/31/2001
2/14/2001
3/2/2001
3/15/2001
3/29/2001
4/12/2001
4/26/2001
5/10/2001
5/24/2001
6/7/2001
6/21/2001
7/5/2001
7/19/2001
8/1/2001
8/16/2001
8/29/2001
9/13/2001
9/27/2001
10/11/2001
10/26/2001
11/7/2001
11/21/2001
12/6/2001
12/18/2001
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 2002
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/4/2002
1/17/2002
1/30/2002
2/14/2002
2/27/2002
3/14/2002
3/28/2002
4/10/2002
4/23/2002
5/9/2002
5/23/2002
6/6/2002
6/20/2002
7/3/2002
7/18/2002
8/2/2002
8/29/2002
9/11/2002
9/24/2002
10/10/2002
10/24/2002
11/6/2002
11/20/2002
12/3/2002
12/18/2002
12/30/2002
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 2003
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/16/2003
1/28/2003
2/11/2003
2/26/2003
3/11/2003
3/25/2003
4/10/2003
4/22/2003
5/6/2003
5/20/2003
6/4/2003
6/19/2003
7/3/2003
7/17/2003
7/31/2003
8/14/2003
8/28/2003
9/9/2003
9/25/2003
10/9/2003
10/23/2003
11/6/2003
12/4/2003
12/16/2003
12/31/2003
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.



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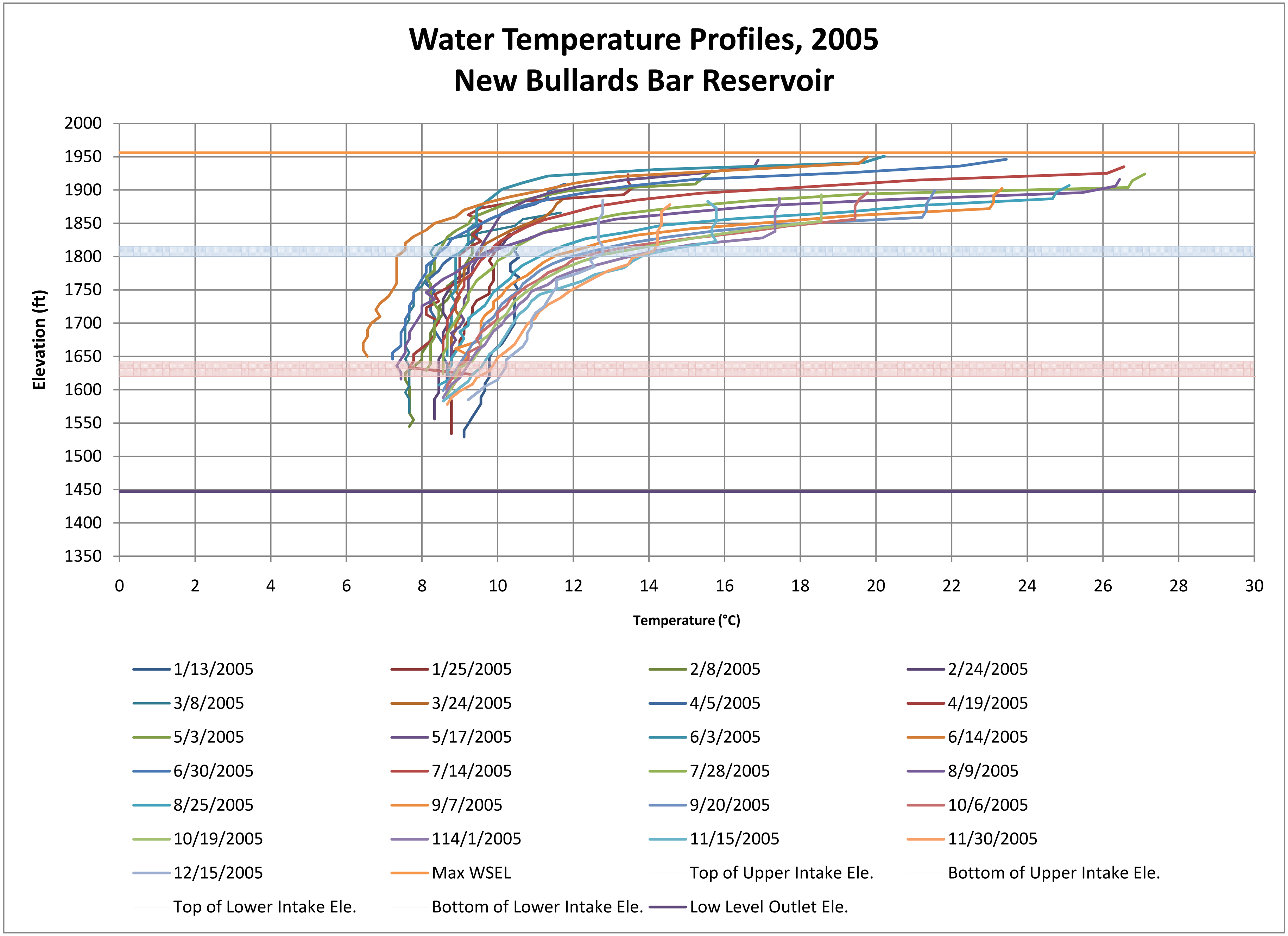
Water Temperature Profiles, 2005
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
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1400
1350
0
2
4
6
8
10
12
14
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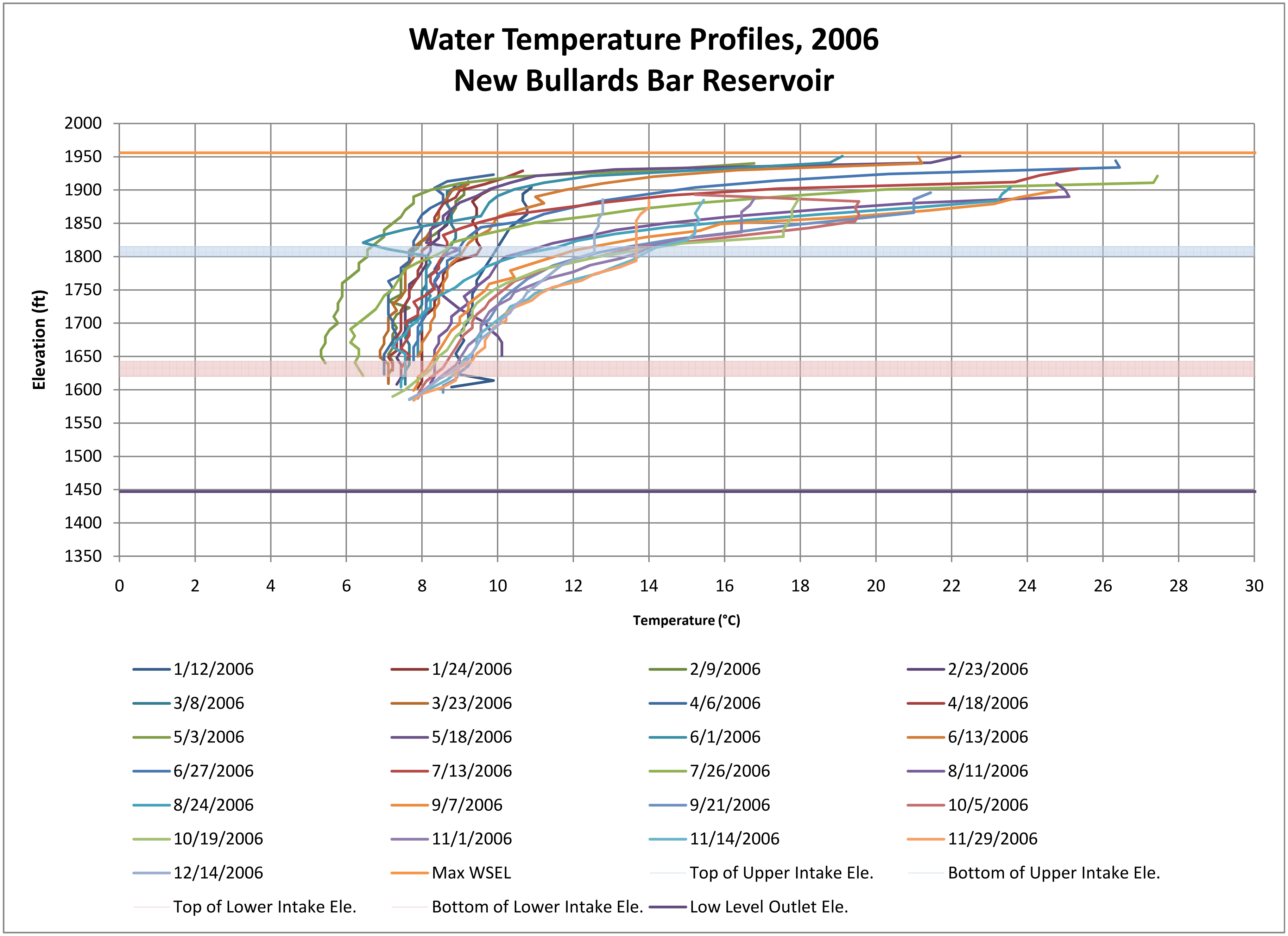
18
20
22
24
26
28
30
Temperature (°C)
1/13/2005
1/25/2005
2/8/2005
2/24/2005
3/8/2005
3/24/2005
4/5/2005
4/19/2005
5/3/2005
5/17/2005
6/3/2005
6/14/2005
6/30/2005
7/14/2005
7/28/2005
8/9/2005
8/25/2005
9/7/2005
9/20/2005
10/6/2005
10/19/2005
114/1/2005
11/15/2005
11/30/2005
12/15/2005
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 2006
New Bullards Bar Reservoir
Elevation (ft)
2000
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1900
1850
1800
1750
1700
1650
1600
1550
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1400
1350
0
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18
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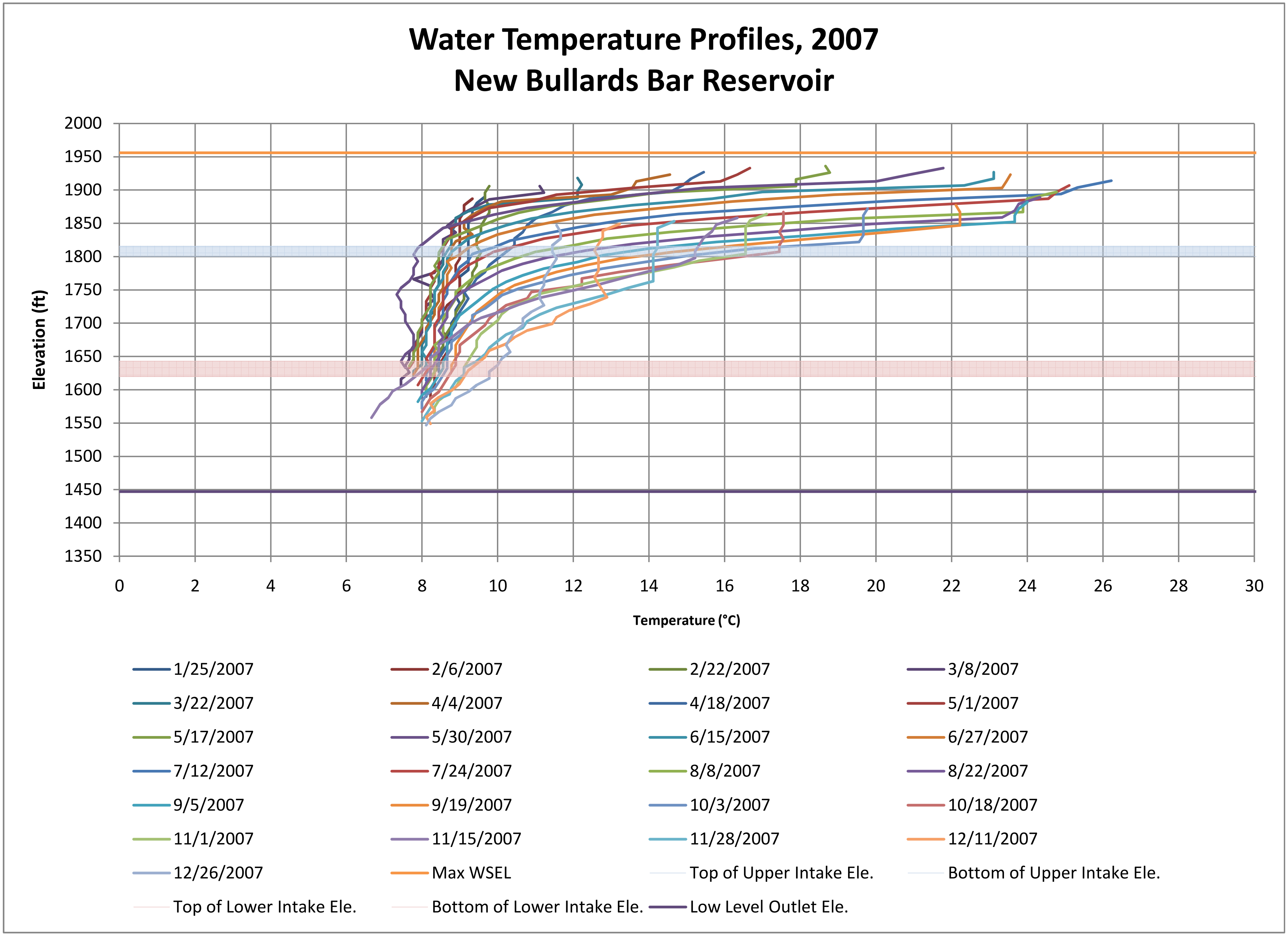
22
24
26
28
30
Temperature (°C)
1/12/2006
1/24/2006
2/9/2006
2/23/2006
3/8/2006
3/23/2006
4/6/2006
4/18/2006
5/3/2006
5/18/2006
6/1/2006
6/13/2006
6/27/2006
7/13/2006
7/26/2006
8/11/2006
8/24/2006
9/7/2006
9/21/2006
10/5/2006
10/19/2006
11/1/2006
11/14/2006
11/29/2006
12/14/2006
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 2007
New Bullards Bar Reservoir
Elevation (ft)
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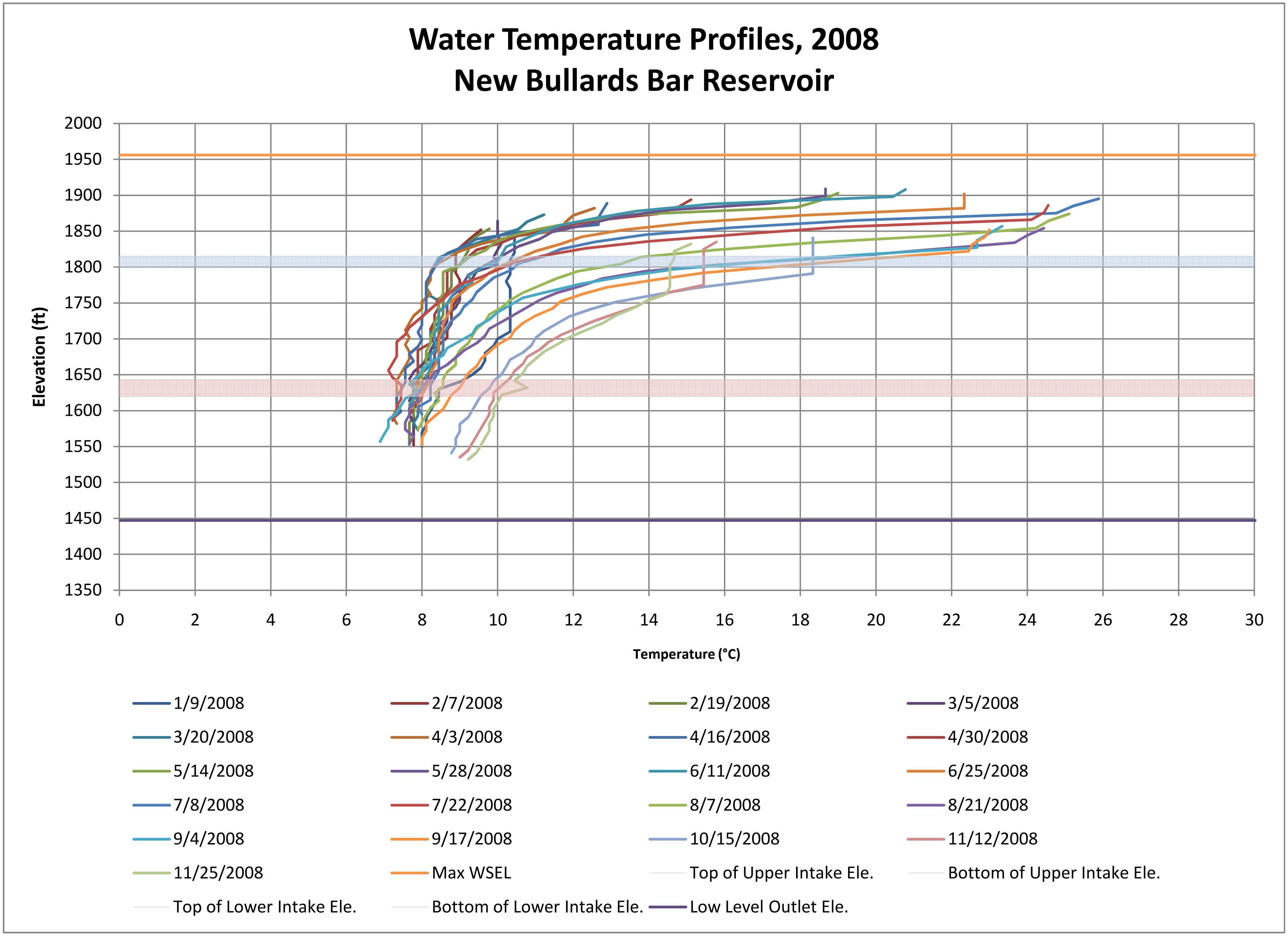
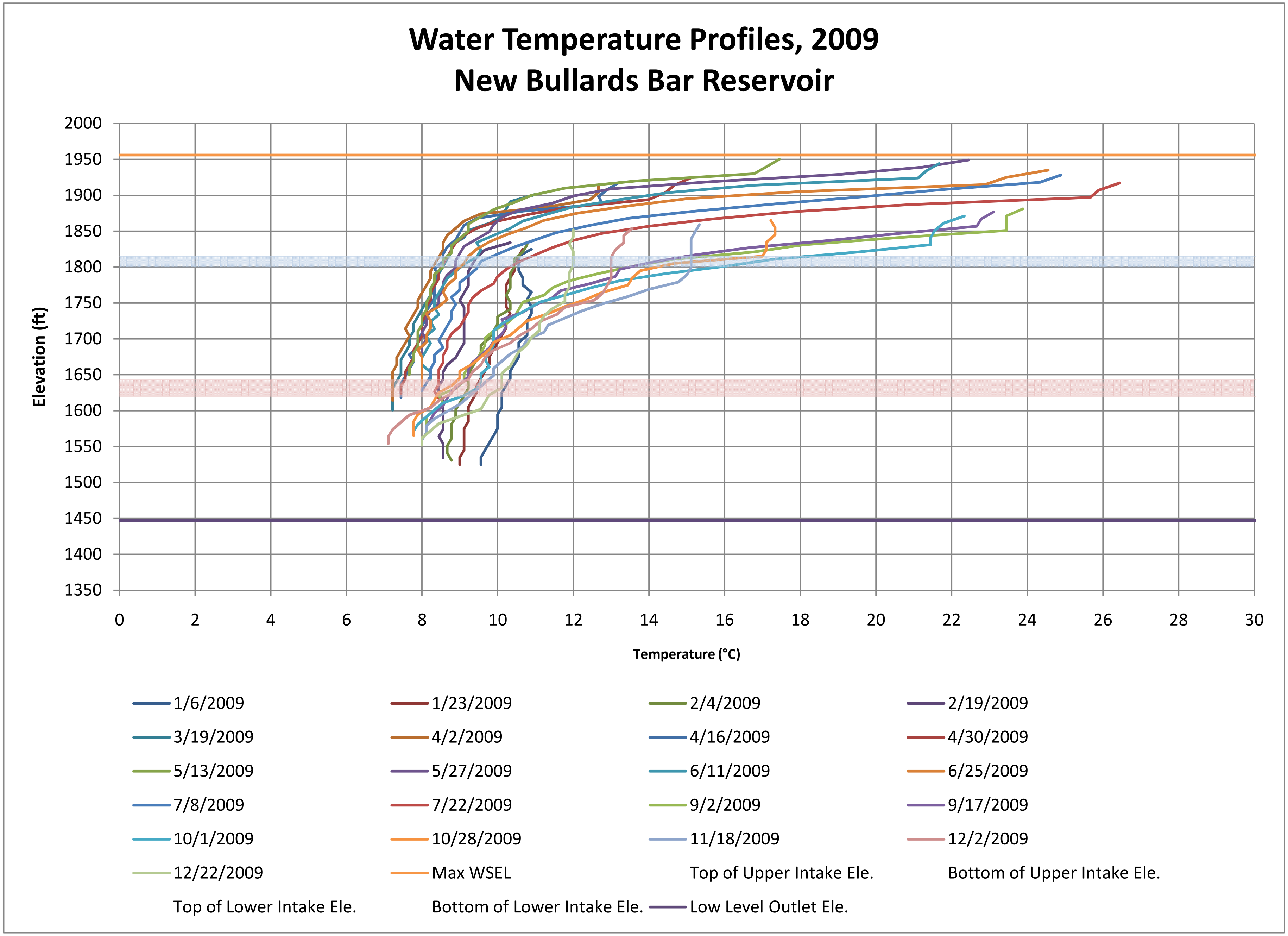
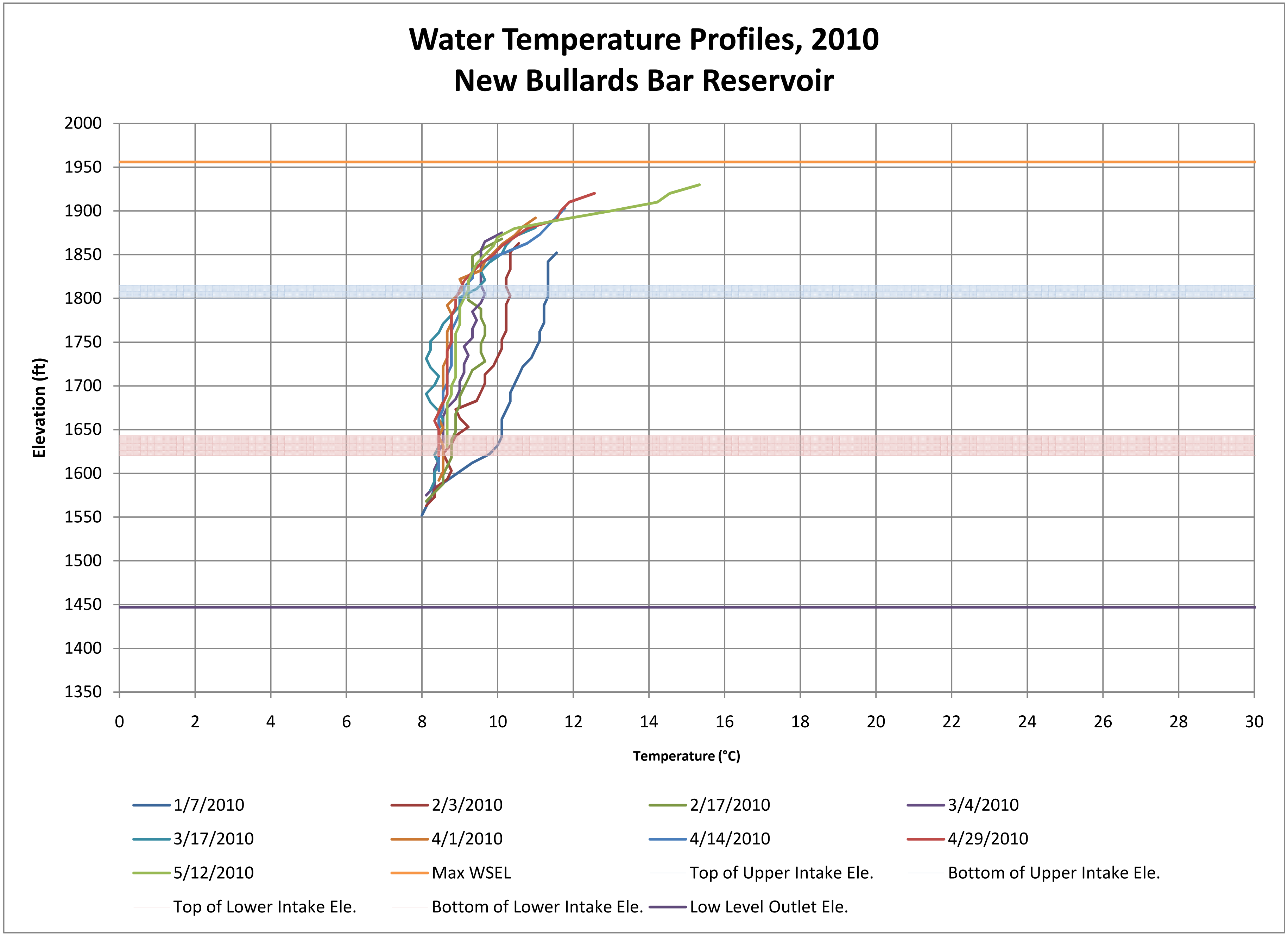
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/25/2007
2/6/2007
2/22/2007
3/8/2007
3/22/2007
4/4/2007
4/18/2007
5/1/2007
5/17/2007
5/30/2007
6/15/2007
6/27/2007
7/12/2007
7/24/2007
8/8/2007
8/22/2007
9/5/2007
9/19/2007
10/3/2007
10/18/2007
11/1/2007
11/15/2007
11/28/2007
12/11/2007
12/26/2007
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 2008
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/9/2008
2/7/2008
2/19/2008
3/5/2008
3/20/2008
4/3/2008
4/16/2008
4/30/2008
5/14/2008
5/28/2008
6/11/2008
6/25/2008
7/8/2008
7/22/2008
8/7/2008
8/21/2008
9/4/2008
9/17/2008
10/15/2008
11/12/2008
11/25/2008
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.


