KLAMATH RIVER BASELINE WATER QUALITY SAMPLING
2011 ANNUAL REPORT

Prepared for the
KHSA Water Quality Monitoring Group

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In 2017, PacifiCorp completed a comprehensive quality control data review process for data collected under Interim Measure 15. During this effort it was discovered that the 2011 dataset had become corrupted. The dataset was corrected, but the magnitude of changes to the dataset meant that the annual report had to be completely re-written. This revised report replaces the September 18, 2012 version.

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1. Introduction

On November 13, 2008, the United States, the states of California and Oregon, and PacifiCorp executed an Agreement in Principle (AIP) describing a framework for possible removal of PacifiCorp's dams on the Klamath River. Interim Measure 12 of the AIP stipulated a water quality monitoring program, including on-going monitoring of blue-green algae (cyanobacteria) and associated toxins. Water quality monitoring in 2009 was conducted under the plan: AIP Interim Measure 12: Water Quality Monitoring Activities, Monitoring Year 2009.

The Klamath Hydroelectric Settlement Agreement (KHSA), signed on February 18, 2010, superseded the AIP. Interim Measure 15 of KHSA states that PacifiCorp shall fund long-term baseline water quality monitoring to support dam removal, nutrient removal, and permitting studies, and also will fund blue-green algae (BGA) and BGA toxin monitoring as necessary to protect public health. PacifiCorp provides funding of $500,000 per year for this measure. The monitoring is performed by an entity or entities agreed upon by the parties to the KHSA and in consultation with the appropriate water quality agencies. The 2011 water quality monitoring was conducted under the KHSA and represents the third year of water quality monitoring.

The monitoring program is a cooperative effort of the KHSA Monitoring Group[1]. Actual monitoring is completed by a sub-set of the group that includes the Yurok Tribe, Karuk Tribe, PacifiCorp, and the U.S. Bureau of Reclamation. The program continues to collect data from 254 miles of river and reservoirs from Link River Dam near Klamath Falls, Oregon to the Klamath River Estuary near Klamath, California. Annual planning and coordination meetings, as well as interim reporting meetings during the sampling season, include the KHSA Monitoring Group and stakeholders. The KHSA Monitoring Group ensures that the intent of the Interim Measure is met, appropriate quality assurance protocols and standard operating procedures are in place, water quality conditions and sampling matters are tracked in a timely fashion, and the process is transparent.

This summary report focuses on the grab sampling data collection in 2011. It also presents the available water quality probe data. Four appendices accompany this report: sampling locations are presented in Appendix A; field data (i.e., sonde measurements, nutrients, particulate, microcystin, etc.) from the 2011 water quality sampling program is presented in Appendix B; phytoplankton species charts and biovolume graphs are presented in Appendix C; and a technical memorandum for the 2011 inter-laboratory comparisons is presented in Appendix D**Error! Reference source not found.**.

[1] The KHSA Monitoring Group consists of representatives from the North Coast Regional Water Quality Control Board; Oregon Department of Environmental Quality; U.S. Environmental Protection Agency, Region IX; Karuk Tribe; Yurok Tribe; PacifiCorp; and U.S. Bureau of Reclamation.

The primary elements of the KHSA monitoring program include baseline monitoring and public health monitoring. The baseline water quality monitoring element includes water quality grab sample data, physical observations associated with these grab samples, water quality probe data, and algae species and concentration data. The water quality probes recorded observations at hourly or sub-hourly intervals. Parameters sampled by probes included water temperature, dissolved oxygen, specific conductivity, and pH at specific locations in the Klamath River (Table 1). The grab samples are collected for analytical determination for a suite of water quality constituents (Section 3.1). The algae data in the baseline monitoring element includes algae species identification and quantification samples collected at each sampling location. The grab sample, water quality probe data, and algae species quantification are presented in this report; these data sets are also available in electronic form. Monitoring was carried out from February through December in 2011.

The public health monitoring program data consists of algae species data from samples collected at specific sites within reservoirs and river reaches and focuses on algae species and algal toxins. These results are not discussed herein, but rather are reported separately as a compilation of summary reports presented through the 2011 season (http://www.pacificorp.com/es/hydro/hl/kr.html#). These reports were used to track phytoplankton and toxin conditions that supported management decisions to post and de-post reservoir and river reaches with public health advisories.

These data are accessible via the KBMP website[2]. In addition, the KBMP website includes links previous reports and other, associated program documents, and other materials and features that provide transparency to the KBMP process that are directly transferable to the KHSA monitoring program.

There are other Klamath River monitoring efforts outside of the KHSA program that are sponsored by individual entities, including entities that participate in the KHSA program. However, only data collected under the KHSA baseline water monitoring program are included herein. Public health data collected in 2011 has been added to the data files associated with this report, but is not analyzed or presented within this document. The entire Interim Measure 15 data set is available at: http://www.pacificorp.com/es/hydro/hl/kr.html.

[2] http://www.kbmp.net/maps-data/links-data-reports

2. Baseline Program Water Quality Sampling

In 2011, sampling was conducted at 24 sites along the Klamath River and its tributaries, from Link Dam to the Klamath River estuary (Figure 1), by the four sampling entities (USBR, PacifiCorp, Karuk Tribe, and Yurok Tribe). Sixteen of those sites were located on the mainstem of the Klamath River, four sites were located in the reservoirs on the Klamath River, and four sites were located on the major tributaries of the Klamath River (Shasta, Scott, Salmon, and Trinity rivers). Physical parameters (water temperature, dissolved oxygen, specific conductivity, and pH) were collected at all sites during the sampling year. Grab samples of all other baseline water quality constituents were collected monthly, except at Link River Dam and Klamath River below Iron Gate Dam, where samples were collected bi-monthly from May through October and monthly for the remainder of the sampling season.

Analyzed nutrients included: inorganic nitrogen (total nitrogen, total Kjeldahl nitrogen, nitrate+nitrite, ammonia), inorganic phosphorus (total phosphorus, orthophosphate), particulate and dissolved carbon, total and volatile suspended solids, chlorophyll-a, and 5-day carbonaceous biological oxygen demand (CBOD). Phytoplankton species samples were also collected. Site locations, sampling frequency, and sampling entity are presented in Table 1.