Water Temperature Profiles, 2009
New Bullards Bar Reservoir
Elevation (ft)
2000
1950
1900
1850
1800
1750
1700
1650
1600
1550
1500
1450
1400
1350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/6/2009
1/23/2009
2/4/2009
2/19/2009
3/19/2009
4/2/2009
4/16/2009
4/30/2009
5/13/2009
5/27/2009
6/11/2009
6/25/2009
7/8/2009
7/22/2009
9/2/2009
9/17/2009
10/1/2009
10/28/2009
11/18/2009
12/2/2009
12/22/2009
Max WSEL
Top of Upper Intake Ele.
Bottom of Upper Intake Ele.
Top of Lower Intake Ele.
Bottom of Lower Intake Ele.
Low Level Outlet Ele.



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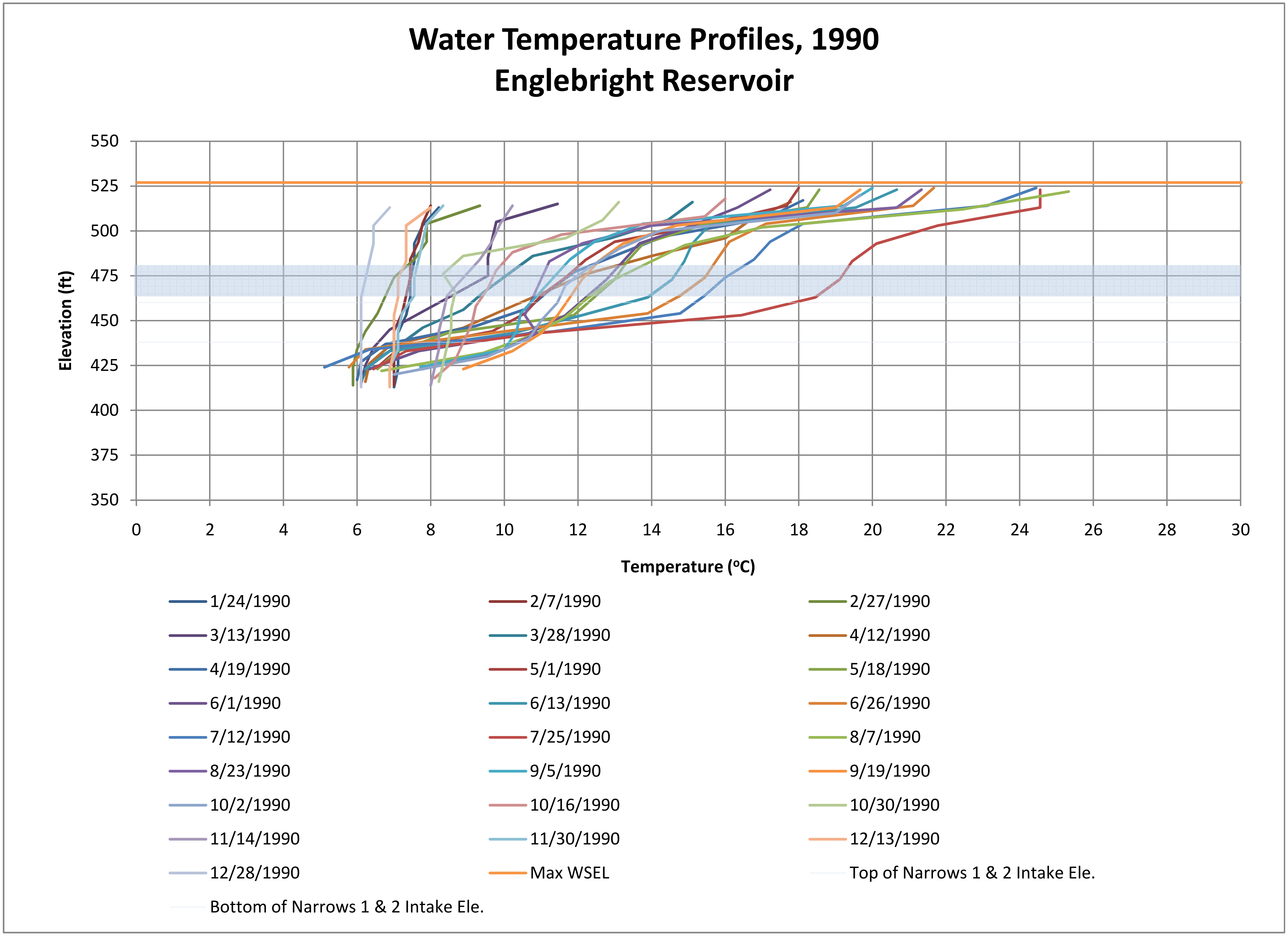
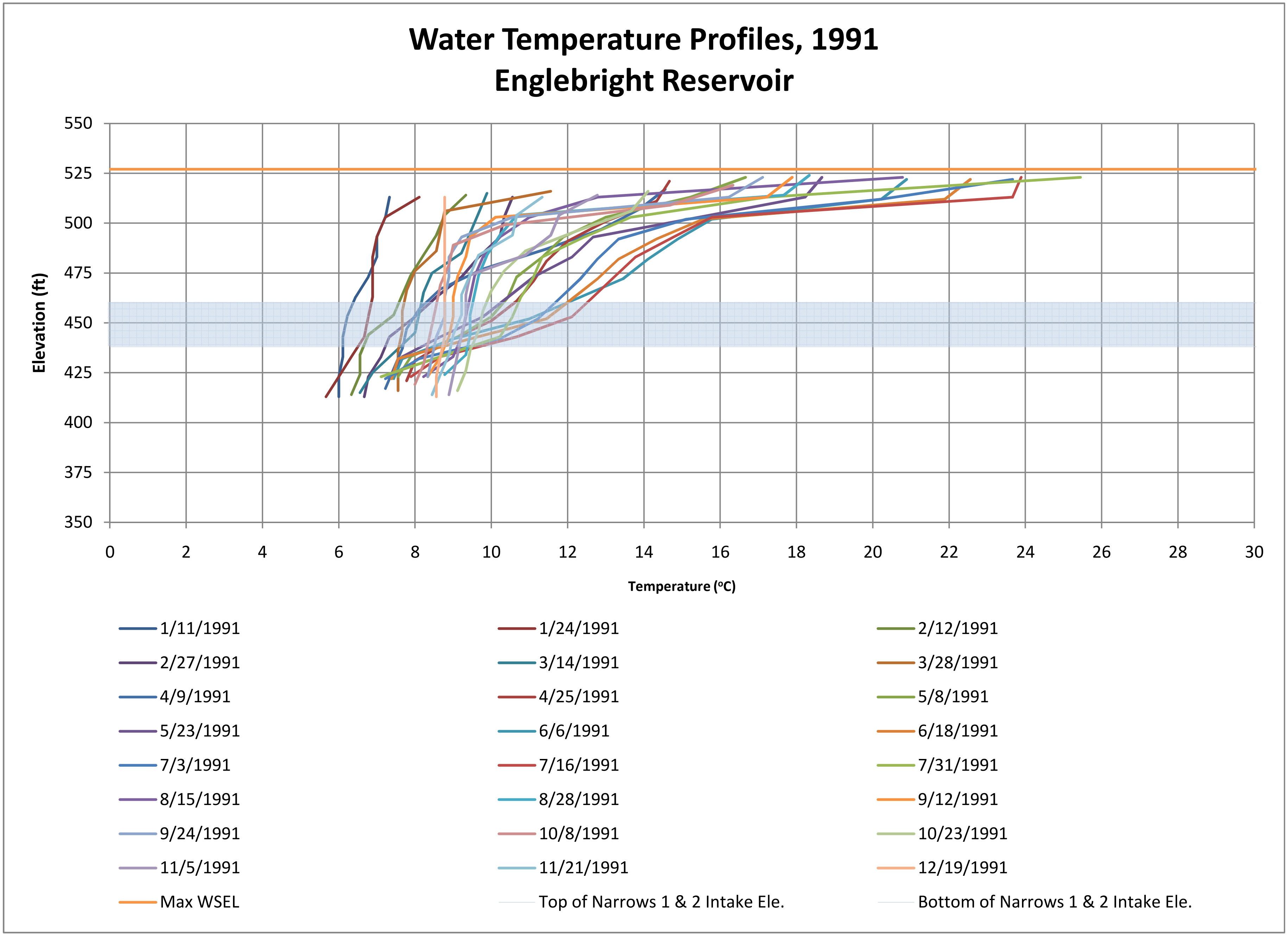

Water Temperature Profiles, 1990
Englebright Reservoir
Elevation (ft)
550
525
500
475
450
425
400
375
350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (ºC)
1/24/1990
2/7/1990
2/27/1990
3/13/1990
3/28/1990
4/12/1990
4/19/1990
5/1/1990
5/18/1990
6/1/1990
6/13/1990
6/26/1990
7/12/1990
7/25/1990
8/7/1990
8/23/1990
9/5/1990
9/19/1990
10/2/1990
10/16/1990
10/30/1990
11/14/1990
11/30/1990
12/13/1990
12/28/1990
Max WSEL
Top of Narrows 1 & 2 Intake Ele.
Bottom of Narrows 1 & 2 Intake Ele.


Water Temperature Profiles, 1991
Englebright Reservoir
Elevation (ft)
550
525
500
475
450
425
400
375
350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/11/1991
1/24/1991
2/12/1991
2/27/1991
3/14/1991
3/28/1991
4/9/1991
4/25/1991
5/8/1991
5/23/1991
6/6/1991
6/18/1991
7/3/1991
7/16/1991
7/31/1991
8/15/1991
8/28/1991
9/12/1991
9/24/1991
10/8/1991
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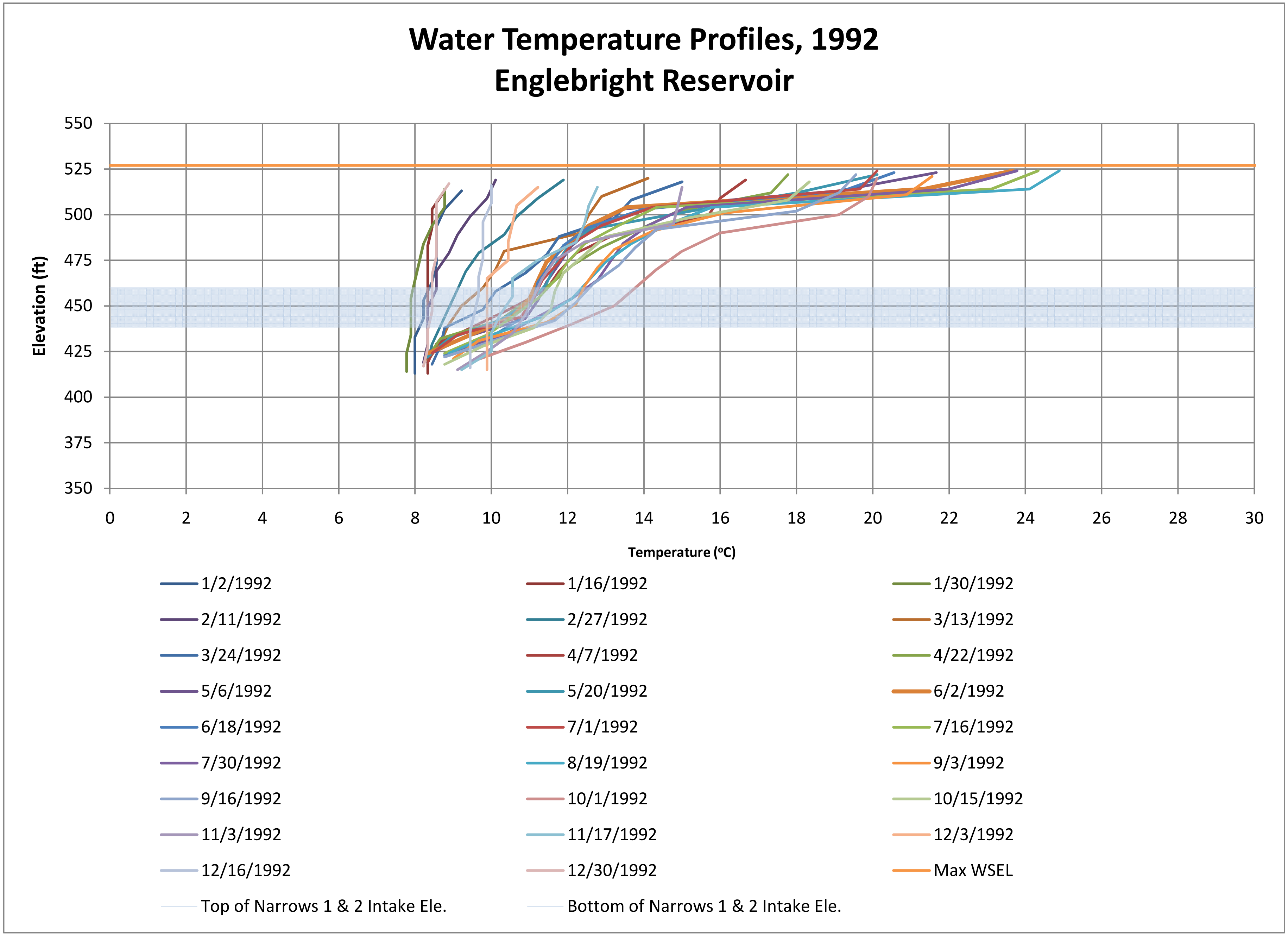
12/19/1991
Max WSEL
Top of Narrows 1 & 2 Intake Ele.
Bottom of Narrows 1 & 2 Intake Ele.