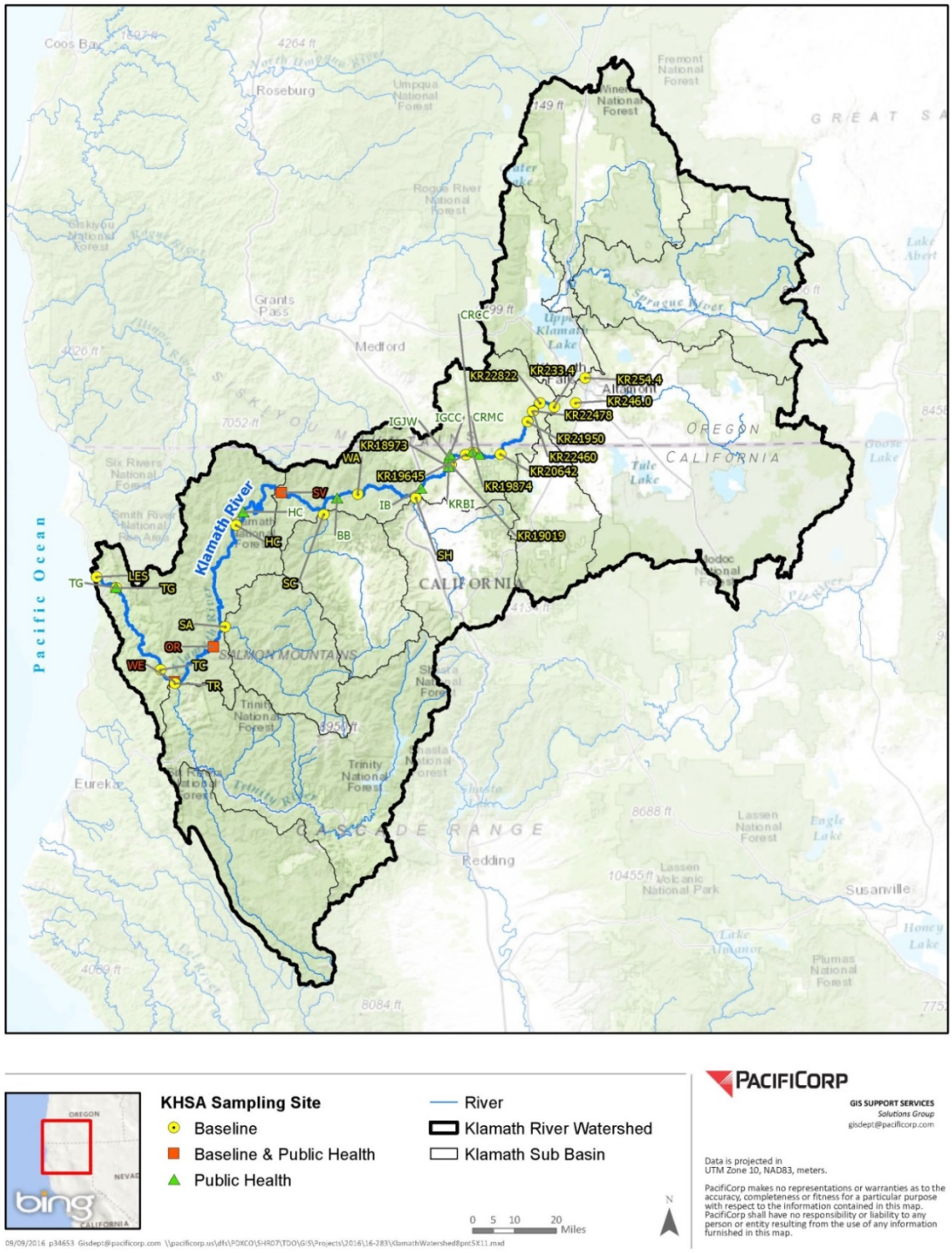

Figure 1. 2011 KHSA Klamath River baseline monitoring sampling sites.

Table 1. 2011 Baseline monitoring locations, constituents, sampling frequency, and sampling entity

Site ID	Monitoring Location / Sampling Method:	Temperature (oC) T,P	Dissolved Oxygen (mg/l) P	pH (log[H+]) P	Specific Conductivity (uS/cm) P	Inorganic/Organic N (mg/l) G	Inorganic/Organic P (mg/l) G	Dissolved Organic Carbon (mg/l) G	TSS/VSS (mg/l) G	Alkalinity (mg/l) G	Water Column Chl_a/Pheo (ug/l) G	Phytoplankton species G	Microcystin (ug/l) G	LC-MS confirmation of Microcystin	CBOD, mg/l G	Sampling Entity
KR25444	**Link Dam (RM 254.44; Baseline)**	H	H	H	H	M/ BM	M/ BM	M/ BM	M/ BM	M/ BM	M/ BM	M/ BM	BM/S	-	M2/ BM2	**USBR**
KR24600	**Keno Reservoir at Miller Island (RM 246.0; Baseline)**	H	H	H	H	M	M	M	M	M	M	M	M/S	-	M	**USBR**
KR23340	**Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)**	H/VP	D	D	D	M	M	M	M	M	M	M	M/S	-	M2/ BM2	**USBR**
KR22822	**Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)**	H	D	D	D	M	M	M	M	M	M	M	-	-	-	**PacifiCorp**
KR22478	**J.C. Boyle Reservoir (RM 224.78; Baseline)[a]**	VP	VP	VP	VP	M	M	M	M	M	M	M	M/S	-	-	**PacifiCorp**
KR22460	**Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)**	H	D	D	D	M	M	M	M	M	M	M	-	-	-	**PacifiCorp**
KR21950	**Klamath River below USGS Gage (RM 219.50; Baseline)**	H	D	D	D	M	M	M	M	M	M	M	M/S	-	-	**PacifiCorp**
KR20642	**Klamath River above Shovel Creek (RM 206.42; Baseline)**	H	D	D	D	M	M	M	M	M	M	M	M/S	-	M2/ BM2	**PacifiCorp**
KR19874	**Copco Reservoir (RM 198.74; Baseline)[b]**	VP	VP	VP	VP	M	M	M	M	M	M	M	M/S	-	-	**PacifiCorp**
KR19645	**Klamath River below Copco Dam (RM 196.45; Baseline)**	H	D	D	D	M	M	M	M	M	M	M	M/S	-	-	**PacifiCorp**
KR19019	**Iron Gate Reservoir (RM 190.19; Baseline)[c]**	VP	VP	VP	VP	M	M	M	M	M	M	M	M/S	-	-	**PacifiCorp**
KR18973	**Klamath River below Iron Gate Dam (RM 189.73; Baseline)**	H	H	H	H	M/ BM	M/ BM	M/ BM	M/ BM	M/ BM	M/ BM	M/ BM	BM/S	-	M2/ BM2	**PacifiCorp**
KR15626	**Klamath River at Walker Bridge (RM 156.26; Baseline)**	H	D	D	D	M	M	M	M	M	M	M	M/S	-	-	**Karuk**
KR12850	**Klamath River below Seiad (RM 128.5; Baseline)**	H	H	H	H	M	M	M	M	M	M	M	M/S	-	M	**Karuk**
KR10130	**Klamath River below Happy Camp (RM 101.3; Baseline)**	H	D	D	D	M	M	M	M	M	M	M	M/S	-	-	**Karuk**
KR05910	**Klamath River at Orleans (USGS) (RM 59.1; Baseline)**	H	H	H	H	M	M	M	M	M	M	M	M/S	-	-	**Karuk**
KR04350	**Klamath River at Weitchpec (RM 43.5; Baseline)**	H	H	H	H	M	M	M	M	M	M	M	M/S	S2	-	**Yurok**
KR03850	**Klamath River below Trinity River (RM 38.5; Baseline)**	H	H	H	H	M	M	M	M	M	M	M	M/S	-	-	**Yurok**

	Monitoring Location	Temperature (oC)	Dissolved Oxygen (mg/l)	pH (log[H+])	Specific Conductivity (uS/cm)	Inorganic/Organic N (mg/l)	Inorganic/Organic P (mg/l)	Dissolved Organic Carbon (mg/l)	TSS/VSS (mg/l)	Alkalinity (mg/l)	Water Column Chl_a/Pheo (ug/l)	Phytoplankton species	Microcystin (ug/l)	LC-MS confirmation of Microcystin	CBOD, mg/l	Sampling Entity
KR00600	**Klamath River near Klamath (RM 6.0; Baseline)[d]**	H	H	H	H	M	M	M	M	M	M	M	M/S	-	-	**Yurok**
KR00050	**Klamath River Estuary (RM 0.5; Baseline)[e]**	D	D	D	D	M	M	M	M	M	M	M	M/S	-	-	**Yurok**
SH00000	**Shasta River near mouth (Baseline)**	H	H	H	H	M	M	M	M	M	M	M	-	-	-	**Karuk**
SC00000	**Scott River near mouth (Baseline)**	H	H	H	H	M	M	M	M	M	M	M	-	-	-	**Karuk**
SA00000	**Salmon River near mouth (Baseline)**	H	H	H	H	M	M	M	M	M	M	M	-	-	-	**Karuk**
TR00000	**Trinity River near mouth (Baseline)**	H	H	H	H	M	M	M	M	M	M	M	-	-	-	**Yurok**

Notes:

[a] Sampling at two depths in J.C. Boyle reservoir (0.5 m and 8 m below surface)

[b] Sampling at three depths in Copco reservoir (0.5 m below surface, one intermediate depth, and 1 m above bottom)

[c] Sampling at four depths in Iron Gate reservoir (0.5 m below surface, one intermediate depths, and 1 m above bottom)

Sampling for particulate carbon and particulate nitrogen occurred at PacifiCorp sites (Feb to Dec) and Reclamation sites (Jun to Sep)

Key:

Sampling Method

T – Thermistor

P – Probe or data sonde (minimum seasonal deployment – April to November)

G – Grab sample

Sampling Frequency Codes

H – Hourly measurements (in some instances, sub-hourly)

VP – Vertical profile at stated sampling frequency

M – Monthly sampling

M/S – Monthly sampling (May – October)

BM/S – Bi-monthly sampling (July – October)

M/BM – Bi-monthly sampling (May – October) and monthly sampling the remainder of the year

M2/BM2 - Bi-monthly sampling (June –September) and monthly sampling the remainder of the year

S2 – Monthly sampling (July – October)

3. Water Sample Collection

Water samples were collected by the KHSA baseline water quality monitoring program participants as was the water quality probe data (temperature, dissolved oxygen, specific conductivity, and pH). Analytical samples (i.e., other physical constituents and chemical constituents listed in Table 1) were sent to laboratories for analysis.

3.1. Analytical Samples

Grab water samples were collected for analytical determination of:

- Nitrogen: ammonia (NH4), nitrate+nitrite (NO3+NO2), total Kjeldahl nitrogen (TKN), and total nitrogen (TN), particulate carbon (PN)
- Phosphorus: orthophosphate (OPO4) and total phosphorus (TP)
- Carbon: dissolved organic carbon (DOC) and particulate carbon (PC)
- Solids: total suspended solids (TSS) and volatile suspended solids (VSS)
- Carbonaceous biological oxygen demand (CBOD)
- Alkalinity (ALKT)
- Phytoplankton (algae): chlorophyll-a and pheophytin
- Microcystin (MCYN)

Additional microcystin grab samples were collected for the analysis using liquid chromatography tandem mass spectrometry (LC-MS). Not all constituents were sampled at all locations. A total of seven laboratories completed the analytical work for the participating program agencies:

- Basic Laboratories (Basic) in Redding, California
  - http://www.basiclab.com/
- CH2MHill Applied Sciences Laboratory (CH2MHill) in Corvallis, Oregon
  - *(no website)*
- Aquatic Research in Seattle, Washington
  - http://www.aquaticresearchinc.com/index.htm
- Chesapeake Biological Laboratories (CBL) in Solomons, Maryland,
  - http://www.umces.edu/cbl
- EPA Region 9 (EPA) laboratory in Richmond, California
  - http://www.epa.gov/region9/lab/
- California Department of Fish and Game Water Pollution Control (DFG) Laboratory in Rancho Cordova, California
  - http://www.dfg.ca.gov/
- Aquatic Analysts in Friday Harbor, Washington
  - *(no website)*

3.2. Physical Measurements

At a minimum, water temperature, pH, specific conductivity, and dissolved oxygen were measured at all sampling sites. In some cases, sampling entities collected additional information (e.g., turbidity) during field visits to meet multiple objectives. Physical measurements were recorded at each site using either thermistors, or water quality probes that were maintained and calibrated by each sampling entity. In addition to the vertical profiles in reservoirs and continuous time series monitoring (Table 1), physical parameters were also measured when grab samples were collected. Physical measurements that were collected during grab sampling are included in the field data (Appendix A) while time series monitoring data are maintained by (and available from) each sampling entity.

3.3. Quality Assurance

Program samples were collected under individual entity Quality Assurance Project Plans, Standard Operating Procedures, and/or Sampling Analysis Plans (Karuk 2009, PacifiCorp 2008, USBR 2005, and Yurok 2008). These methods have been compared and reviewed by the KHSA Working Group to ensure consistent sampling techniques are applied (KHSA-WG 2010).

3.4. Laboratory Comparison

In 2009 and 2010, the sampling location for the laboratory comparison samples was at Link River Dam. In 2011, the sampling location was changed to the Klamath River Estuary. Triplicate samples were collected on three occasions (April 13th, July 6th, and November 16th) and submitted for analysis to three laboratories: Aquatic Research, Basic Laboratory, and CH2MHill. Nutrient concentrations were generally lower at this location than Link Dam. Details on the 2011 laboratory comparisons are presented in Appendix D.

3.5. Water Quality Analytical Methods

Basic Laboratory, CH2MHill, Aquatic Research, and Chesapeake Biological Laboratories used either Standard Methods or EPA analytical methods for analysis of nutrients, dissolved and particulate carbon, alkalinity, carbonaceous biological oxygen demand, total suspended solids and volatile suspended solids (Table 2). Method detection limits (MDL) and reporting limits (RL) varied among the laboratories or, in certain cases, were not available.

3.5.1. Algae Samples

Analysis of chlorophyll-a and pheophytin was performed by three of the aforementioned laboratories. Algae samples collected by USBR, PacifiCorp, Karuk Tribe, and Yurok Tribe were sent to Aquatic Analysts in Friday Harbor, Washington. Microcystin analysis was performed using the enzyme-linked immunosorbent assay (ELISA) method at the EPA laboratory. Additional microcystin analysis was completed by the DFG laboratory using LC-MS for selected locations.

Table 2. 2011 Analyzing laboratory method references, method detection limits (MDLs), and method reporting limits (RLs) for water quality constituents. Units presented in milligrams per liter (mg/L) or parts per million (ppm) unless otherwise noted. All unique MDLs and RLs are shown; "na" indicates no limit available for a method.