Water Temperature Profiles, 1992
Englebright Reservoir
Elevation (ft)
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525
500
475
450
425
400
375
350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (ºC)
1/2/1992
1/16/1992
1/30/1992
2/11/1992
2/27/1992
3/13/1992
3/24/1992
4/7/1992
4/22/1992
5/6/1992
5/20/1992
6/2/1992
6/18/1992
7/1/1992
7/16/1992
7/30/1992
8/19/1992
9/3/1992
9/16/1992
10/1/1992
10/15/1992
11/3/1992
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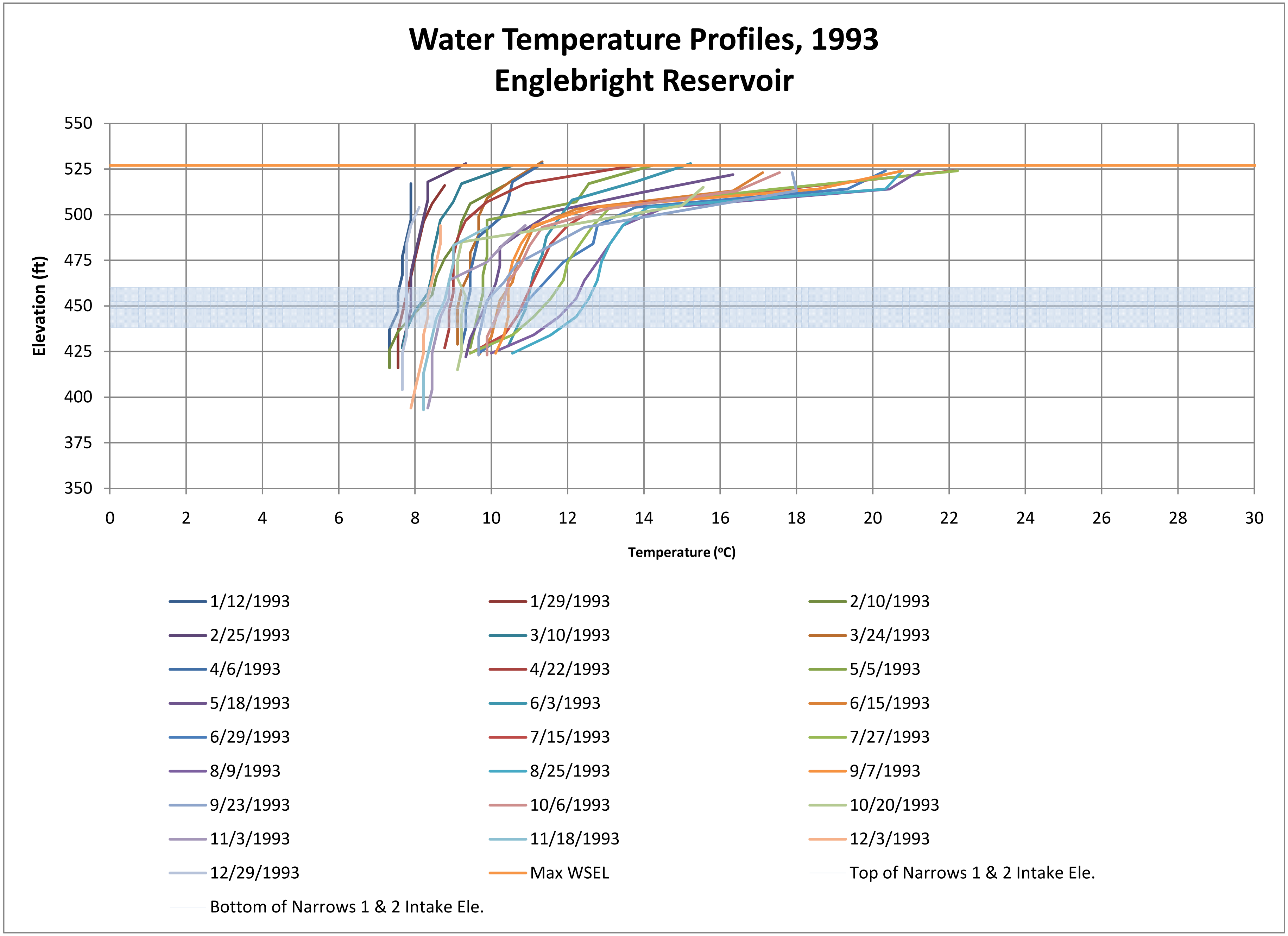
12/16/1992
12/30/1992
Max WSEL
Top of Narrows 1 & 2 Intake Ele.
Bottom of Narrows 1 & 2 Intake Ele.


Water Temperature Profiles, 1993
Englebright Reservoir
Elevation (ft)
550
525
500
475
450
425
400
375
350
0
2
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6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (ºC)
1/12/1993
1/29/1993
2/10/1993
2/25/1993
3/10/1993
3/24/1993
4/6/1993
4/22/1993
5/5/1993
5/18/1993
6/3/1993
6/15/1993
6/29/1993
7/15/1993
7/27/1993
8/9/1993
8/25/1993
9/7/1993
9/23/1993
10/6/1993
10/20/1993
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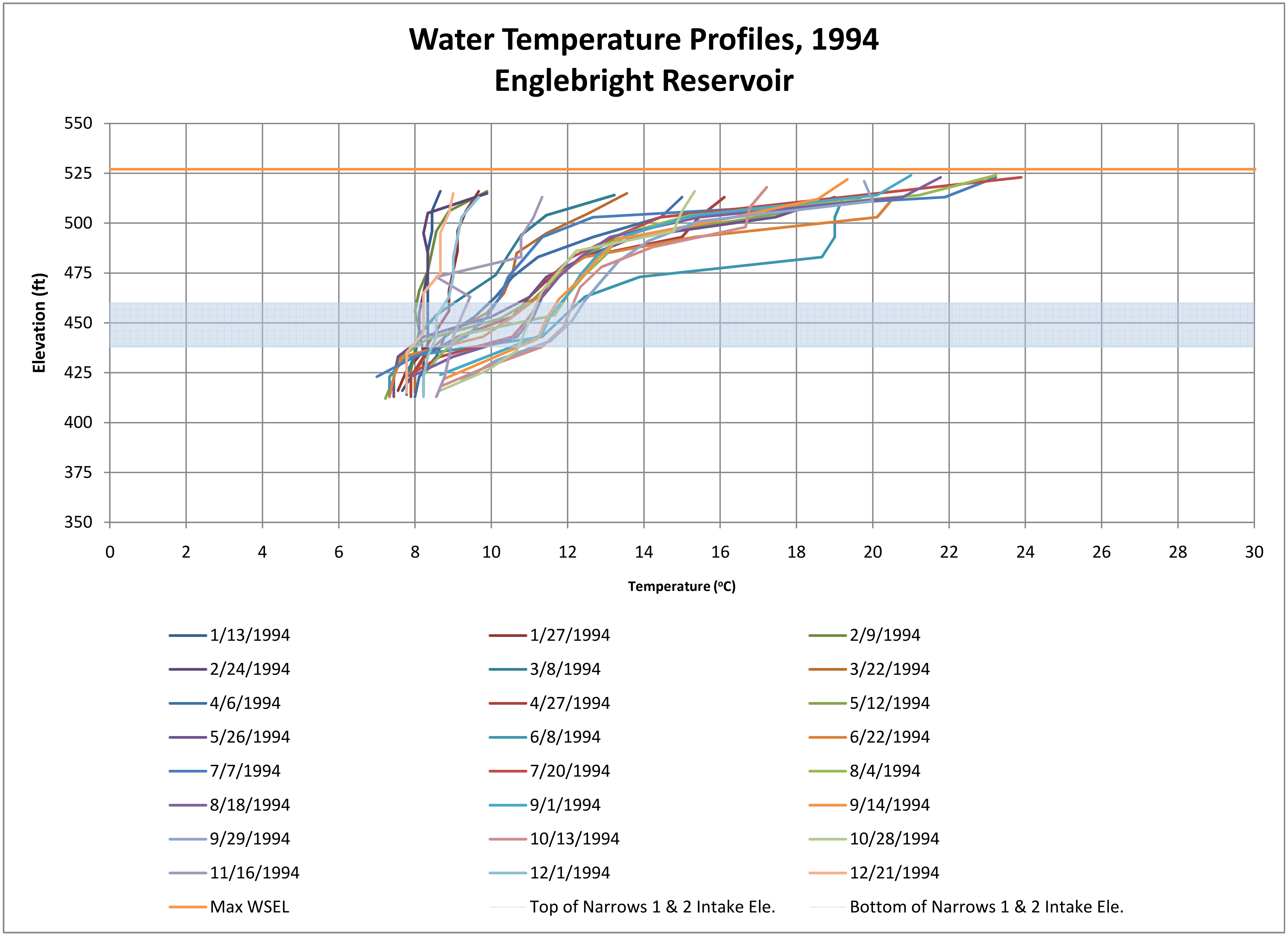
Max WSEL
Top of Narrows 1 & 2 Intake Ele.
Bottom of Narrows 1 & 2 Intake Ele.


Water Temperature Profiles, 1994
Englebright Reservoir
Elevation (ft)
550
525
500
475
450
425
400
375
350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (ºC)
1/13/1994
1/27/1994
2/9/1994
2/24/1994
3/8/1994
3/22/1994
4/6/1994
4/27/1994
5/12/1994
5/26/1994
6/8/1994
6/22/1994
7/7/1994
7/20/1994
8/4/1994
8/18/1994
9/1/1994
9/14/1994
9/29/1994
10/13/1994
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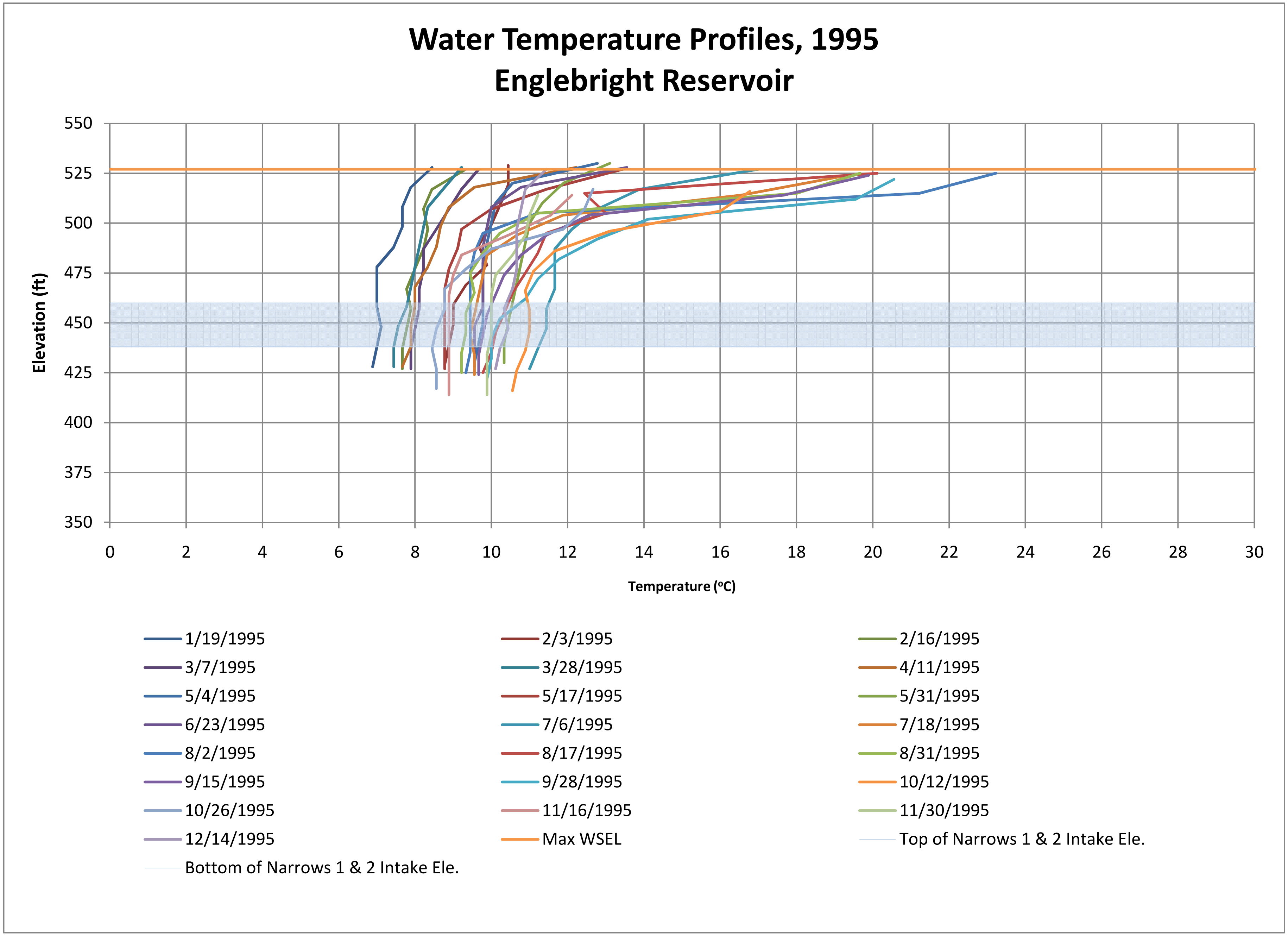
12/21/1994
Max WSEL
Top of Narrows 1 & 2 Intake Ele.
Bottom of Narrows 1 & 2 Intake Ele.


Water Temperature Profiles, 1995
Englebright Reservoir
Elevation (ft)
550
525
500
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450
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375
350
0
2
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12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/19/1995
2/3/1995
2/16/1995
3/7/1995
3/28/1995
4/11/1995
5/4/1995
5/17/1995
5/31/1995
6/23/1995
7/6/1995
7/18/1995
8/2/1995
8/17/1995
8/31/1995
9/15/1995
9/28/1995
10/12/1995
10/26/1995
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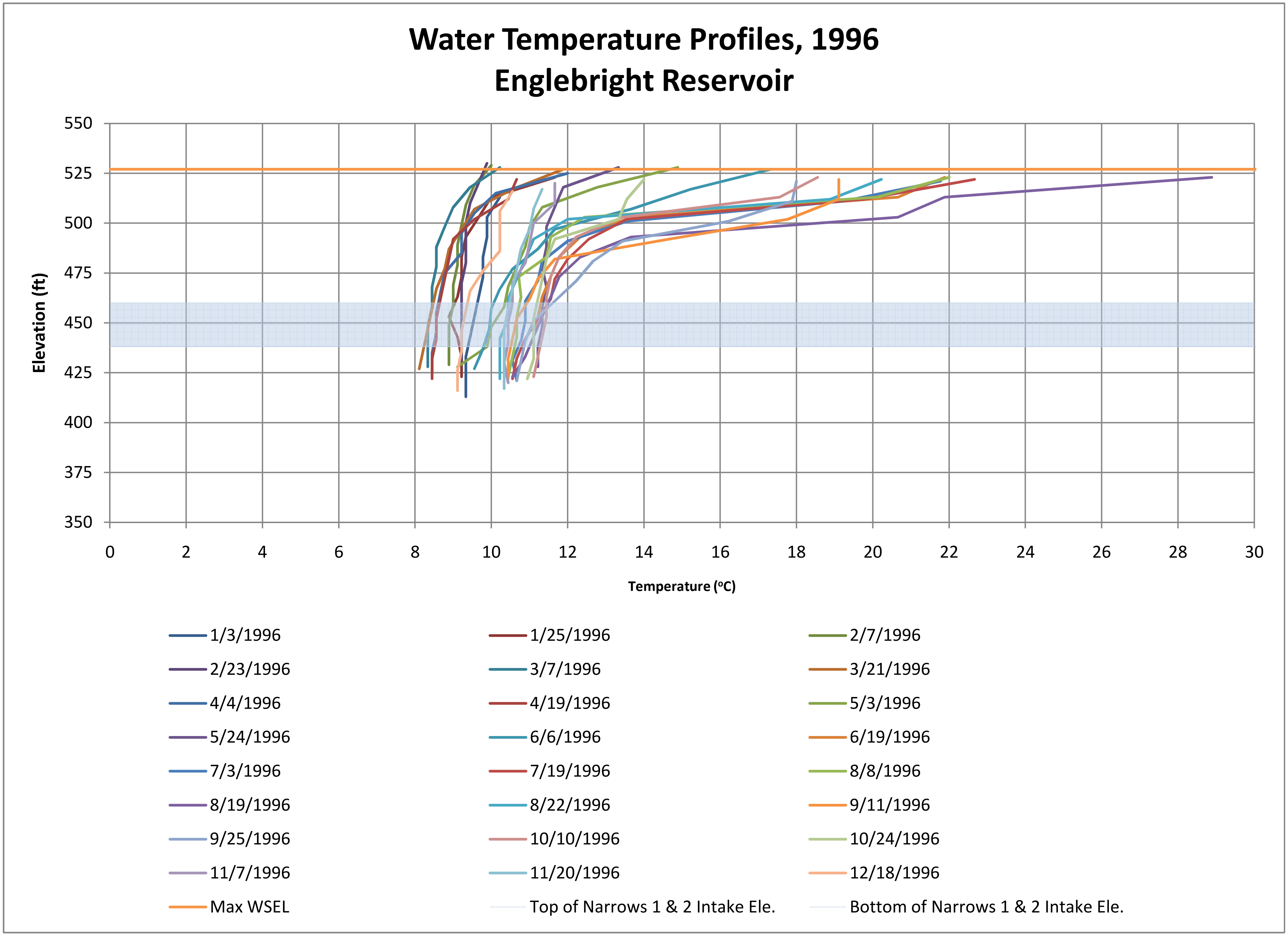
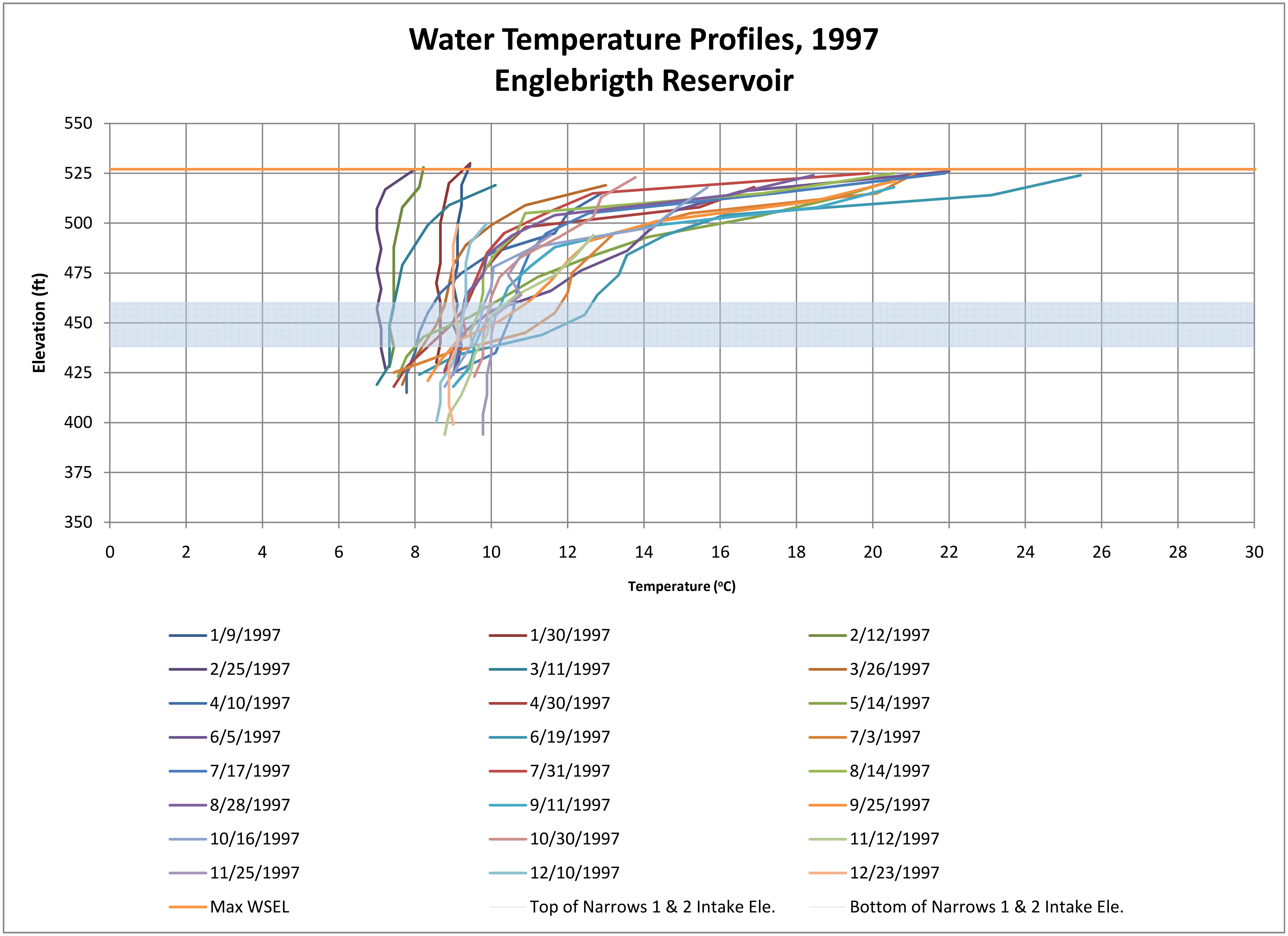
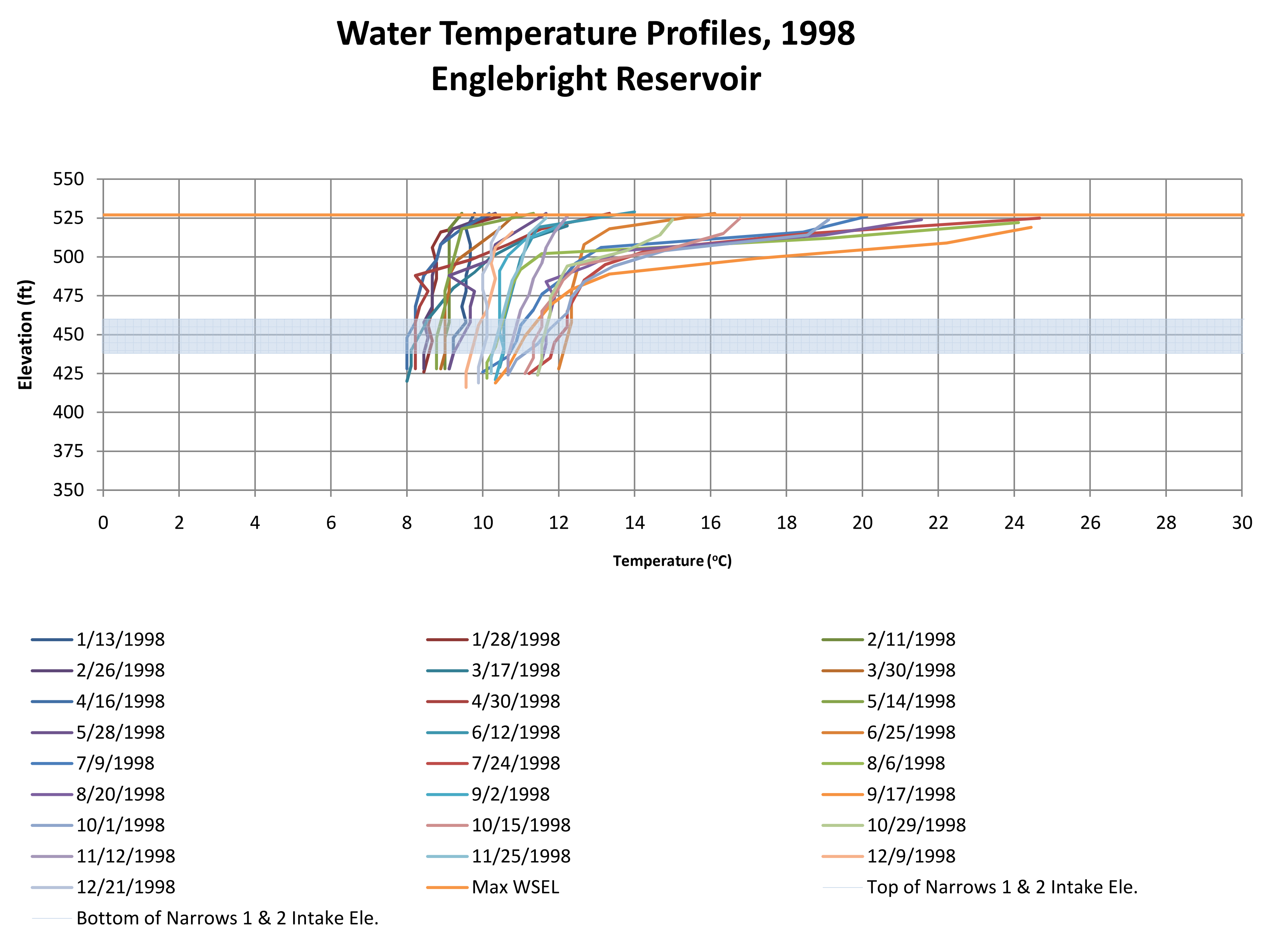
11/30/1995
12/14/1995
Max WSEL
Top of Narrows 1 & 2 Intake Ele.
Bottom of Narrows 1 & 2 Intake Ele.