		Basic			CH2MHill			Aquatic Research			CBL			EPA		
Constituent Name	**Constituent ID**	**Method**	**MDL**	**RL**	**Method**	**MDL[1]**	**RL[2]**	**Method**	**MDL**	**RL**	**Method**	**MDL**	**RL**	**Method**	**MDL**	**RL**
Alkalinity	ALKT	SM 2320B	1.0	5.0	EPA 310.1	n/a 0.6	5.0	SM 2320B	1.0	-	-	-	-	-	-	-
Carbonaceous Biological Oxygen Demand – 5 day	CBOD	SM 5210	3.0	3.0	SM5210B	n/a	2.00	SM 5210B	2.0	-	-	-	-	-	-	-
Dissolved Organic Carbon	DOC	SM5310C	0.30 0.20	0.50	SM5310C	0.08 0.065 0.10	0.50	SM 5310B	0.25	-	-	-	-	-	-	-
Ammonia	NH3	EPA 350.1	0.02	0.05	EPA 350.1	0.014	0.050	SM 4500NH3 H	0.01	-	-	-	-	-	-	-
Nitrate + Nitrite	NO3+NO2	EPA 353.2	0.01	0.05	EPA 353.2	0.003	0.010	SM 4500N03 F	0.01	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen	TKN	EPA 351.2	0.1	0.2	EPA 351.2	0.044	0.20	EPA 351.1	0.2	-	-	-	-	-	-	-
Total Nitrogen	TN	EPA 351.2	(calc) 0.1	0.25 0.20	SM4500-N C	0.062	0.20	SM4500N C	0.05	-	-	-	-	-	-	-
Ortho-phosphate	OPO4	SM 4500P-E	0.01	0.05	EPA 365.1	0.001	0.010	SM 4500PF	0.001	-	-	-	-	-	-	-
Total Phosphorus	TP	SM 4500P-BE	0.02	0.05	EPA 365.4	0.024	0.050	SM 4500PF	0.002	-	-	-	-	-	-	-
Total Suspended Solids	TSS	SM 2540D	1.0	5.0	SM 2540D	n/a 1.2	2.00	SM 2540D	0.5	-	-	-	-	-	-	-
Volatile Suspended Solids	VSS	SM 2540D	1.0	5.0	EPA 160.4	n/a 1.2	2.00	SM 2540E	0.5	-	-	-	-	-	-	-
Chlorophyll-a	CHLA	SM 10200H	2.0 4.0	6.0 13.0	-	-	-	SM 10200H	0.1	-	EPA 445.0	0.68	-	-	-	-
Pheophytin	PHEO	SM 10200H	2.0 4.0	6.0 13.0	-	-	-	SM 10200H	0.1	-	EPA 445.0	0.68	-	-	-	-
Microcystin	MYCN	-	-	-	-	-	-	-	-	-	-	-	-	ELISA	0.15	0.18
Particulate Carbon	PC	-	-	-	-	-	-	-	-	-	EPA 440.0	-	0.0633	-	-	-
Particulate Nitrogen	PN	-	-	-	-	-	-	-	-	-	EPA 440.0	-	0.0105	-	-	-

MDL – method detection limit RL – method reporting limit n/a indicates the method did not provide an MDL
[1] CH2M uses the term limit of detection (LOD) instead of MDL
[2] CH2M uses the term limit of quantification (LOQ) instead of RL
[3] Units for chlorophyll-a, microcystin, and anatoxin-a are in micrograms per liter (µg/L, or ppb).

4. Baseline Program Water Quality Data

Water quality samples for the 2011 KHSA baseline water quality monitoring program were collected from February through December in 2011. Sampling crews from the various entities collected samples within a few days of each other. Sampling on the same day throughout the basin was infeasible because of other obligations, shipping constraints, travel considerations, and other factors. In most cases all 24 sites were sampled each month, though there were occasional periods when one or more sites were omitted or one or more constituents were not sampled. Compiled data from all baseline-program sampling is presented in Appendix B and summarized below, except for time series data, which can be obtained from the individual sampling entities (Table 1). Selected results of algae species identification are presented below and in Appendix C

4.1. Data Summary

Field measurements collected include at a minimum water temperature, pH, specific conductivity, and dissolved oxygen. Chemical and biological water quality measurements include two types of algae related estimates (chlorophyll-a and pheophytin), alkalinity, two forms of carbon (dissolved organic and particulate), carbonaceous biological oxygen demand, four forms of nitrogen (ammonia, nitrate+nitrite, total Kjeldahl, total nitrogen, and particulate nitrogen), two forms of phosphorus (orthophosphate and total phosphorus), total suspended solids, and volatile suspended solids, turbidity, and microcystin.

Data are summarized in this report to illustrate general spatial and temporal patterns during the 2011 sampling period. In addition to the dataset (Appendix B), data are also summarized in three formats:

(1) Longitudinal boxplots[3] based on seasonal grab sample data

(2) Physical water quality sonde data (hourly) at specific locations

(3) Flow data (hourly) and discretely collected constituent data at U.S. Geological Survey (USGS) flow gage locations

(4) Charts and graphs representing the groups of algae and respective biovolumes at the sampling locations for March, June, September, and November.

The boxplots and hourly data are presented in the main report; however, because of the small sample size at each site during 2011, the boxplots presented in the annual report are not statistically robust and are included for illustration purposes only. Also, no boxplots were generated for sites with less than six points of data in 2011; the captions of the boxplot figures

[3] A box-and-whisker plot is a graphical way of presenting statistical parameters including median, mean, lower and upper quartiles, and outliers. The median value is represented by a horizontal line; a box (gray) is formed by the 25th quartile and 75th quartile and represents the inter-quartile range (IQR); the whiskers extend beyond the 1.5*IQR above and below the quartiles; and points beyond the whiskers are termed outliers. Outliers are values between 1.5 to 3 times the IQR. Extreme outliers are values greater than 3 times the IQR.

indicate the locations that were omitted due to lack of sufficient data. The charts and graphs of algae are presented in Appendix C. The data summary constituents presented include: dissolved oxygen, dissolved organic carbon, total nitrogen, total phosphorus, and microcystin. The mainstem sites and major tributaries (Shasta, Scott, Salmon, and Trinity rivers) are presented separately.

Time series data are presented for discretely collected individual constituents at locations on the Klamath River for which there are USGS flow gages (Table 3). While algae data are available for the May to October period, September percent biovolume are presented for illustration at eight locations (Figure 2). These locations are: (1) Link Dam (RM 254.44; Baseline), (2) Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline), (3) Copco Reservoir (RM 198.74; Baseline), (4) Klamath River below Iron Gate Dam (RM 189.73; Baseline), (5) Klamath River below Seiad (RM 128.5; Baseline), (6) Klamath River at Orleans (USGS) (RM 59.1; Baseline), (7) Klamath River at Weitchpec (RM 43.5; Baseline), and (8) Klamath River Estuary (RM 0.5; Baseline). Plots representing algae species for other months are presented in Appendix C.

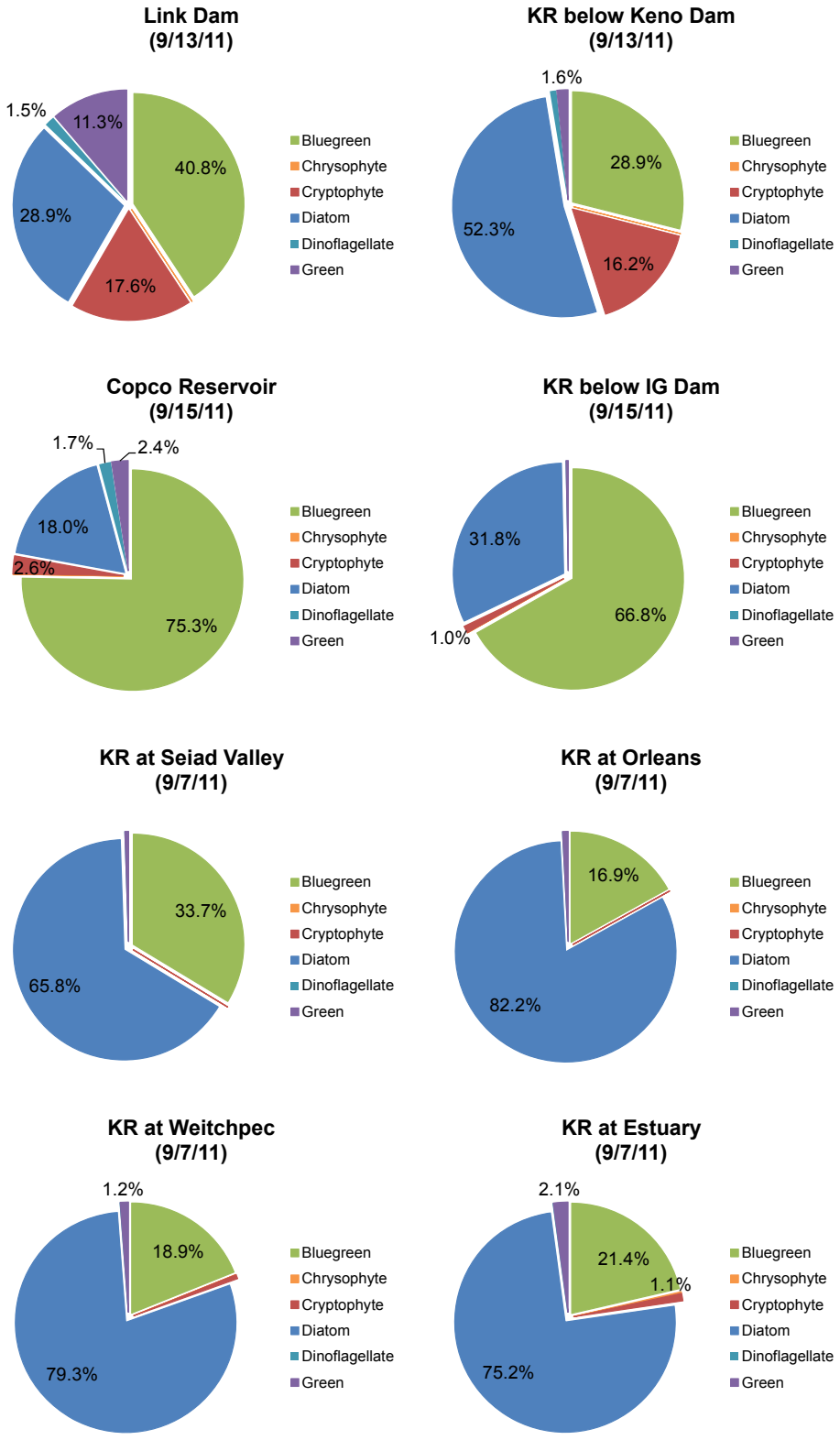

Figure 2. Phytoplankton species percent biovolume for the eight locations in the Klamath River (KR): September 2011.

Table 3. USGS flow gage locations and river mile for time series constituent data.

Location	Approximate River Mile (RM)	USGS Gage Number
Link River at Klamath Falls, OR	254	11507500
Klamath River at Keno, OR	232	11509500
Klamath River below Iron Gate Dam, CA	190	11516530
Klamath River near Seiad Valley, CA	129	11520500
Klamath River at Orleans, CA	59	11523000
Klamath River near Klamath, CA	8	11530500

Grab sample data and the associated physical measurements collected at the time of the grab sample (e.g., water temperature and dissolved oxygen) are shown in Figure 3 through Figure 17. Not all measurements for individual constituents occur on the same date or time. These illustrations are not intended to be comprehensive, but rather to present general conditions throughout the river system during the 2011 field season. The complete data set (Appendix B) is available at the KBMP website (http://www.kbmp.net/). The inter-laboratory comparison report is presented in Appendix D.