Water Temperature Profiles, 1996
Englebright Reservoir
Elevation (ft)
550
525
500
475
450
425
400
375
350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (°C)
1/3/1996
1/25/1996
2/7/1996
2/23/1996
3/7/1996
3/21/1996
4/4/1996
4/19/1996
5/3/1996
5/24/1996
6/6/1996
6/19/1996
7/3/1996
7/19/1996
8/8/1996
8/19/1996
8/22/1996
9/11/1996
9/25/1996
10/10/1996
10/24/1996
11/7/1996
11/20/1996
12/18/1996
Max WSEL
Top of Narrows 1 & 2 Intake Ele.
Bottom of Narrows 1 & 2 Intake Ele.


Water Temperature Profiles, 1997
Englebrigth Reservoir
Elevation (ft)
550
525
500
475
450
425
400
375
350
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
Temperature (ºC)
1/9/1997
1/30/1997
2/12/1997
2/25/1997
3/11/1997
3/26/1997
4/10/1997
4/30/1997
5/14/1997
6/5/1997
6/19/1997
7/3/1997
7/17/1997
7/31/1997
8/14/1997
8/28/1997
9/11/1997
9/25/1997
10/16/1997
10/30/1997
11/12/1997
11/25/1997
12/10/1997
12/23/1997
Max WSEL
Top of Narrows 1 & 2 Intake Ele.
Bottom of Narrows 1 & 2 Intake Ele.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Elevation (ft)
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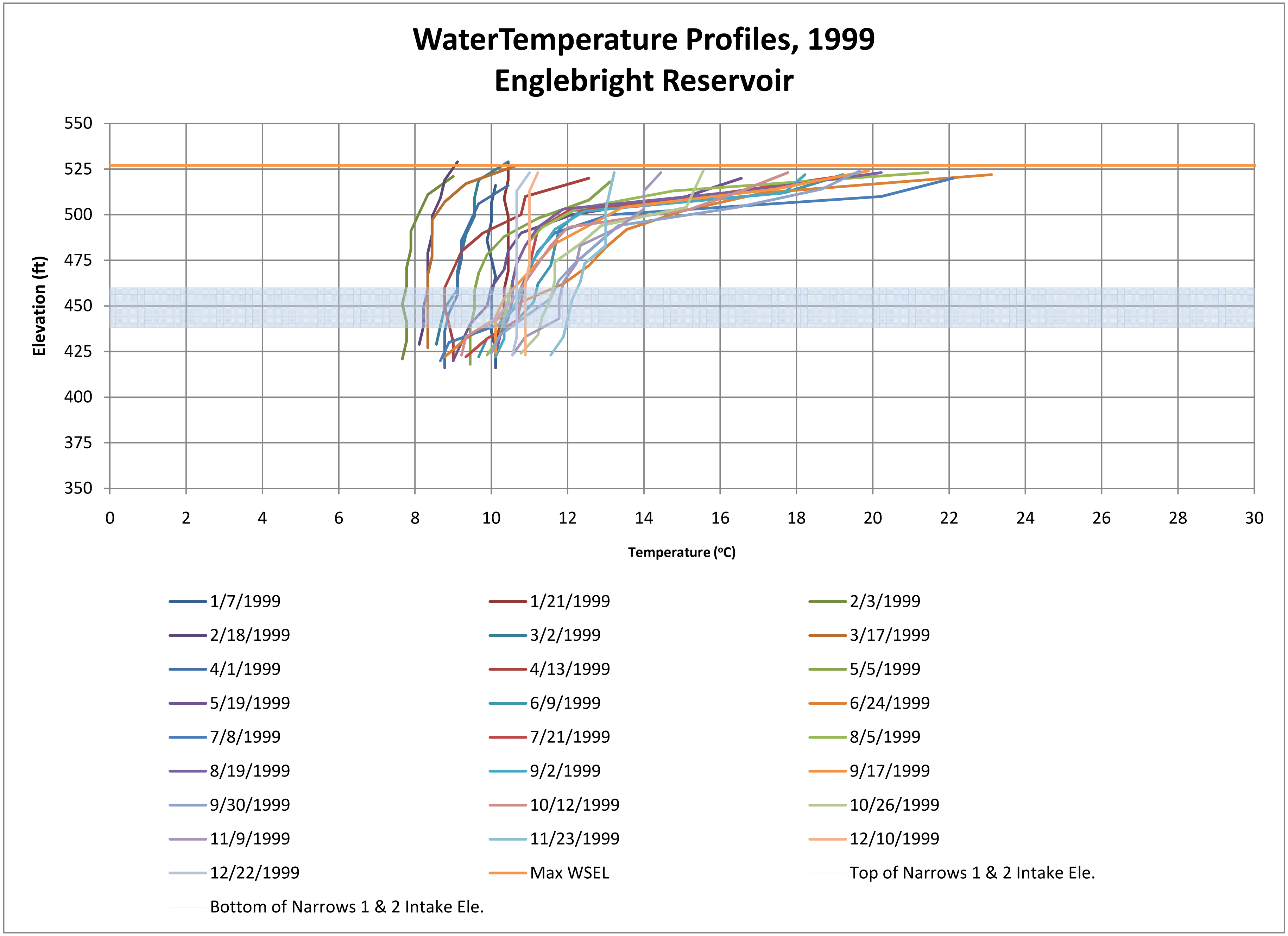