4.1.1. Major tributaries (Boxplot)

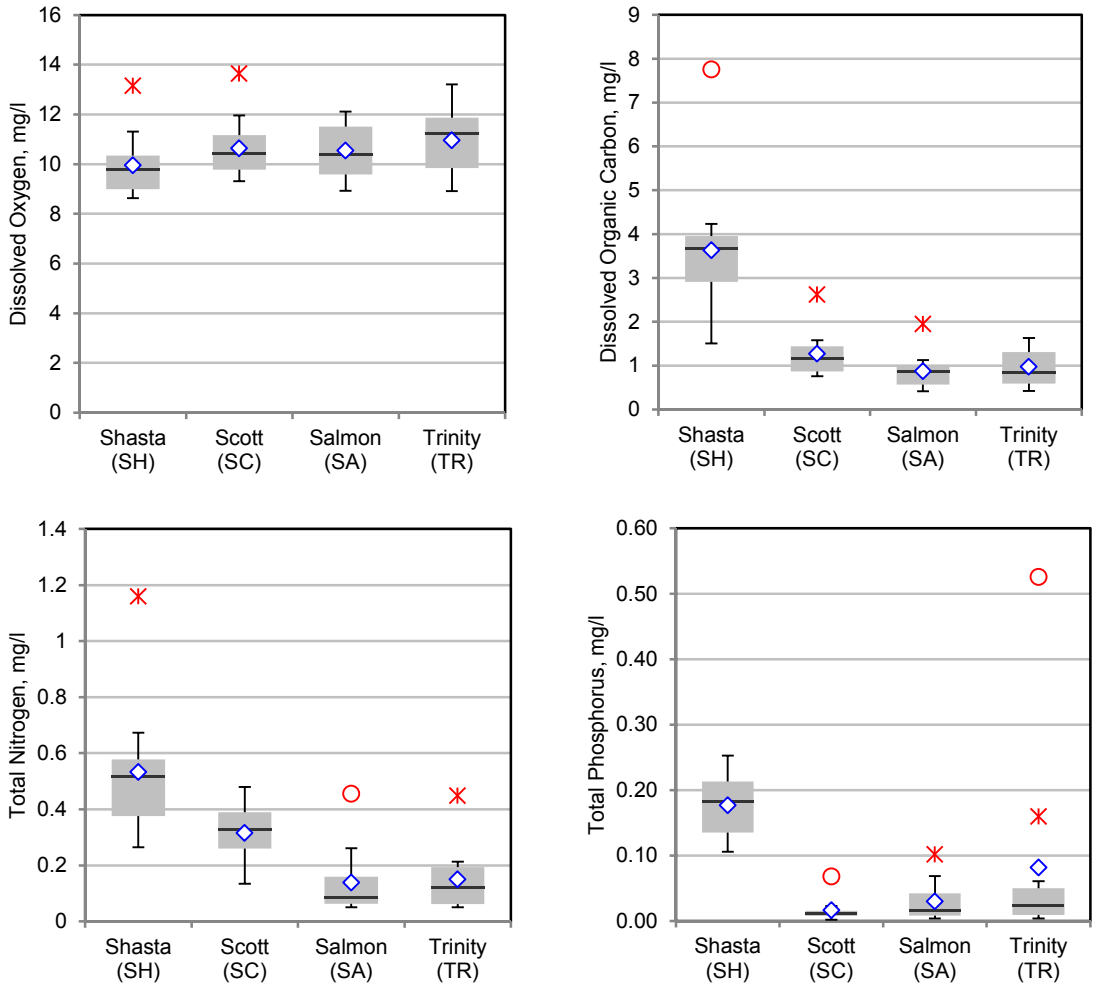

Figure 3. Baseline data for dissolved oxygen, dissolved organic carbon, total nitrogen, and total phosphorus for the Shasta, Scott, Salmon, and Trinity rivers with median (−), mean (◊), outliers (*), and extreme outliers (○) identified (February 2011 – December 2011).

4.1.2. Mainstem locations (Boxplot)

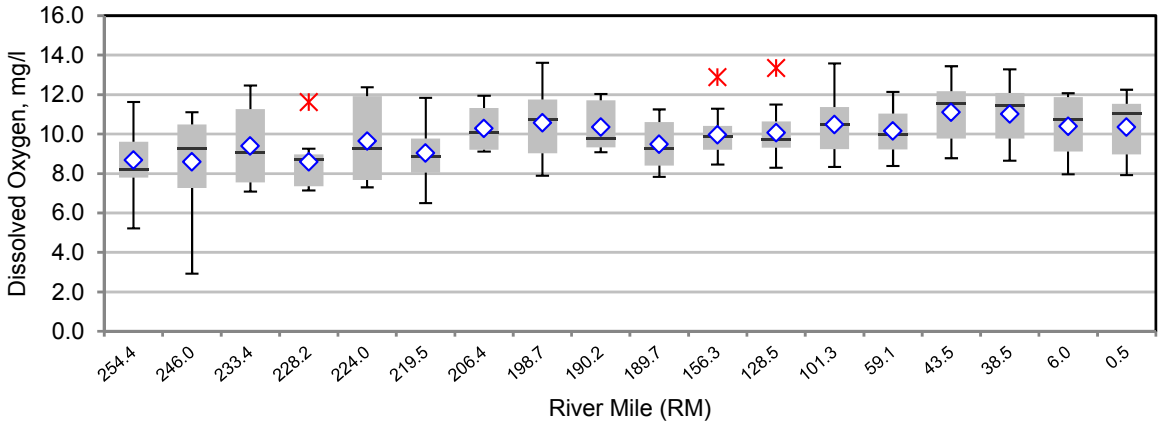

Figure 4. Dissolved oxygen from Link River to the Klamath River estuary with median (−), mean (◊), outliers (*), and extreme outliers (○) identified (February 2011 – December 2011). Note: Includes reservoir sites at Keno Reservoir at Miller Island (RM 246.0; Baseline), Copco Reservoir (RM 198.74; Baseline), and Iron Gate Reservoir (RM 190.19; Baseline). River mile on x-axis not to scale.

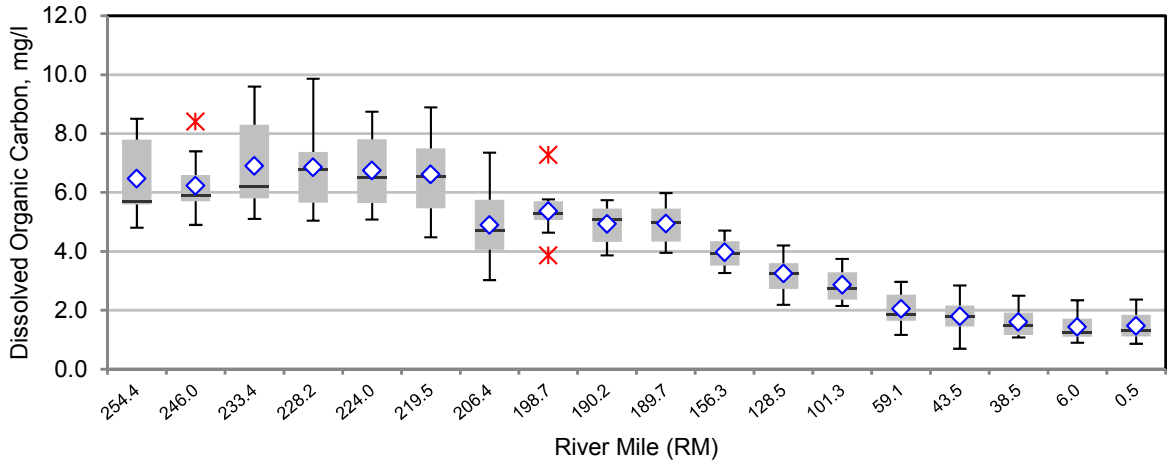

Figure 5. Dissolved organic carbon from Link River to the Klamath River estuary with median (−), mean (◊), outliers (*), and extreme outliers (○) identified (February 2011 – December 2011). Note: Includes reservoir sites at Keno Reservoir at Miller Island (RM 246.0; Baseline), Copco Reservoir (RM 198.74; Baseline), and Iron Gate Reservoir (RM 190.19; Baseline). River mile on x-axis not to scale.