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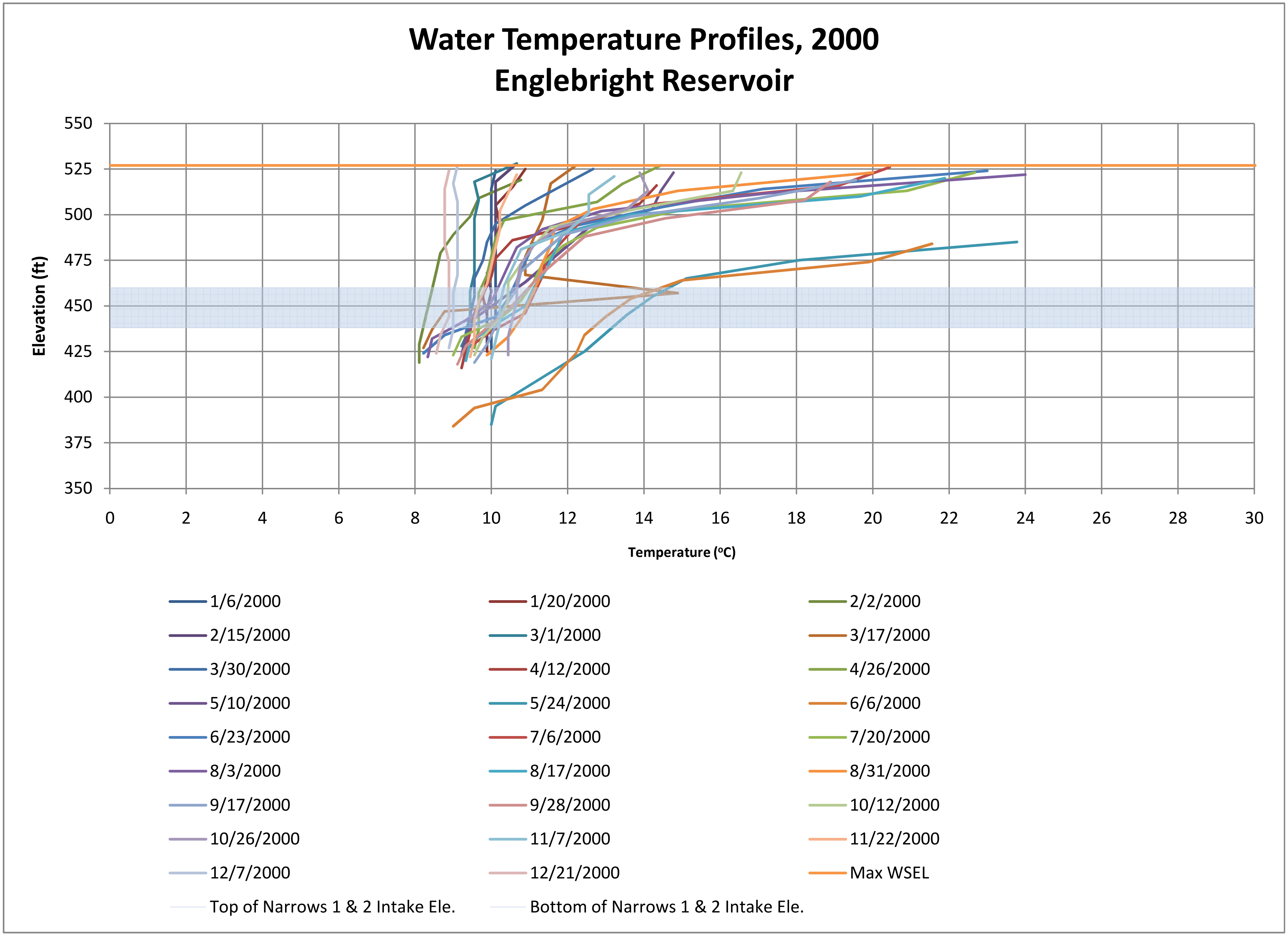
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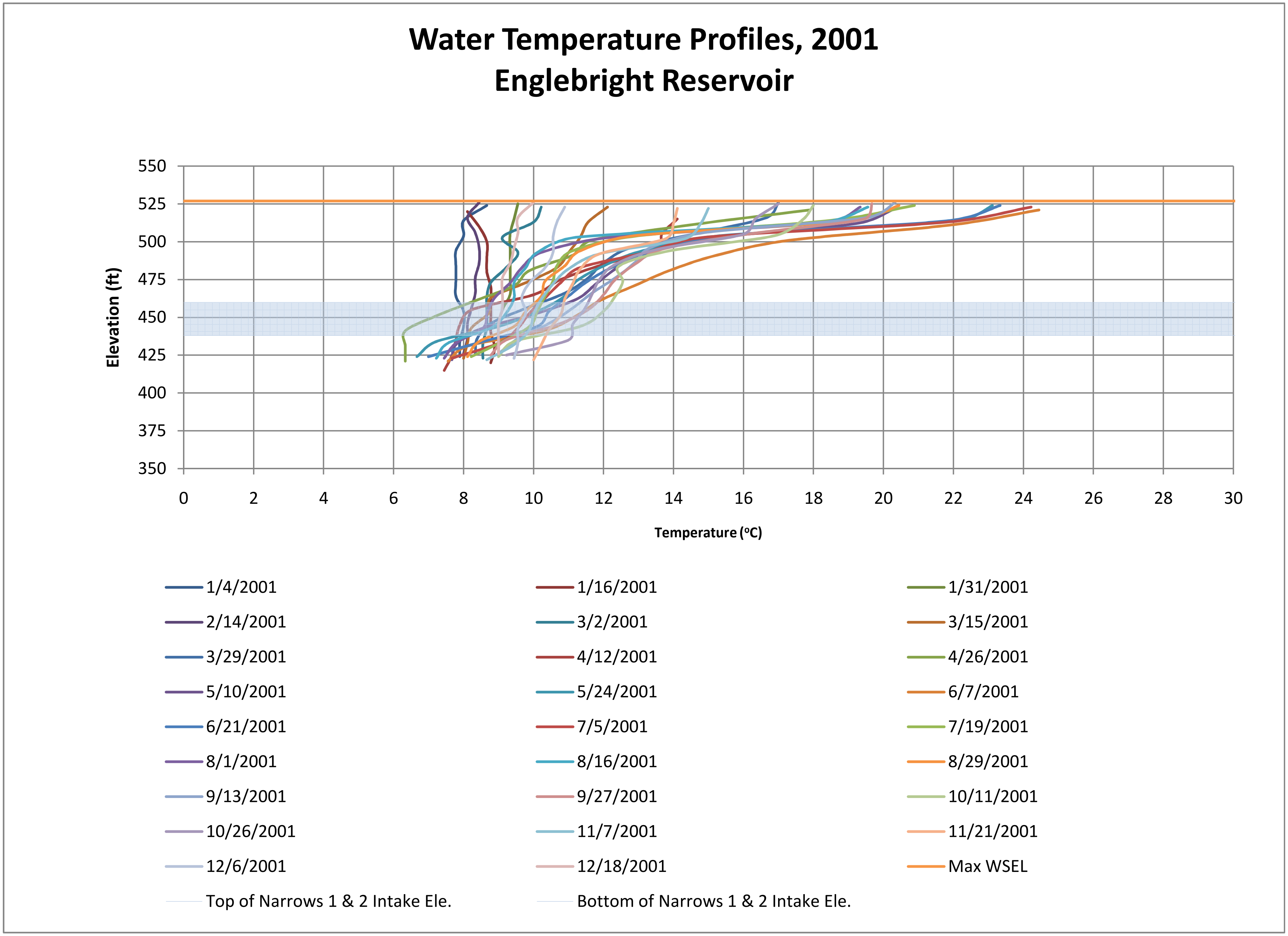
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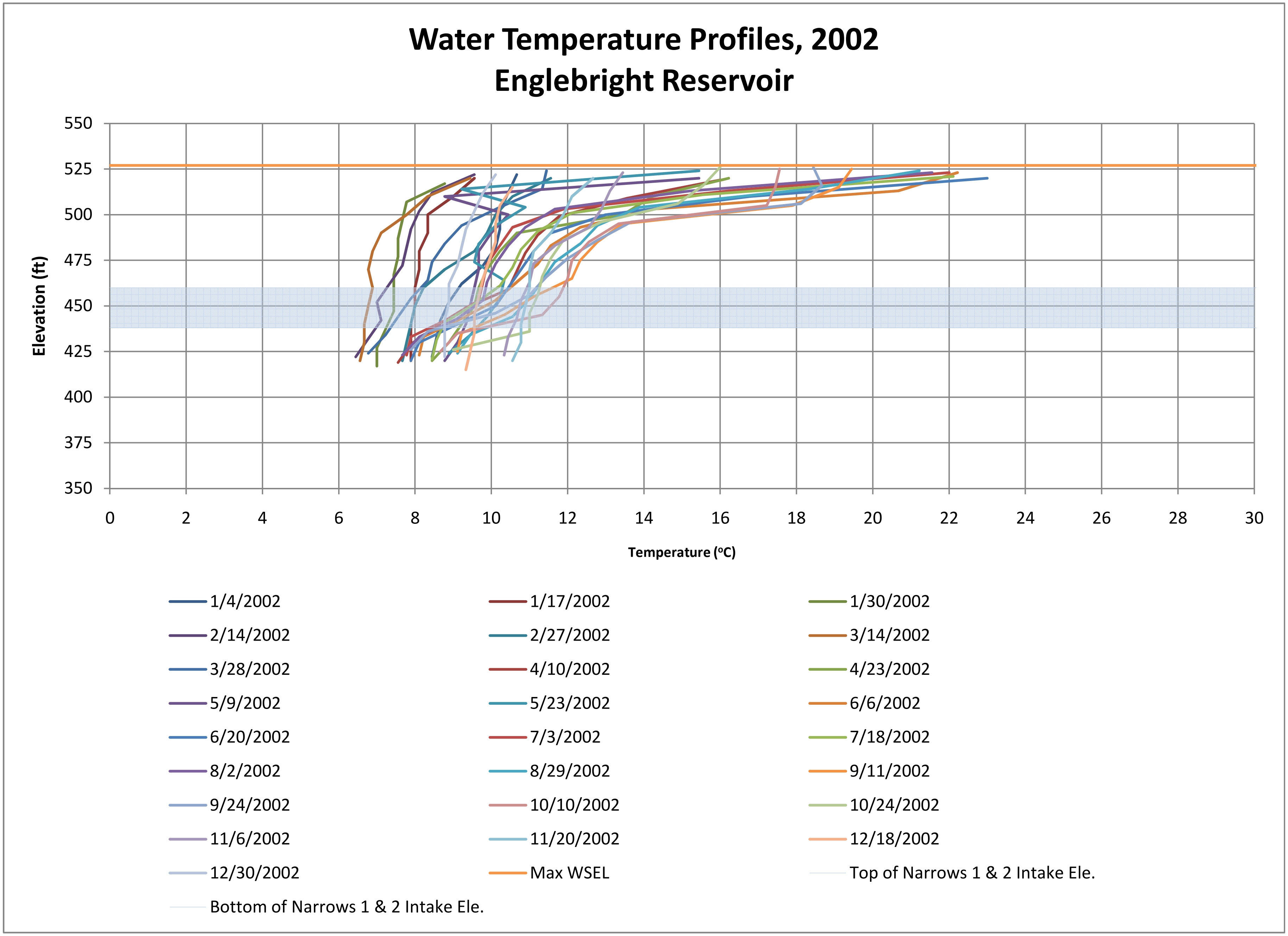
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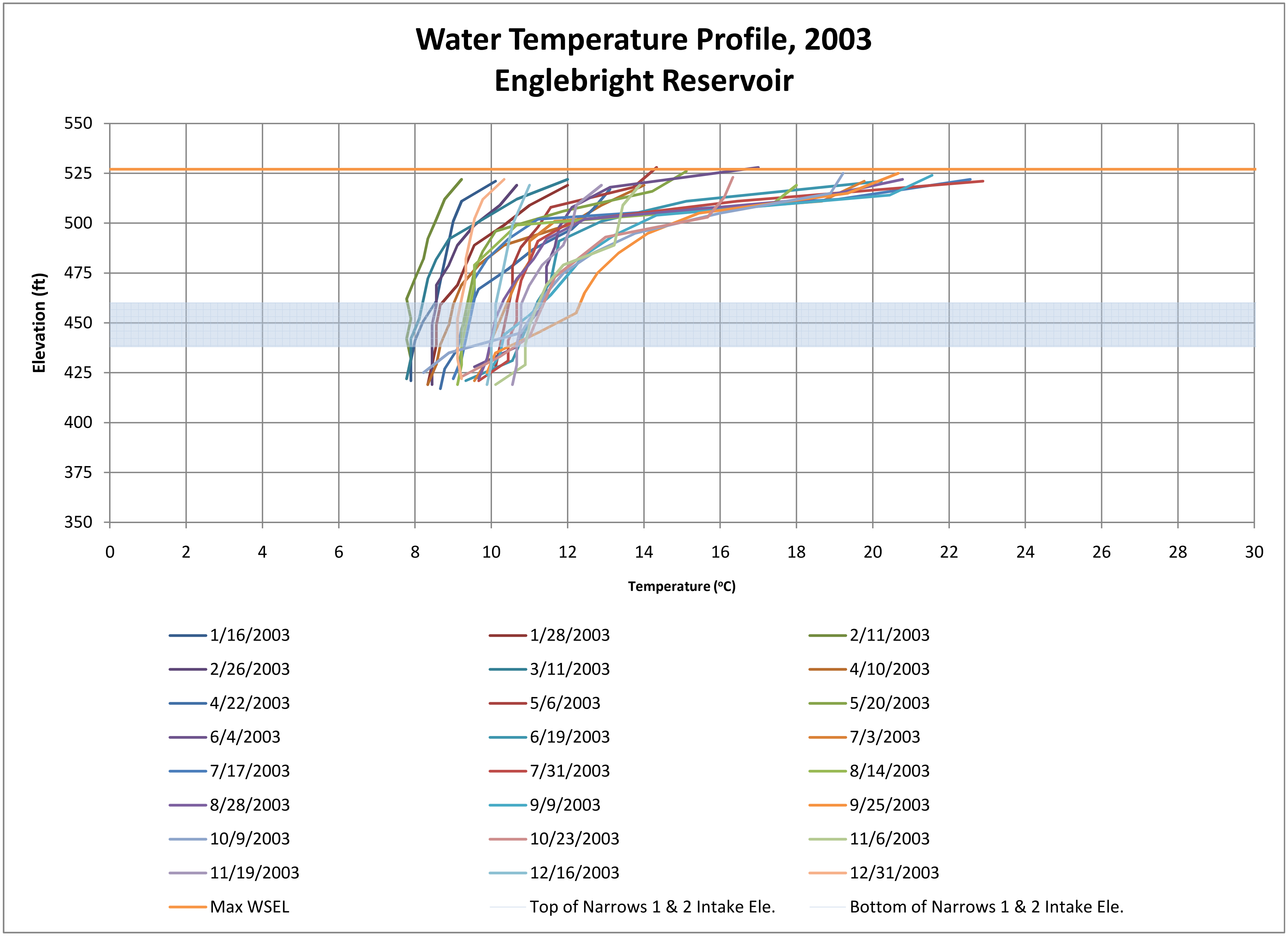
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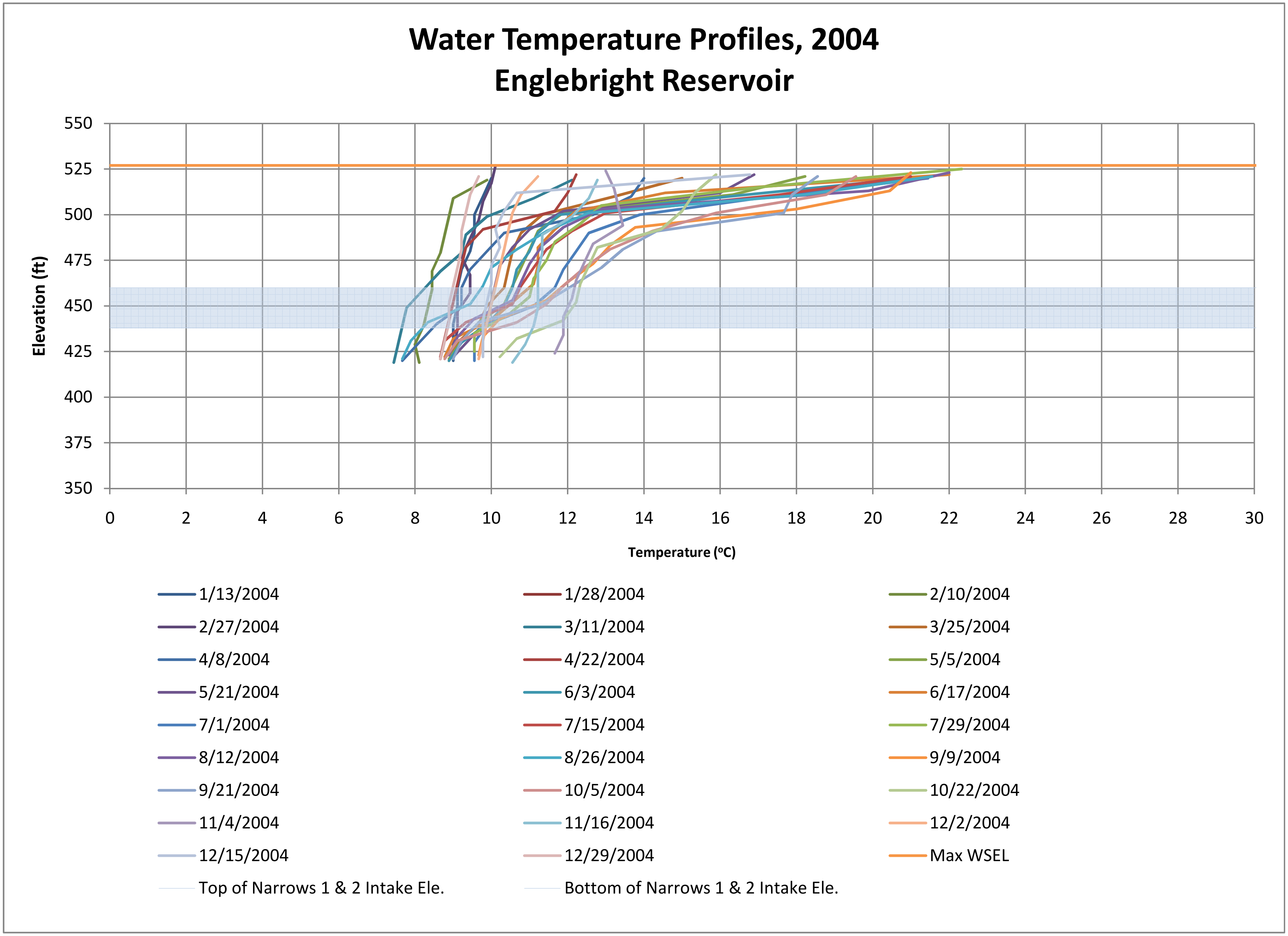
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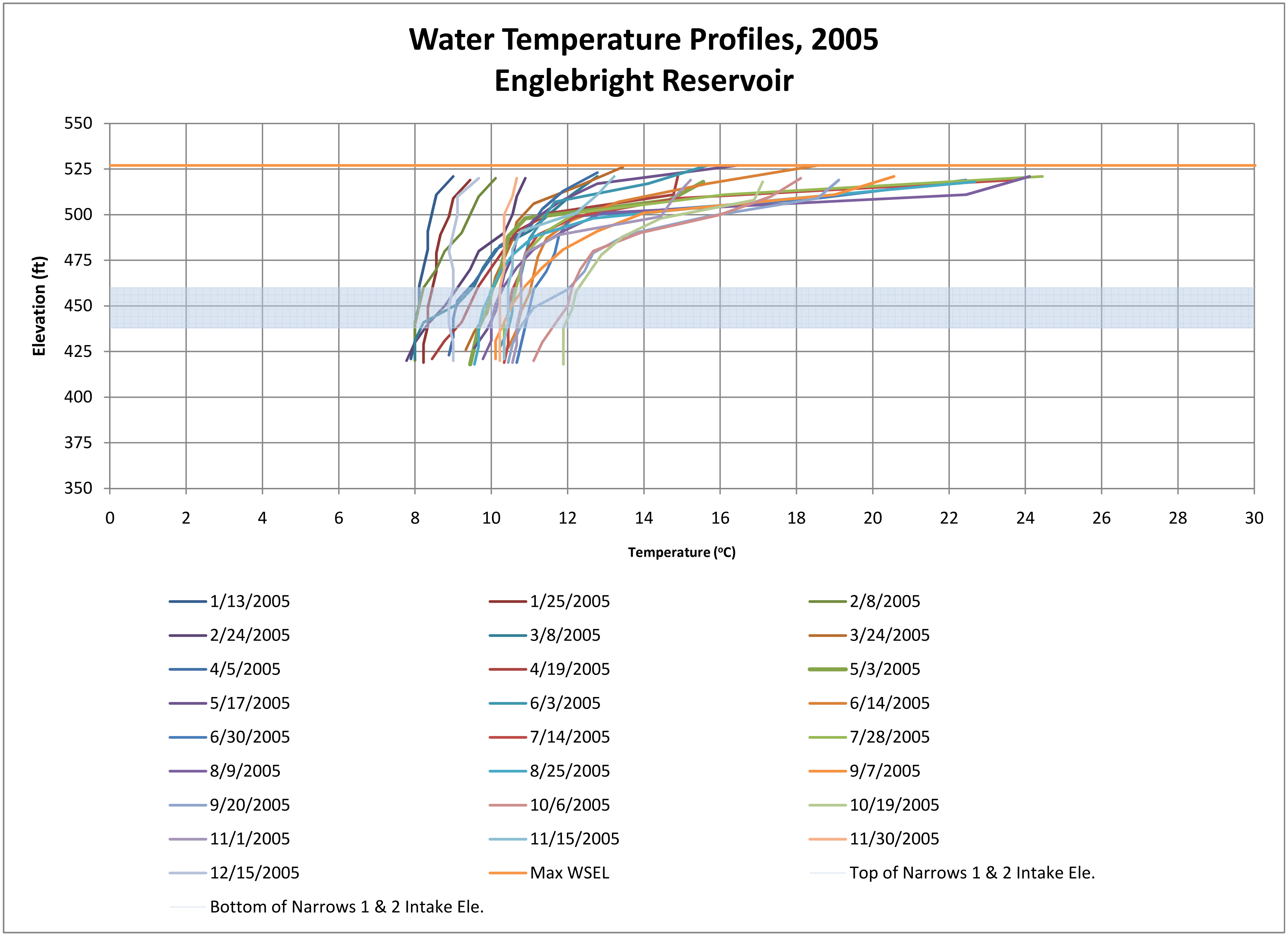
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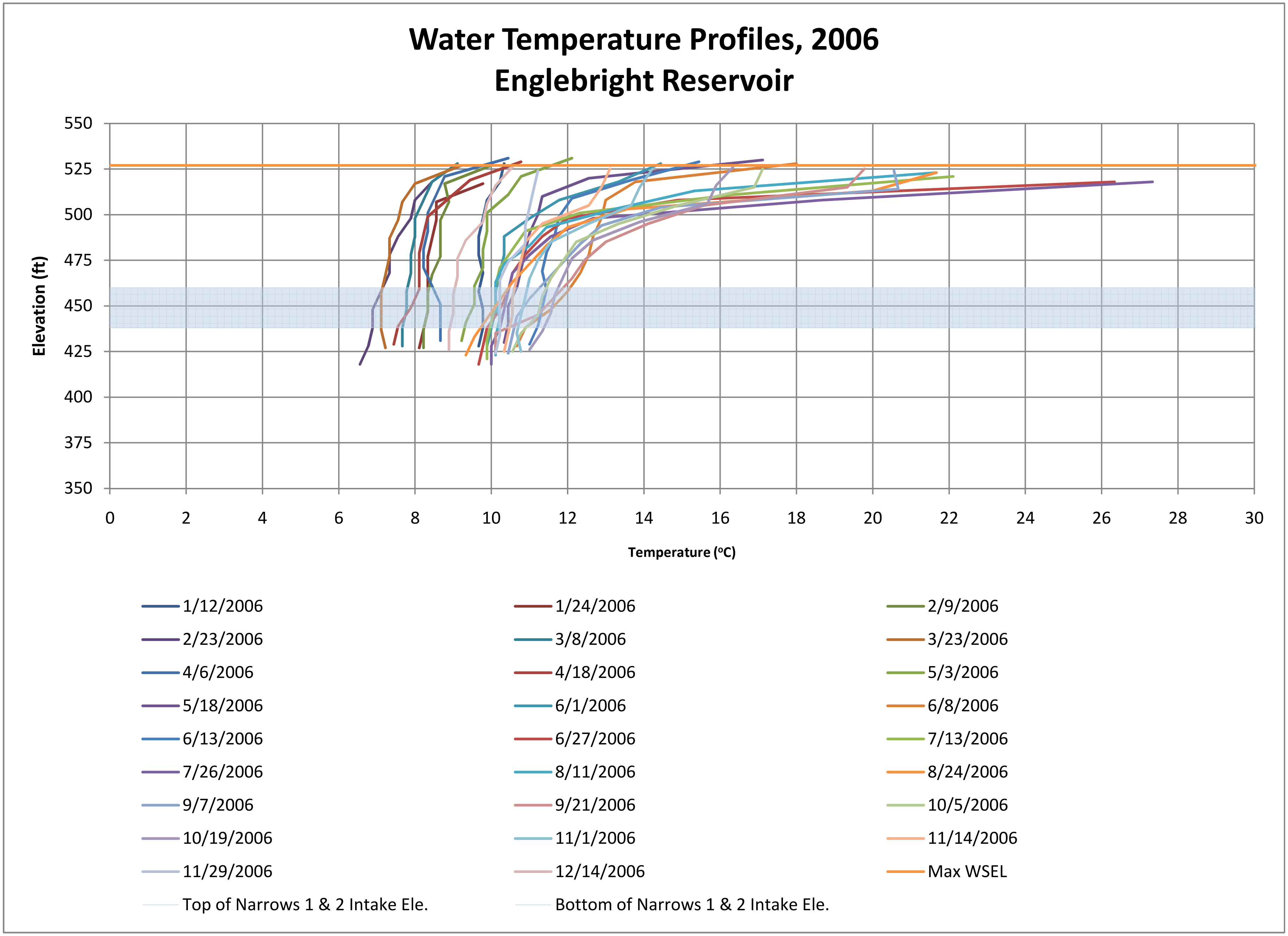
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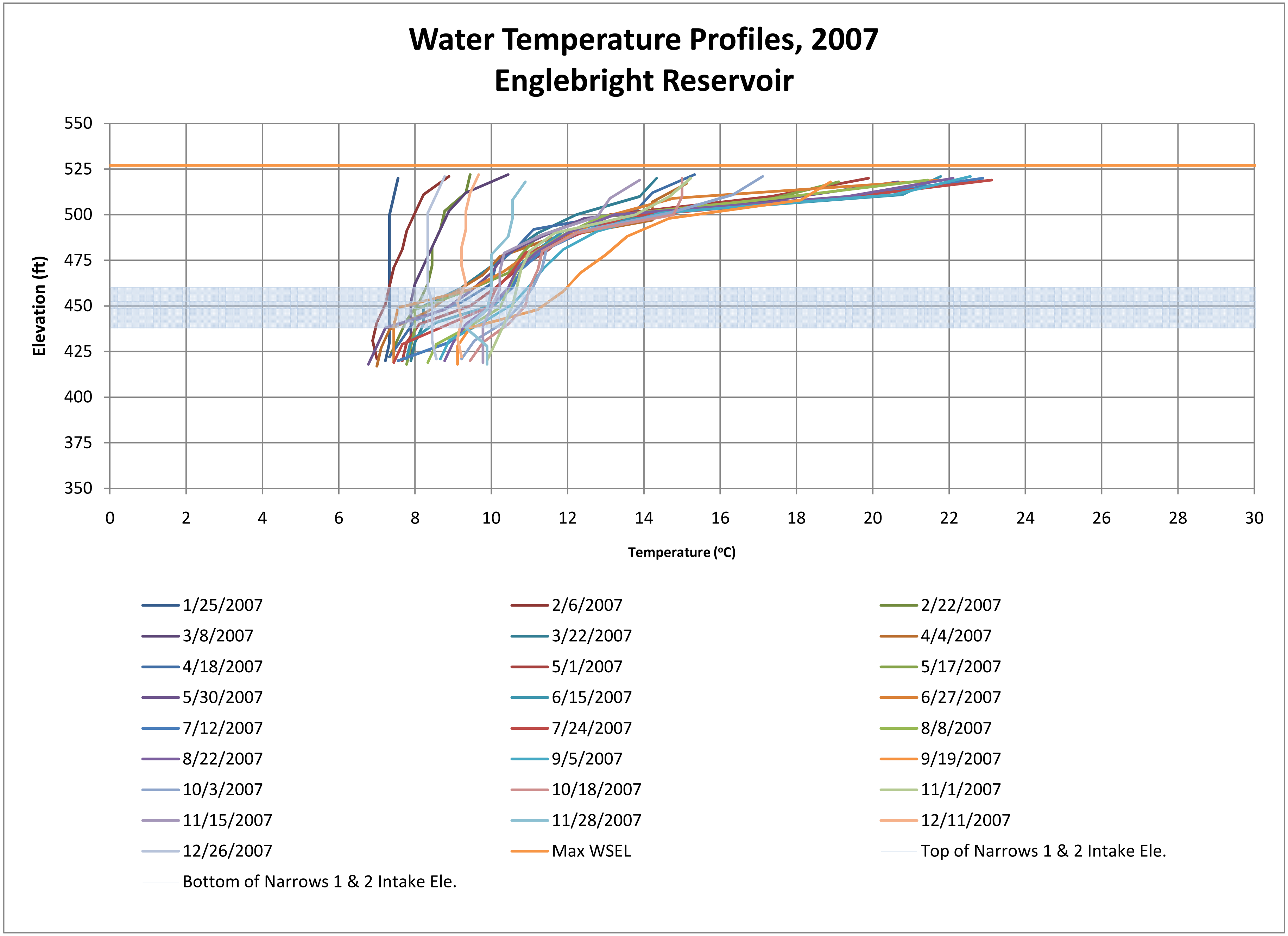
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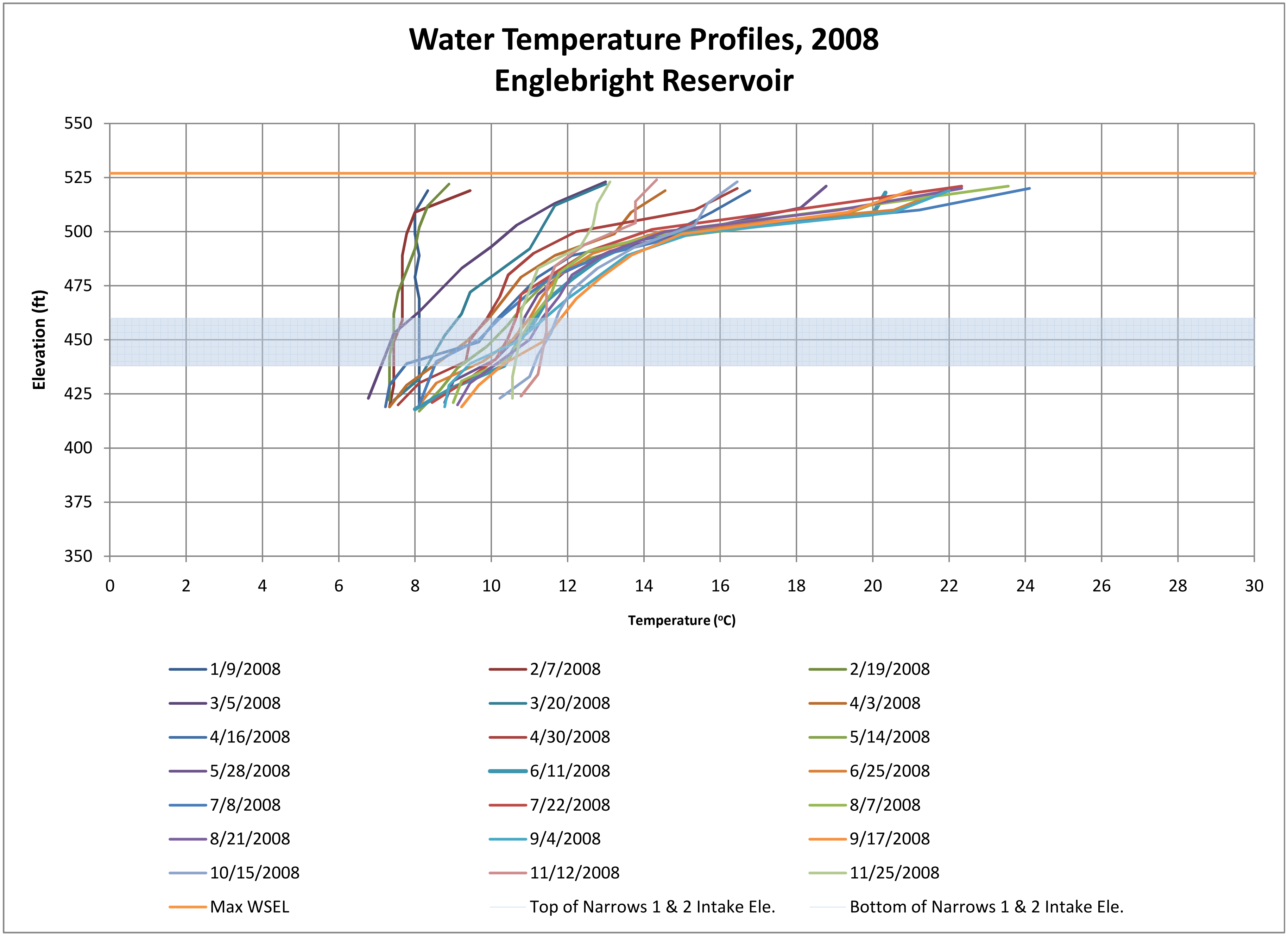
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Temperature (°C)
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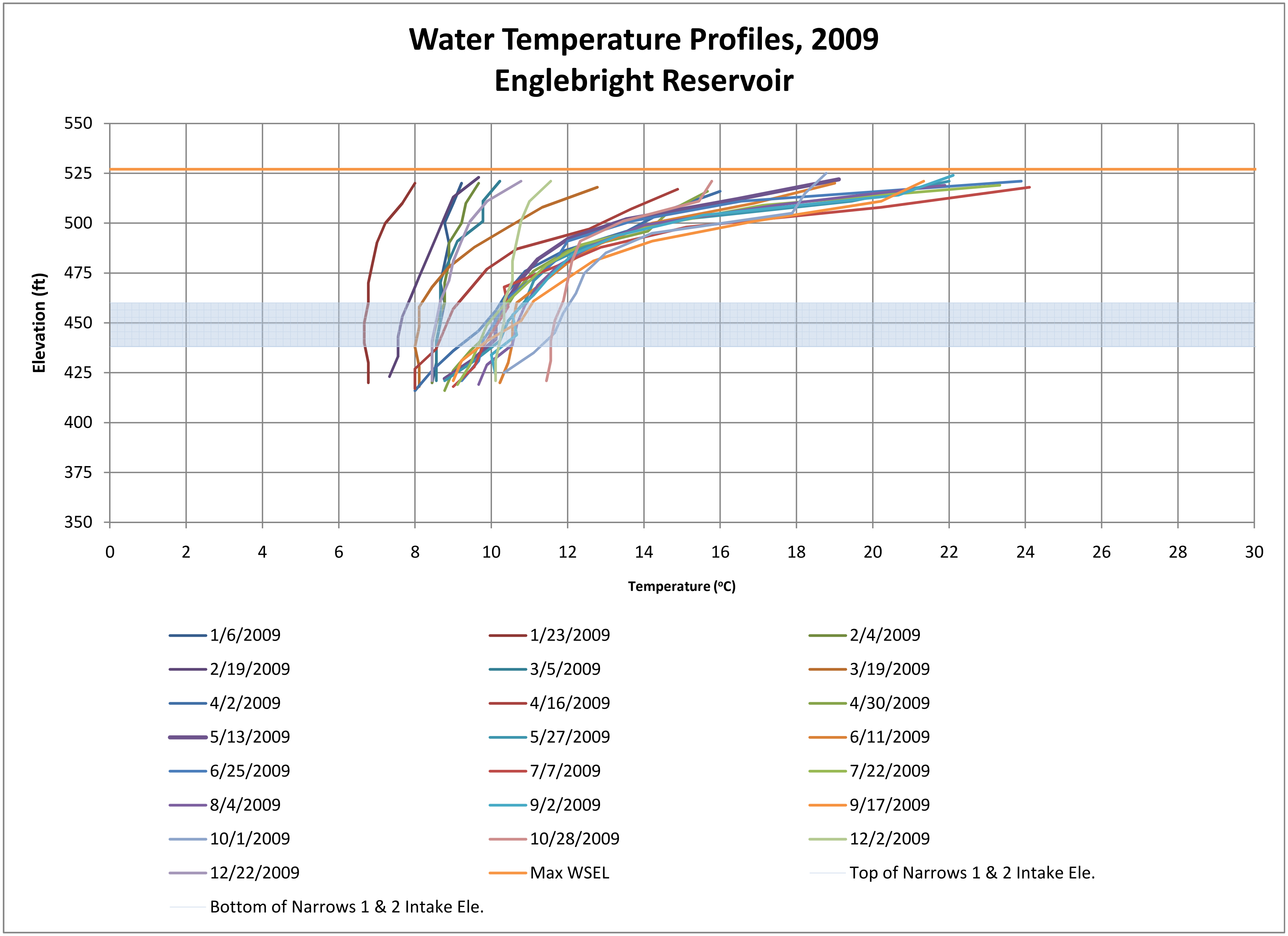
Max WSEL
Top of Narrows 1 & 2 Intake Ele.
Bottom of Narrows 1 & 2 Intake Ele.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Englebright Reservoir
Elevation (ft)
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Temperature (°C)
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Max WSEL
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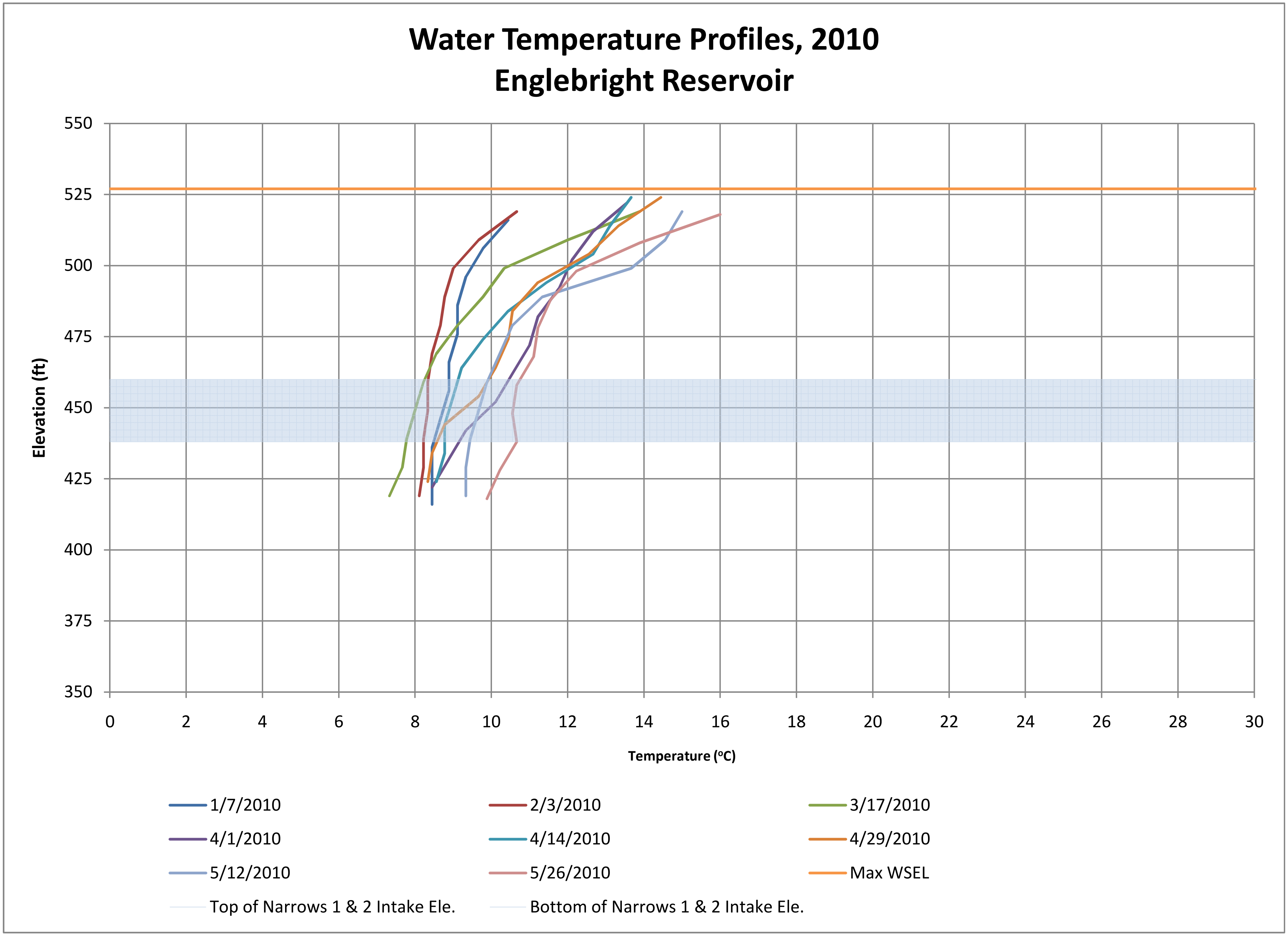

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Section 7.2
Water Resources Attachment

- **Attachment 7.2B: Licensee's 2009 Water Quality Data**

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ATTACHMENT 7.2B

Licensee's 2009 Water Quality

1.0 Surveys

In 2009, Yuba County Water Agency (YCWA or "Licensee") collected 35 surface water samples in stream reaches and reservoirs potentially affected by YCWA's Yuba River Development Project (Project) and monitored dissolved oxygen for 18 days downstream of Project facilities, United States Army Corp of Engineers' (USACE) facilities, and non-Project diversions. Starting on September 5 and completed by October 7, data collection was conducted within the summer low-flow season when Project effects might be expected to be most pronounced.

Of the 35 surface water samples collected, 17 were gathered from locations upstream, downstream and within New Bullards Bar Reservoir and USACE's Englebright Reservoir, as well as four locations downstream of the Project towards the Yuba River's confluence with the Feather River. The remaining 18 samples were collected near reservoir recreation facilities on and around the Labor Day holiday period and were analyzed for bacteria and hydrocarbons. Concurrent with surface water sample collection, dissolved oxygen was continuously monitored for 18 days downstream of New Bullards Bar, Colgate Powerhouse, Narrows 2 Powerhouse, and USACE's Daguerre Point Dam.

Licensee's 2009 water quality sample collection, analysis and results are summarized in the attached tables, Tables 7.2B-1 through 7.2B-7:

Table 7.2B-1	2009 Reservoir and stream reach sampling locations.
Table 7.2B-2	Water quality parameters and associated methods, reporting limits and laboratory holding times.
Table 7.2B-3	Standards, criteria and benchmarks used for determining consistency with Basin Plan Objectives and designated beneficial uses of water in project reservoirs and project-affected stream reaches.
Table 7.2B-4	2009 Sample-specific hardness dependent freshwater aquatic life criteria.
Table 7.2B-5	2009 Reservoir and stream reach sample results.
Table 7.2B-6	2009 Bacteria and Total Petroleum Hydrocarbon (TPH) sample results.
Table 7.2B-7	2009 Average daily dissolved oxygen downstream of Project facilities, USACE facilities, and non-Project diversions for 18 days.

Copies of Tables 7.2B-5 through 7.2B-7 are also available in Excel format from Licensee upon request. Detailed maps of the Project Area[1] are provided in Appendix D.

[1] The Project Area was defined as the area within the Federal Energy Regulatory Commission (FERC) Project Boundary and the land immediately surrounding the FERC Project Boundary (i.e., within about 0.25 mile of the FERC Project Boundary) and included Project-affected reaches between facilities and downstream to the next major water controlling feature or structure, the United States Army Corps of Engineers' (USACE) Daguerre Point Dam.

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2.0 References

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Table 7.2B-1 2009 reservoir and stream reach sampling locations.

Stream Reach	Study element			Sample Depth	Location	Notes
	Water Chemistry Sample [1,2]	Bacteria and TPH Sample [1]	Dissolved Oxygen 18-day Monitoring [3]			
MIDDLE YUBA RIVER						
--	X	--	--	Surface	Above Our House Dam Diversion	Immediately upstream of the impoundment; SYRCL sampling Site
Our House Diversion Dam Reach	X	--	--	Surface	Below Our House Dam Diversion	Immediately downstream of dam
OREGON CREEK						
--	X	--	--	Surface	Above Log Cabin Diversion Dam	Immediately upstream of the impoundment and above inflow from tunnel
Log Cabin Diversion Dam Reach	X	--	--	Surface	Below Log Cabin Diversion Dam	Immediately downstream of dam
NORTH YUBA RIVER						
--	X	--	--	Surface	Below Fiddle Creek at Highway 49[1]	In flowing water upstream of New Bullards Bar; SYRCL Sampling Site
New Bullards Bar Reservoir	--	X	--	Surface	In-reservoir, upstream of both boat ramps	Non-recreation site for bacteria sampling comparisons
	--	X	--	Surface	Emerald Cove Near the Boat Ramp	--
	--	X	--	Surface	Dark Day Cove Near the Boat Ramp	--
	X	--	--	Surface	One Site Near Dam	--
	X	--	--	Bottom		--
New Bullards Bar Dam Reach	X	--	X	Surface	Below New Bullards Bar Dam	--
YUBA RIVER						
Colgate Powerhouse Reach	X	--	X	Surface	Below Colgate Powerhouse	--
USACE's Englebright Reservoir	X	--	--	Surface	One Site Near Dam	--
	X	--	--	Bottom		--
SOUTH YUBA RIVER						
--	X	--	--	Surface	South Yuba River State Park – South Yuba River upstream of Englebright high-water line	SYRCL's Bridgeport sampling site
YUBA RIVER						
Narrows 2 Powerhouse Reach	X	--	X	Surface	Narrows 2 Tailrace/ Downstream of USACE's Englebright Dam	--
--	X	--	--	Surface	Downstream of Deer Creek confluence; at Highway 20	SYRCL Sampling Site
Daguerre Point Dam Reach	X	--	X	Surface	Downstream of USACE's Daguerre Point Diversion Dam	SYRCL Sampling Site
	X	--	--	Surface	At Walnut Avenue	--
	X	--	--	Surface	Marysville	SYRCL Sampling Site

1 Water samples were grab samples collected for laboratory analysis; stream samples were collected from the moving water.
2 Trace metals samples collected using the clean-hands/dirty hands sample collection technique (EPA 1996)
3 Hydrolab sondes were placed in moving water.

Key:
X = A sample was collected at this location or a dissolved oxygen monitoring sonde was placed at this location.
SYRCL= South Yuba River Citizens League
USACE= United States Army Corps of Engineers
-- = not applicable

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Table 7.2B-2. Water quality parameters and associated methods, reporting limits and laboratory holding times.