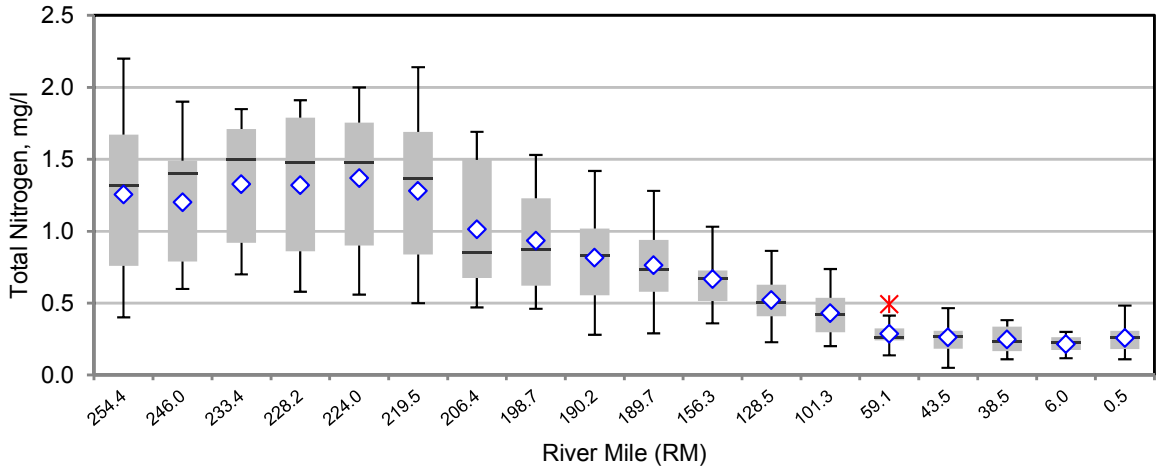

Figure 6. Total nitrogen from Link River to the Klamath River estuary with median (−), mean (◊), outliers (*), and extreme outliers (○) identified (February 2011 – December 2011). Note: Includes reservoir sites at Keno Reservoir at Miller Island (RM 246.0; Baseline), Copco Reservoir (RM 198.74; Baseline), and Iron Gate Reservoir (RM 190.19; Baseline). River mile on x-axis not to scale.

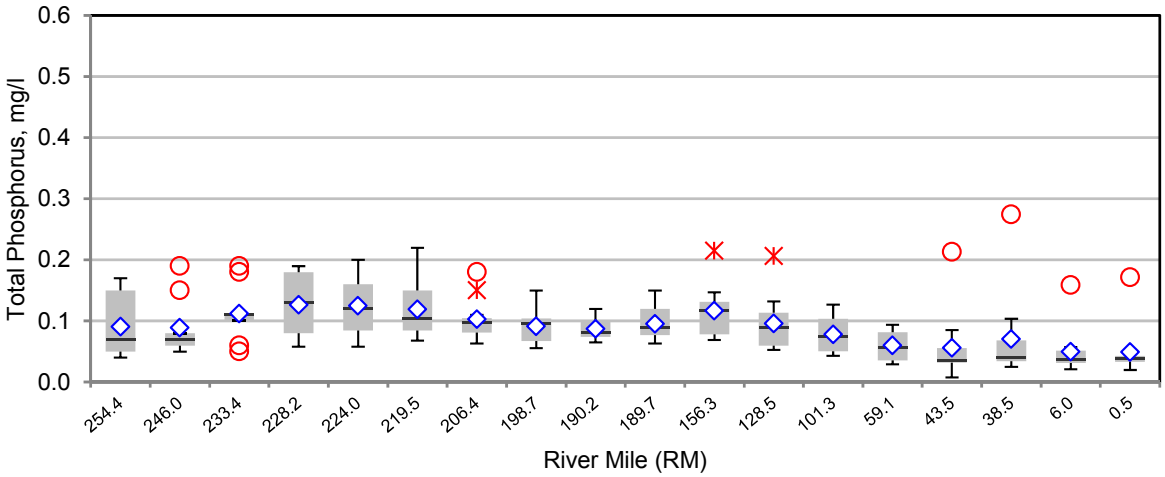

Figure 7. Total phosphorus from Link River to the Klamath River estuary with median (−), mean (◊), outliers (*), and extreme outliers (○) identified (February 2011 – December 2011). Note: Includes reservoir sites at Keno Reservoir at Miller Island (RM 246.0; Baseline), Copco Reservoir (RM 198.74; Baseline), and Iron Gate Reservoir (RM 190.19; Baseline). River mile on x-axis not to scale.

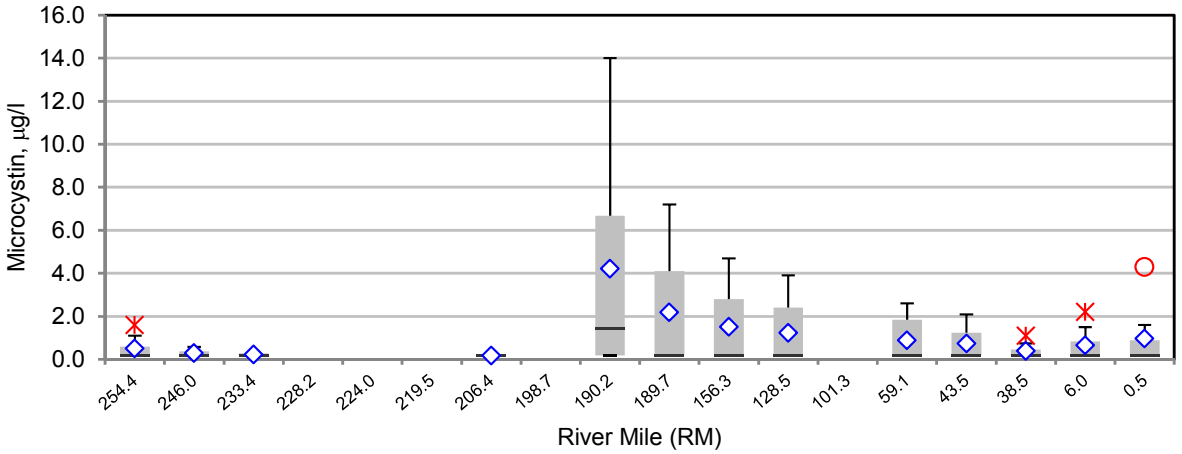

Figure 8. Microcystin from Link River to the Klamath River estuary with median (−), mean (◊), outliers (*), and extreme outliers (○) identified (February 2011 – December 2011). Note: Includes reservoir sites at Keno Reservoir at Miller Island (RM 246.0; Baseline), Copco Reservoir (RM 198.74; Baseline), and Iron Gate Reservoir (RM 190.19; Baseline). River mile on x-axis not to scale. Note: No microcystin boxplots are included for River Mile 228.2, 224.0, 219.5, 198.7 and 101.3 because there were fewer than six data points at each of these sites.