Analyte		Method[1]	Target Reporting Limit μg/L (or other)	Hold time
BASIC WATER QUALITY- FIELD[2]				
Dissolved Oxygen	DO	SM 4500-O	0.1 mg/L	Field
Flow	---	gage or visual estimate[3]	---	Field
pH	---	SM 4500-H	0.1 su	Field
Secchi Disc	---	---	---	Field
Specific conductance	---	SM 2510A	0.001 µSiemens/cm	Field
Turbidity	---	SM 2130 B	0.1 NTU	Field
BASIC WATER QUALITY—LABORATORY[4]				
Total Organic Carbon	TOC	SM 5310	0.2 mg/L	28 d
Dissolved Organic Carbon	DOC	EPA 415.1 D	0.5/0.1	28 d
Total Dissolved Solids	TDS	EPA 2540 C/SM 2340 C	1 mg/L	7d
Total Suspended Solids	TSS	EPA 2520 D SM 2340 D	1 mg/L	7d
INORGANIC IONS[4]				
Alkalinity, Total	---	SM 2340 B	2000	14 d
Calcium	Ca	EPA 6010 B	30	180 d
Chloride	Cl	EPA 300.0	20	28 d
Hardness (measured value)	---	EPA 2340 B SM 2340 C	1 mg/L as $CaCO_3$	14 d
Magnesium	Mg	EPA 6010 B	1	180 d
Potassium	K	EPA 6010 B	500	180 d
Sodium	Na	EPA 6010 B	29	180 d
Sulfate	SO_4^{2-}	EPA 300.0	1.0 mg/L	28 d
Sulfide	S^{2-}	SM 4500 S2 – D	0.05 mg/L	28 d
NUTRIENTS[4]				
Ammonia as N, total	---	EPA 4500-NH3 SM 4500-NH3	0.02	28 d <pH 2
Kjeldahl Nitrogen as N, total	TKN	SM 4500 N	100	28 d <pH 2
Nitrate-Nitrite	---	EPA 300.0	2	28 d <pH 2
Orthophosphate, dissolved	PO_4	EPA 365.1 EPA 300.0	0.01	48 h at 4 °C
Phosphorus, total	TP	SM4500 P	20	28 d <pH 2
METALS (total and dissolved)[5]				
Aluminum (total and dissolved)	Al	EPA 200.8/EPA 1638	4.0/ 0.4	180 d
Arsenic (total and dissolved)	As	EPA 200.8/1638	0.15/0.04	180 d
Cadmium (total and dissolved)	Cd	EPA 200.8/1638	0.020/0.004	180 d
Chromium, Total (total and dissolved)	Cr	EPA 200.8/1638	0.010/0.03	180 d
Copper (total and dissolved)	Cu	EPA 200.8/1638	0.10/0.01	180 d
Iron (total and dissolved)	Fe	EPA 200.8/1638	10.0/3.2	180 d
Lead (total and dissolved)	Pb	EPA 200.8/EPA 1638	0.040/0.003	180 d
Mercury (total)	Hg	EPA 1631	0.0005/0.00008	28 d
Methylmercury (total and dissolved)	CH_3Hg	EPA 1630	0.00005/0.000019	90 d
Nickel (total and dissolved)	Ni	EPA 200.8/1638	0.10/0.01	180 d
Selenium (total)	Se	EPA 200.8/1638	0.60/0.19	180 d
Silver (total and dissolved)	Ag	EPA 200.8/1638	0.20/0.006	180 d
Zinc (total and dissolved)	Zn	EPA 200.8/1638	0.2/0.1	180 d

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Table 7.2B-2. (continued)

Analyte		Method[1]	Target Reporting Limit µg/L (or other)	Hold time
BACTERIA[6]				
Total coliform	--	SM 9221	1.1 MPN	24 h
Fecal coliform	--	SM 9221	1.1 MPN	24 h
Escherichia coli	*E. coli*	SM 9221	1.1 MPN	24 h
PETROLEUM HYDROCARBONS[4]				
Total Petroleum Hydrocarbons (gasoline range)	TPH-g	EPA SW8015B	50	14 d
Oil & Grease	O&G	Visual Observation	--	--

[1] All methods EPA methods or equivalent (APHA 2010; EPA 1996; EPA 2010).
[2] *In situ* measurements were collected with the Hydrolab Quanta.
[3] Sampling locations were co-located with temperature monitoring sites and with flow gages, as much as possible; if flow was not measured, it was visually estimated.
[4] Analyses were performed by CalScience Environmental Laboratories, Inc. in Garden Grove, California, a California-certified laboratory.
[5] Metals analyses were performed by Frontier GeoSciences, Inc. of Seattle, Washington, a California-certified laboratory. Holding times for metals are for samples after filtration and preservation.[6] Bacteria samples were sent to Cranmer Engineering and Analytical Laboratory in Grass Valley, California.

Key:
EPA = United States Environmental Protection Agency
$CaCO_3$ = Calcium carbonate
cm = centimeter
d = days
h = hours
µg/L = micrograms per liter (equals parts per billion)
mg/L = milligrams per liter (equals parts per million)
NTU = Nephelometric Turbidity Units
SM = Standard Method
su = Standard Unit
-- = not available or not applicable

Table 7.2B-3. Standards, criteria and benchmarks used for determining consistency with Basin Plan Objectives and designated beneficial uses of water in Project reservoirs and Project-affected stream reaches.[1]

Basin Plan Water Quality Objective (Potentially Affected Beneficial Uses)	Symbol or Abbreviation	Standard, Criteria or Benchmark Value[2]	Reference	Notes
BIOSTIMULATORY SUBSTANCES (COLD, SPAWN)				
Total Kjeldahl Nitrogen	TKN	None	--	--
Total Phosphorous	TP	None	--	--
CHEMICAL CONSTITUENTS (AGR, MUN)				
Alkalinity (as $CaCO_3$)	--	20 mg/L (minimum)	Marshack 2008	Low alkalinity can affect water treatment
Aluminum	Al	1 mg/L	CDHS 2005 cited in CVRWQCB 1998	Title 22 Primary MCL
Arsenic	As	0.010 mg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL
Cadmium	Cd	5 µg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL
Calcium	Ca	None	--	--
Chromium (total)	Cr (total)	50 µg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL
Copper	Cu	1.3 mg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL
Lead	Pb	15 µg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL

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Table 7.2B-3. (continued)

Basin Plan Water Quality Objective (Potentially Affected Beneficial Uses)	Symbol or Abbreviation	Standard, Criteria or Benchmark Value [2]	Reference	Notes
CHEMICAL CONSTITUENTS (AGR, MUN) (continued)				
Mercury (inorganic)	Hg	0.002 mg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL
Nickel	Ni	0.1 mg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL
Nitrate	NO_3	45 mg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL
Nitrite	NO_2	1 mg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL
Nitrate + Nitrite	$NO_3 + NO_2$	10 mg/L (combined total)	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL
Potassium	K	None	--	--
Selenium	Se	0.05 mg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL
Sodium	Na	20 mg/L	Marshack 2008	Sodium Restricted Diet[3]
Specific conductance	--	150 µmhos	CVRWQCB 1998	Aquatic Life Protection
Zinc	Zn	5 mg/L	CDPH 2010 cited in CVRWQCB 1998	Title 22 Secondary MCL
DISSOLVED OXYGEN (COLD, SPAWN)				
Dissolved Oxygen	DO	7.0 mg/L (minimum)	CVRWQCB 1998	Aquatic life protection
FLOATING MATERIAL (REC-1, REC-2)				
Floating Material	--	Narrative Criteria	CVRWQCB 1998	Aesthetic – Absent by visual observation
OIL & GREASE (REC-1, REC-2)				
Oil & Grease	--	Narrative Criteria	CVRWQCB 1998	Aesthetic – Absent by visual observation
Total Petroleum Hydrocarbons	TPH	None	--	--
pH (COLD, SPAWN, WILD)				
pH	--	6.5-8.5	CVRWQCB 1998	Aquatic life protection
SEDIMENT AND SETTLEABLE SOLIDS (REC-2, SPAWN, WILD)				
Sediment	--	Narrative Criteria	CVRWQCB 1998	--
TASTES & ODORS (MUN)				
Aluminum	Al	0.2 mg/L	CDPH 2005 cited in CVRWQCB 1998	Title 22 Secondary MCL
Chloride	Cl	250 mg/L	CDPH 2005 cited in CVRWQCB 1998	Title 22 Secondary MCL
Copper	Cu	1 mg/L	CDPH 2005 cited in CVRWQCB 1998	Title 22 Secondary MCL
Iron	Fe	0.3 mg/L	CDPH 2005 cited in CVRWQCB 1998	Title 22 Secondary MCL
Silver	Ag	0.1 mg/L	CDPH 2005 cited in CVRWQCB 1998	Title 22 Secondary MCL
Specific Conductance	--	900 µmhos	CDPH 2005 cited in CVRWQCB 1998	Title 22 Secondary MCL
Sulfate	SO_4	250 mg/L	CDPH 2005 cited in CVRWQCB 1998	Title 22 Secondary MCL
Total Dissolved Solids	TDS	500 mg/L	CDPH 2005 cited in CVRWQCB 1998	Title 22 Secondary MCL
Zinc	Zn	5 mg/L	CDPH 2005 cited in CVRWQCB 1998	Title 22 Secondary MCL
TEMPERATURE (COLD, SPAWN)				
Temperature	--	Narrative Criteria	CVRWQCB 1998	--
TOXICITY (COLD, SPAWN, MUN) [4]				
Alkalinity (as $CaCO_3$)	--	20 mg/L (minimum concentration except where natural concentrations are less.)	Marshack 2008	Low alkaline waters susceptible to acidification

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Table 7.2B-3. (continued)

Basin Plan Water Quality Objective (Potentially Affected Beneficial Uses)	Symbol or Abbreviation	Standard, Criteria or Benchmark Value [2]	Reference	Notes
TOXICITY (COLD, SPAWN, MUN) [4] (continued)				
Aluminum	Al	0.087 µg/L[5]	Marshack 2008	EPA AWQC; aquatic life protective
Ammonia as N (pH and Temp dependent)	NH_3-N	24.1 mg/L (CMC); 4.1-5.9 mg/L (CCC)	EPA 2000	CTR criteria over 0-20ºC assuming pH 7.0
		5.6 mg/L (CMC); 1.7-2.4 mg/L (CCC)	EPA 2000	CTR criteria over 0-20ºC assuming pH 8.0
		0.9 mg/L (CMC); 0.3-0.5 mg/L (CCC)	EPA 2000	CTR criteria over 0-20ºC assuming pH 9.0
Arsenic	As	340 µg/L (CMC); 150 µg/L (CCC)	EPA 2000	CTR criteria
Cadmium (hardness dependent)	Cd	0.23 µg/L (CMC); 0.15 µg/L (CCC)	EPA 2000	CTR for unfiltered sample assuming hardness of 5 mg/L as $CaCO_3$
		0.4 µg/L (CMC); 0.34 µg/L (CCC)	EPA 2000	CTR for unfiltered sample assuming hardness of 10 mg/L as $CaCO_3$
		0.56 µg/L (CMC); 0.53 µg/L (CCC)	EPA 2000	CTR for unfiltered sample assuming hardness of 15 mg/L as $CaCO_3$
		0.83 µg/L (CMC); 0.95 µg/L (CCC)	EPA 2000	CTR for unfiltered sample assuming hardness of 25 mg/L as $CaCO_3$
Chromium (hardness dependent)	Cr	47.19 µg/L (CMC); 15.31 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 5 mg/L as $CaCO_3$
		83.25 µg/L (CMC); 27.0 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 10 mg/L as $CaCO_3$
		116.03 µg/L (CMC); 37.64 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 15 mg/L as $CaCO_3$
		176.31 µg/L (CMC); 57.19 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 25 mg/L as $CaCO_3$
Copper (hardness dependent)	Cu	0.83 µg/L (CMC); 0.72 µg/L (CCC)	EPA 2000	CTR for unfiltered sample assuming hardness of 5 mg/L as $CaCO_3$
		1.6 µg/L (CMC); 1.3 µg/L (CCC)	EPA 2000	CTR for unfiltered sample assuming hardness of 10 mg/L as $CaCO_3$
		2.34 µg/L (CMC); 1.84 µg/L (CCC)	EPA 2000	CTR for unfiltered sample assuming hardness of 15 mg/L as $CaCO_3$
		3.79 µg/L (CMC); 2.85 µg/L (CCC)	EPA 2000	CTR for unfiltered sample assuming hardness of 25 mg/L as $CaCO_3$
Lead (hardness dependent)	Pb	2 µg/L (CMC) 0.086 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 5 mg/L as $CaCO_3$
		5 µg/L (CMC) 0.191 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 10 mg/L as $CaCO_3$
		8 µg/L (CMC) 0.303 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 15 mg/L as $CaCO_3$
		0.54 µg/L (CCC) 14 µg/L (CMC)	EPA 2000	CTR for dissolved sample assuming hardness of 25 mg/L as $CaCO_3$

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Table 7.2B-3. (continued)

Basin Plan Water Quality Objective (Potentially Affected Beneficial Uses)	Symbol or Abbreviation	Standard, Criteria or Benchmark Value [2]	Reference	Notes
TOXICITY (COLD, SPAWN, MUN) [4] (continued)				
Mercury	Hg	0.050 µg/L	EPA 2000 40 CFR 131.38	CTR/Federal Register. 5/18/00
Nickel (hardness dependent)	Ni	37.2 µg/L (CMC); 4.1 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 5 mg/L as $CaCO_3$
		66.9 µg/L (CMC); 7.4 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 10 mg/L as $CaCO_3$
		94.3 µg/L (CMC); 10.5 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 15 mg/L as $CaCO_3$
		145.2 µg/L (CMC); 16.1 µg/L (CCC)	EPA 2000	CTR for dissolved sample assuming hardness of 25 mg/L as $CaCO_3$
Nitrate-Nitrite	NO_3-N+NO_2-N	10 mg/L (combined total)	CDPH 2010 cited in CVRWQCB 1998	Title 22 Primary MCL (“Blue baby Syndrome”)
Silver (hardness dependent)	Ag	0.02 µg/L (CMC) instantaneous	EPA 2000	CTR for unfiltered sample assuming hardness of 5 mg/L as $CaCO_3$
		0.08 µg/L (CMC) instantaneous	EPA 2000	CTR for unfiltered sample assuming hardness of 10 mg/L as $CaCO_3$
		0.16 µg/L (CMC) instantaneous	EPA 2000	CTR for unfiltered sample assuming hardness of 15 mg/L as $CaCO_3$
		0.37 µg/L (CMC) instantaneous	EPA 2000	CTR for unfiltered sample assuming hardness of 25 mg/L as $CaCO_3$
Zinc (hardness dependent)	Zn	9.47 µg/L	EPA 2000	CTR for unfiltered sample assuming hardness of 5 mg/L as $CaCO_3$
		17.03 µg/L	EPA 2000	CTR for unfiltered sample assuming hardness of 10 mg/L as $CaCO_3$
		24.01 µg/L	EPA 2000	CTR for unfiltered sample assuming hardness of 15 mg/L as $CaCO_3$
		37.02 µg/L	EPA 2000	CTR for unfiltered sample assuming hardness of 25 mg/L as $CaCO_3$
TURBIDITY (COLD, SPAWN, WILD, MUN)				
Turbidity	NTU	increase < 1 NTU for 1-5 NTU background; increase < 20% for 5-50 NTU background	CVRWQCB 1998	Aesthetic, disinfection, egg incubation
BACTERIA (MUN, REC-1)				
Total coliform	--	< 10,000 MPN per 100 mL < 240 MPN per 100 mL (geometric mean);	EPA 2003	Water contact recreation, single-day sample; Water contact recreation, 30-day geometric mean
Fecal coliform	--	< 200 MPN per 100 mL (geometric mean); < 10% of samples > 400 MPN per 100 mL	CVRWQCB 1998	Water contact recreation, 30-day geometric mean; with individual samples not > 400 MPN/100 mL

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Table 7.2B-3. (continued)

Basin Plan Water Quality Objective (Potentially Affected Beneficial Uses)	Symbol or Abbreviation	Standard, Criteria or Benchmark Value [2]	Reference	Notes
BACTERIA (MUN, REC-1) (continued)				
Escherichia coli	*E. coli*	< 126 MPN per 100 mL (geometric mean) <235 MPN per 100 mL in any single sample	EPA 2003	Water contact recreation, 30-day geometric mean

[1] Beneficial uses are designated in CVRWQCB 1998; a constituent may be listed under more than one beneficial use.
[2] When a standard or criterion was not available, benchmarks were excerpted from EPA (2003) and Marshack (2008).
[3] Guidance level to protect those individuals restricted to a total sodium intake of 500 mg/day (Marshack 2008).
[4] California Toxics Rule (CTR) values assume total recoverable concentrations of filtered samples (dissolved fraction).
[5] Benchmark is likely overly protective, as EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 0.087 µg /L aluminum when either total recoverable or dissolved is measured (Marshack 2008)

Key:
AWQC = Ambient Water Quality Criteria
EPA = Environmental Protection Agency
$CaCO_3$ = Calcium carbonate
CMC = Criterion Maximum Concentration (1-hour acute exposure) for aquatic toxicity as defined by EPA (2000)
CCC = Criterion Continuous Concentration (4-day chronic exposure) for aquatic toxicity as defined by EPA (2000)
CTR = California Toxics Rule
MCL = Maximum Contaminant Level
µmhos = micro-mhos
µg/L = micrograms per liter
mg/L = milligrams per liter
MPN = Most Probable Number
NTU = Nephelometric turbidity units
SM = Standard Method
su = standard unit
-- = not available or not applicable

Table 7.2B-4. Sample-specific hardness dependent freshwater aquatic life criteria.

Hardness (mg/L)	Hardness Dependent Aquatic Life Criteria[1,2]						
	Criteria Continuous Concentration (CCC) (dissolved)						
	Cadmium (µg/L)	Chromium (µg/L)	Copper (µg/L)	Lead (µg/L)	Nickel (µg/L)	Silver (µg/L)	Zinc (µg/L)
21	0.72	49.5	2.36	0.44	13.8	0.24	31.5
34	1.02	73.5	3.56	0.76	20.8	0.54	47.4
36	1.07	77.1	3.74	0.81	21.9	0.60	49.7
37	1.09	78.8	3.83	0.84	22.4	0.62	50.9
38	1.11	80.5	3.92	0.87	22.9	0.65	52.0
40	1.15	84.0	4.09	0.92	23.9	0.71	54.4
48	1.32	97.5	4.78	1.12	27.9	0.98	63.4
64	1.64	123	6.12	1.54	35.6	1.60	80.9
72	1.78	136	6.76	1.76	39.3	1.96	89.4
75	1.84	140	7.00	1.84	40.7	2.10	92.5
79	1.91	146	7.32	1.95	42.6	2.30	96.8
90	2.10	163	8.19	2.24	47.5	2.88	108

Note: All concentrations are in µg/L or parts-per-billion.
[1] Significant figures presented herein are an artifact of the Excel spreadsheet used for calculations
[2] California Toxics Rule (dissolved fraction) calculations excerpted from Marshack (2008):

Cadmium (Cd) CCC_{Cd} $=[e^{[0.7852[\ln(Hardness)]]-2.715}][1.11672-[\ln(Hardness)*0.041838]]$
Chromium (Cr) CCC_{Cr} $=[e^{[0.819[\ln(Hardness)]]+1.561}][0.86]$
Copper (Cu) CCC_{Cu} $=[e^{[0.8545[\ln(Hardness)]]+1.702}][0.96]$
Lead (Pb) CCC_{Pb} $=[e^{[1.273[\ln(Hardness)]]-4.705}][1.46203-[\ln(Hardness)*0.145712]]$
Nickel (Ni) CCC_{Ni} $=[e^{[0.846[\ln(Hardness)]]+0.0584}][0.997]$
Silver (Ag) CCC_{Ag} $=[e^{[1.72[\ln(Hardness)]]-6.52}][0.85]$
Zinc (Zn) CCC_{Zn} $=[e^{[0.8473[\ln(Hardness)]]+0.884}][0.986]$

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Table 7.2B-5. Reservoir and stream reach sample results.

Analyte	Standard Criteria or Benchmark[1]	River Name	North Yuba River		Middle Yuba River		Middle Yuba River		Oregon Creek		Oregon Creek		North Yuba River		North Yuba River		North Yuba River	
		Sample Location	New Bullards Bar Inflow		Above Our House Dam Diversion		Below Our House Dam Diversion		Above Log Cabin Diversion Dam		Below Log Cabin Diversion Dam		New Bullards Bar Reservoir[2]		New Bullards Bar Reservoir[2]		Below New Bullards Bar Dam	
		Lat./Long.	0655730, 4354999		0672624, 4364531		0672379, 4364362		0667280, 4367442		0667039, 4367286		0660148, 4362475		0660148, 4362476		--	
		Sample ID	103410-2-1		103410-2-2		103410-2-3		103410-2-4		103410-2-5		103410-1-1A		103410-1-1B		103410-2-6	
		Sample Depth	Surface		Surface		Surface		Surface		Surface		Surface		Bottom		Surface	
		Date	09/15/2009		09/15/2009		09/15/2009		09/15/2009		09/15/2009		09/17/2009		09/17/2009		09/14/2009	
		Sample Type	Original		Original		Original		Original		Original		Original		Original		Original	
		Units	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes
IN SITU MEASUREMENTS																		
Stream Flow[3]	--	cfs	121		25		30			--	2			--			6	
Secchi	--	ft	--		--		--		--		--		9		--		--	
Temperature	--	°C	8.79		18.26		17.98		15.87		16.12		23.28		7.43		8.79	
Dissolved Oxygen	--	% sat	104.8		--		--		--		--		--		--		104.8	
Dissolved Oxygen	7 (minimum)	mg/L	10.22		8.17		7.65		9.67		7.92		7.71		8.02		10.22	
Specific Conductance	150	µmohms	0.068		0.15		0.151		0.137		0.192		0.1		0.1		0.068	
pH	6.5-8.5	stnd units	8.31		7.51		7.31		8.07		7.81		8.37		7.21		8.31	
Turbidity	--	NTU	3.1		1.3		0.5		3.3		14.5		0.4		0		3.1	
BASIC WATER QUALITY																		
Carbon, Dissolved Organic	--	mg/L	0.61		0.67		1.2		0.98		0.69		1.1		1.1		1.1	
Carbon, Total Organic	--	mg/L	0.73		0.82		1.4		1.2		0.76		1.1		1.2		1.1	
Solids, Total Dissolved	500	mg/L	70		66		54		92		66		50		36		51	
Solids, Total Suspended	--	mg/L	1.5		1.2		1	U	4.5		1	U	1	U	1	U	1	U
INORGANIC IONS																		
Alkalinity, Total (as CaCO3)	20 (minimum)	mg/L	72		72		72		86		80		36		34		34	
Calcium	--	mg/L	20.4		20.9		11.3		21		22.1		9.71		9.16		9.35	
Chloride	250	mg/L	0.68	J	0.7	J	0.88	J	1.7		0.76	J	0.63	J	0.5	J	0.53	J
Hardness, Total	--	mg/L	72		75		64		90		79		38		34		36	
Magnesium	--	mg/L	5.09		5.29		9.24		8.63		5		2.77		2.62		2.78	
Potassium	--	mg/L	0.6		0.606		0.766		1.34		0.361	J	0.607		0.519		0.519	
Sodium[4]	20	mg/L	3.53		3.4		3.17		5.31		3.16		2.37		2.04		1.94	
Sulfate	250	mg/L	9.5		9.7		7.8		15		7.5		3.7		3.3		5.6	
Sulfide, Total	--	mg/L	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	--		0.05	U	--	
NUTRIENTS																		
Ammonia (as N)[5]	temp/pH dep.	mg/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Nitrate (as N)	45	mg/L	0.1	U	0.02	J	0.1	U	0.028	J	0.1	U	0.1	U	0.027	J	0.036	J
Nitrite (as N)	1	mg/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
o-Phosphate (as P)	--	mg/L	0.028	J	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Phosphorus, Total	--	mg/L	0.39		0.38		0.48		0.72		0.36		0.16		0.21		0.37	
Total Kjeldahl Nitrogen	--	mg/L	0.56		0.7		0.84		0.7		0.56		0.7		0.56		0.5	U

Analyte	Standard Criteria or Benchmark[1]	River Name	Yuba River		South Yuba River		Yuba River		Yuba River		Yuba River		Yuba River		Yuba River		Yuba River		Yuba River	
		Sample Location	Below Colgate Tunnel		Englebright Inflow		Englebright Reservoir[2]		Englebright Reservoir[2]		Below Smartville gage		Below Deer Creek		Below Daquerre Diversion Dam		At Walnut Avenue		Marysville	
		Lat./Long.	0655730, 4354999		--		0649344, 4344972		0649344, 4344973		06449012, 4344349		0643788, 4342522		0634234, 4341040		0627459, 4337347		0621943, 4332656	
		Sample ID	103410-2-7		103410-2-8		103410-1-2A		103410-1-2B		103410-2-9		103410-2-10		103410-2-11		103410-2-12		103410-2-13	
		Sample Depth	Surface		Surface		Surface		Bottom		Surface		Surface		Surface		Surface		Surface	
		Date	09/14/2009		09/14/2009		09/17/2009		09/17/2009		09/14/2009		09/16/2009		09/16/2009		09/16/2009		09/16/2009	
		Sample Type	Original		Original		Original		Original		Original		Original		Original		Original		Original	
		Units	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes
IN SITU MEASUREMENTS																				
Stream Flow[3]	--	cfs	763.7		53		--		--		4.4		782		782		782		782	
Secchi	--	ft	--		--		12		--		--		--		--		--		--	
Temperature	--	°C	8.42		20.85		20.03		9.11		11.38		12.35		14.33		16.63		16.08	
Dissolved Oxygen	--	% sat	102.9		--		--		--		83.1		--		86.6		--		--	
Dissolved Oxygen	7 (minimum)	mg/L	10.13		7.25		9.2		**6.13**		7.49		9.5		7.26		8.72		7.67	
Specific Conductance	150	µmohms	0.065		0.107		0.1		0.1		0.069		0.075		0.078		0.081		0.083	
pH	6.5-8.5	stnd units	7.72		7.91		8.33		7.36		7.75		7.76		7.7		8.05		8.01	
Turbidity	--	NTU	2.2		0		147.2		4		6.3		0.3		1.2		1.5		15.4	
BASIC WATER QUALITY																				
Carbon, Dissolved Organic	--	mg/L	1.3		1		1.1		1.4		1.4		1.1		1.1		1.1		1.1	
Carbon, Total Organic	--	mg/L	1.2		1.1		1.3		1.4		1.4		1.2		1.2		1.1		1.2	
Solids, Total Dissolved	500	mg/L	51		58		40		46		53		62		68		64		68	
Solids, Total Suspended	--	mg/L	1	U	1	U	1	U	1.5		14		1	U	1	U	1	U	15	
INORGANIC IONS																				
Alkalinity, Total (as CaCO3)	20 (minimum)	mg/L	31		44		36		34		54		**1**	**U**	37		37		38	
Calcium	--	mg/L	8.69		12.1		9.18		8.29		9.02		9.32		9.52		9.76		9.19	
Chloride	250	mg/L	0.49	J	2.6		0.63	J	0.8	J	0.63	J	0.74	J	0.82	J	0.93	J	0.88	J
Hardness, Total	--	mg/L	34		48		36		21		37		36		37		38		40	
Magnesium	--	mg/L	2.59		3.84		2.73		2.78		2.71		2.87		3.06		3.41		3.3	
Potassium	--	mg/L	0.512		0.529		0.493	J	0.6		0.427	J	0.434	J	0.519		0.546		0.511	
Sodium[4]	20	mg/L	1.9		4.3		2.17		2.25		2.02		2.34		2.39		2.51		2.42	
Sulfate	250	mg/L	5.3		9.6		5.8		3.8		5.5		170		3.9		4.4		4.6	
Sulfide, Total	--	mg/L	--		--		0.05	U	0.05	U	--		0.05	U	0.05	U	0.05	U	0.05	U
NUTRIENTS																				
Ammonia (as N)[5]	temp/pH dep.	mg/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Nitrate (as N)	45	mg/L	0.1	U	0.1	U	0.1	U	0.069	J	0.021	J	0.1	U	0.028	J	0.1	U	0.1	U
Nitrite (as N)	1	mg/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
o-Phosphate (as P)	--	mg/L	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.083	J	0.1	U	0.1	U	0.1	U
Phosphorus, Total	--	mg/L	0.37		0.19		0.22		0.2		0.26		0.42		0.21		0.33		0.32	
Total Kjeldahl Nitrogen	--	mg/L	0.5	U	0.56		0.56		0.56		0.56		0.5	U	0.5	U	0.56		0.56	

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Analyte	Standard Criteria or Benchmark[1]	River Name	North Yuba River		Middle Yuba River		Middle Yuba River		Oregon Creek		Oregon Creek		North Yuba River		North Yuba River		North Yuba River		Yuba River		South Yuba River		Yuba River		Yuba River		Yuba River		Yuba River		Yuba River		Yuba River		Yuba River	
		Sample Location	New Bullards Bar Inflow		Above Our House Dam Diversion		Below Our House Dam Diversion		Above Log Cabin Diversion Dam		Below Log Cabin Diversion Dam		New Bullards Bar Reservoir[2]		New Bullards Bar Reservoir[2]		Below New Bullards Bar Dam		Below Colgate Tunnel		Englebright Inflow		Englebright Reservoir[2]		Englebright Reservoir[2]		Below Smartville gage		Below Deer Creek		Below Daquerre Diversion Dam		At Walnut Avenue		Marysville	
		Lat./Long.	0655730, 4354999		0672624, 4364531		0672379, 4364362		0667280, 4367442		0667039, 4367286		0660148, 4362475		0660148, 4362476		--		0655730, 4354999		--		0649344, 4344972		0649344, 4344973		06449012, 4344349		0643788, 4342522		0634234, 4341040		0627459, 4337347		0621943, 4332656	
		Sample ID	103410-2-1		103410-2-2		103410-2-3		103410-2-4		103410-2-5		103410-1-1A		103410-1-1B		103410-2-6		103410-2-7		103410-2-8		103410-1-2A		103410-1-2B		103410-2-9		103410-2-10		103410-2-11		103410-2-12		103410-2-13	
		Sample Depth	Surface		Surface		Surface		Surface		Surface		Surface		Bottom		Surface		Surface		Surface		Surface		Bottom		Surface		Surface		Surface		Surface		Surface	
		Date	09/15/2009		09/15/2009		09/15/2009		09/15/2009		09/15/2009		09/17/2009		09/17/2009		09/14/2009		09/14/2009		09/14/2009		09/17/2009		09/17/2009		09/14/2009		09/16/2009		09/16/2009		09/16/2009		09/16/2009	
		Sample Type	Original		Original		Original		Original		Original		Original		Original		Original		Original		Original		Original		Original		Original		Original		Original		Original		Original	
		Units	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes	Result	Notes
TOTAL METALS CONCENTRATIONS																																				
Aluminum[6]	87	µg/L	8.4		5.9		4.7		9.1		5.4		74.0		28.8		20.0		36.3		7.6		29.4		20.2		20.9		21.4		13.1		15.6		**180**	
Arsenic[7]	10	µg/L	4.91		5.42		1.08		4.07		1.01		0.39		0.36		0.48		0.51		0.59	Q	0.52		0.46		0.64		0.64		0.51		0.54		0.61	
Cadmium	5	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Chromium	50	µg/L	0.31		0.27		0.34		0.15		0.36		0.18	Q	0.28		0.24		0.23		0.18		0.24		0.22		0.24		0.22		0.22		0.16		0.50	
Copper	1000	µg/L	0.40	Q	0.41	Q	0.41	Q	0.34	Q	0.29	Q	0.31	Q	0.41	Q	0.42	Q	0.43		0.76	Q	0.47	Q	0.59		0.49	Q	0.43	Q	0.43		0.44		0.96	
Iron	300	µg/L	60.2		130		37.6		**1770**		56.4		15.5		14.5		43.9		43.0		44.5		21.3		19.6		64.0		43.9		14.0		33.2		243	
Lead	15	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.141	
Mercury	50	ng/L	0.61		0.59		0.71		0.58		0.56		0.50	U	0.82		0.50	U	0.60		0.82		0.89		0.50	U	0.72		1.08		1.04		1.00		3.10	
Methyl Mercury	--	ng/L	0.092		0.096	Q	0.073		0.277		0.077	Q	0.050	U	0.050	Q, U	0.067	Q	0.050	U	0.069		0.050	Q, U	0.050	Q, U	0.062		0.050	Q, U	0.052		0.052		0.109	
Nickel	100	µg/L	0.95		1.06	Q	3.08		2.33		0.64	Q	0.10	Q, U	0.84		0.50		0.97		0.51	Q	0.55		0.84	Q	0.93	Q	0.64	Q	0.48	Q	0.44	Q	1.05	
Selenium	50	µg/L	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U	0.60	U
Silver	100	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Zinc	5000	µg/L	0.30		0.49		0.34		0.35	Q	0.26	Q	0.20	U	0.25	Q	0.32	Q	0.23	Q	0.20	Q, U	0.72		0.45		0.24	Q	0.25	Q	0.48	Q	0.25		0.84	
DISSOLVED METALS CONCENTRATIONS																																				
Aluminum	--	µg/L	4.4		4.0	U	4.0	U	4.0	U	4.0	U	12.2		9.9		4.0	U	4.7		4.0	U	4.7		4.7		4.0	U	4.0	U	4.0	U	4.0	U	4.0	U
Arsenic	150	µg/L	4.91		5.12		1.08		2.05		1.00		0.37		0.36		0.43		0.50		0.64	Q	0.52		0.39		0.58		0.58		0.50		0.50		0.52	
Cadmium[8]	Table 7.2B-4	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Chromium[8]	Table 7.2B-4	µg/L	0.24		0.21		0.32		0.10	U	0.33		0.17	Q	0.24		0.23		0.19		0.15		0.21		0.22		0.23		0.20		0.20		0.16		0.14	
Copper[8]	Table 7.2B-4	µg/L	0.51	Q	0.49	Q	0.43	Q	0.37	Q	0.40	Q	0.40	Q	0.42	Q	0.43	Q	0.39		0.85	Q	0.48	Q	0.82		0.60	Q	0.46	Q	0.68		0.43		0.41	
Iron	--	µg/L	49.9		83.0		31.8		143		53.6		10.0	U	10.0	U	26.6		25.3		35.5		10.0	U	10.0	U	37.1		10.0	U	10.0	U	10.0	U	12.8	
Lead[8]	Table 7.2B-4	µg/L	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U	0.040	U
Methyl Mercury	--	ng/L	0.54	U	0.100	Q	0.050	U	0.211		0.077	Q	0.050	U	0.050	Q, U	0.077	Q	0.050	U	0.050	U	0.050	Q, U	0.050	Q, U	0.050	U	0.050	Q, U	0.053		0.050	U	0.067	
Nickel[8]	Table 7.2B-4	µg/L	0.88		1.14	Q	2.91		2.12		0.74	Q	0.17	Q	0.78		0.43		0.93		0.60	Q	0.52		0.90	Q	0.99	Q	0.68	Q	0.67	Q	0.47	Q	0.46	
Silver[8]	Table 7.2B-4	µg/L	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U	0.020	U
Zinc[8]	Table 7.2B-4	µg/L	0.20	U	0.39		0.20		0.61	Q	0.34	Q	0.20	U	0.48	Q	0.53	Q	0.40	Q	0.31	Q	0.20	U	1.36		0.45	Q	0.32	Q	0.52	Q	2.19		0.20	U

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Table 7.2B-6. Bacteria and Total Petroleum Hydrocarbon (TPH) sample results.

Sample Date[1]		**Sample Location and Number**				
		Emerald Cove Marina		**Dark Day Boat Ramp**		**Reference Site[2]**
		103410-3-1	**Duplicate**	**103410-3-2**	**Duplicate**	**103410-3-3**
FECAL COLIFORM RESULTS (MPN PER 100 ML) < 10% of samples > 400 MPN per 100 mL; < 200 MPN per 100 mL (geometric mean) (CVRWQCB 1998)						
Round 1	9/6/09	<2	--	2	2	--
Round 2	9/17/09	<2	<2	<2	--	<2
Round 3	9/23/09	<2	--	<2	<2	--
Round 4	9/28/09	4	7	<2	--	--
Round 5	10/2/09	<2	--	<2	<2	--
	Geometric Mean	<2	--	<2	--	--
TOTAL COLIFORM RESULTS (MPN PER 100 ML) < 10,000 MPN per 100 mL; < 240 MPN per 100 mL (geometric mean) (EPA 2003)						
Round 1	9/6/09	816	--	1733	517	--
Round 2	9/17/09	136	136	78	--	46
Round 3	9/23/09	2419	--	491	457	--
Round 4	9/28/09	1733	1300	866	--	--
Round 5	10/2/09	1553	--	<2419	690	--
	Geometric Mean	**937**	--	**674**	--	--
E. COLI RESULTS (MPN PER 100 ML) <235 MPN per 100 mL in any single sample; < 126 MPN per 100 mL (geometric mean) (EPA 2003)						
Round 1	9/6/09	1	--	absent	--	--
Round 2	9/17/09	absent	absent	absent	--	absent
Round 3	9/23/09	absent	--	absent	absent	--
Round 4	9/28/09	1	absent	absent	--	--
Round 5	10/2/09	absent	--	absent	absent	--
	Geometric Mean	absent	--	absent	--	--
TOTAL PETROLEUM HYDROCARBONS (MG/L) "*…waters shall not contain oils, greases, waxes or other materials in concentrations that cause nuisance, result in visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.*" (CVRWQCB 1998)						
Labor Day Weekend	9/6/09	<50		48 J		--
		Sheen observed on September 17.		No sheen observed during field visits.		

[1] Round 1 samples were collected during the holiday weekend, Labor Day 2009.
[2] During Round 2, a reference sample was also collected from upstream of the recreation sites and in the center of New Bullards Bar Reservoir.
Notes:
Calculated geometric means provided in **bold** are greater than the Basin Plan Water Quality Objective (CVRWQCB 1998) or benchmark (EPA 2003).
J Results were evaluated to the method detection limit (MDL); detected concentrations > or = to the MDL but < the reporting limit (RL) were qualitifed with a "J" flag.
< Not detected
-- Not measured at this location and time.

Table 7.2B-7 2009 Average daily dissolved oxygen downstream of Project facilities, USACE facilities, and non-Project diversions for 18 days.

Sonde Location	**New Bullards Bar Dam Reach**		**Colgate Powerhouse Reach**		**Narrows 2 Powerhouse Reach**		**Daguerre Point Dam Reach**	
Start Date	**9/5/2009**		**9/24/2009**		**9/5/2009**		**9/10/2009**	
End Date	**9/22/2009**		**10/7/2009**		**9/22/2009**		**9/29/2009**	
Day	**DO (mg/L)**	**Saturation (%)**	**DO (mg/L)**	**Saturation (%)**	**DO (mg/L)**	**Saturation (%)**	**DO (mg/L)**	**Saturation (%)**
DISSOLVED OXYGEN (mg/L, % saturation) "*…the monthly median of the mean daily DO concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percentile concentration shall not fall below 75 percent of saturation. DO concentrations shall not be reduced below the following minimum levels at any time: waters designated WARM 5.0 mg/l; waters designated COLD 7.0 mg/l; waters designated SPWN 7.0 mg/l.*" (CVRWQCB 1998)								
1	10.0	91.4	11.3	98.9	10.5	97.3	8.7	86.2
2	10.1	91.4	11.4	98.8	10.5	97.5	8.6	85.1

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Table 7.2B-7 (continued)

Sonde Location	New Bullards Bar Dam Reach		Colgate Powerhouse Reach		Narrows 2 Powerhouse Reach		Daguerre Point Dam Reach	
Start Date	9/5/2009		9/24/2009		9/5/2009		9/10/2009	
End Date	9/22/2009		10/7/2009		9/22/2009		9/29/2009	
Day	DO (mg/L)	Saturation (%)	DO (mg/L)	Saturation (%)	DO (mg/L)	Saturation (%)	DO (mg/L)	Saturation (%)
3	10.0	91.5	11.4	99.1	10.6	97.8	7.9	78.2
4	10.1	91.0	11.3	98.5	10.5	97.3	9.2	89.1
5	10.1	91.8	11.3	98.2	10.5	97.2	9.2	90.3
6	10.1	91.9	11.6	99.8	10.5	96.9	9.2	89.0
7	10.0	91.8	11.8	101.4	10.5	96.9	9.2	91.9
8	10.0	91.3	10.8	94.2	10.4	96.6	9.1	90.3
9	10.1	91.2	10.8	94.2	10.4	96.6	9.0	89.8
10	10.1	92.0	10.8	93.4	10.4	96.6	9.0	90.1
11	10.1	91.6	10.8	94.5	10.4	96.5	9.1	90.8
12	10.1	91.9	10.9	94.7	10.4	96.4	8.8	87.0
13	10.1	91.8	10.9	95.4	10.4	96.2	8.8	87.3
14	10.1	91.5	11.0	95.1	10.4	96.8	9.1	89.3
15	10.1	91.9	11.3	98.9	10.3	95.9	9.0	89.4
16	10.1	91.6	11.4	98.8	10.3	96.1	8.9	87.0
17	10.1	91.8	11.4	99.1	10.3	96.6	8.7	86.2
18	10.2	91.8	11.3	98.5	10.3	96.4	8.8	86.7
minimum	10.0	91.0	10.8	93.4	10.3	95.9	7.9	78.2
maximum	10.2	92.0	11.8	101.4	10.6	97.8	9.2	91.9

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