4.1.1. Major tributaries (Time Series)

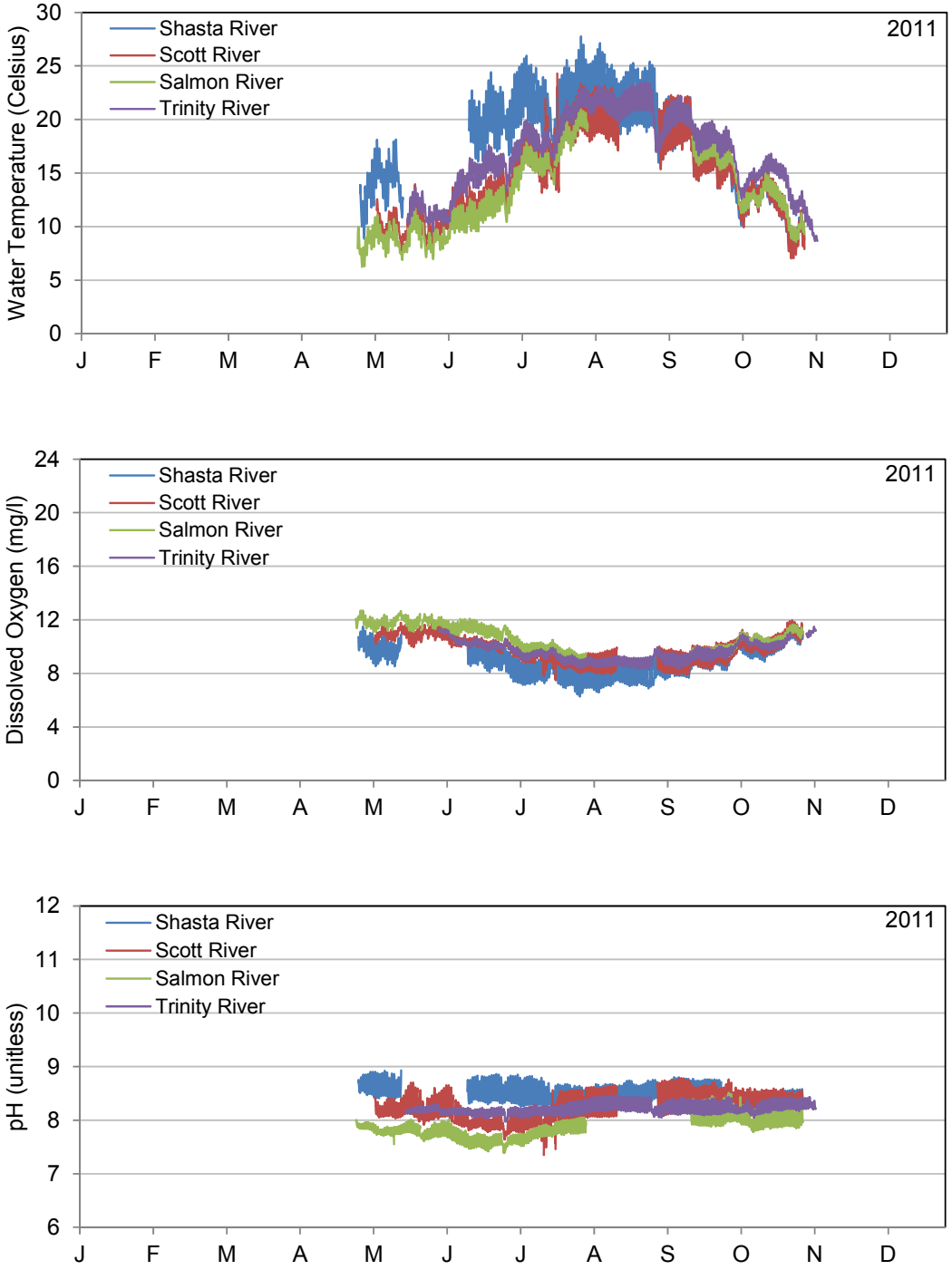

Figure 9. Continuous water temperature, dissolved oxygen, and pH data (2011) for the Shasta River, Scott River, Salmon River, and Trinity River.

4.1.2. Mainstem Klamath River (Time Series)

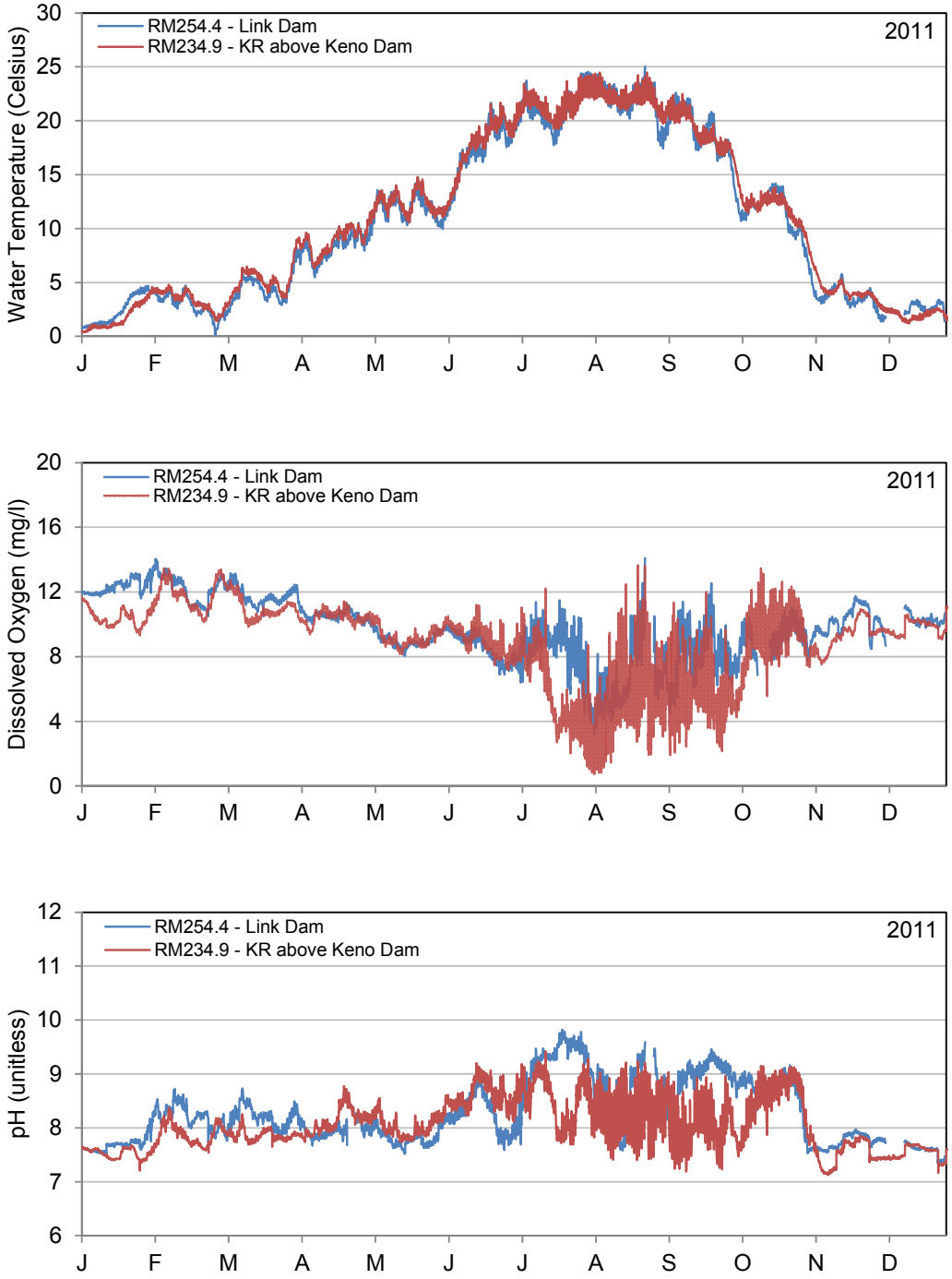

Figure 10. Continuous water temperature, dissolved oxygen, and pH data (2011) for Klamath River (KR) at Link Dam (RM 254.44; Baseline) and Klamath River above Keno Dam (surface) (RM 234.9).

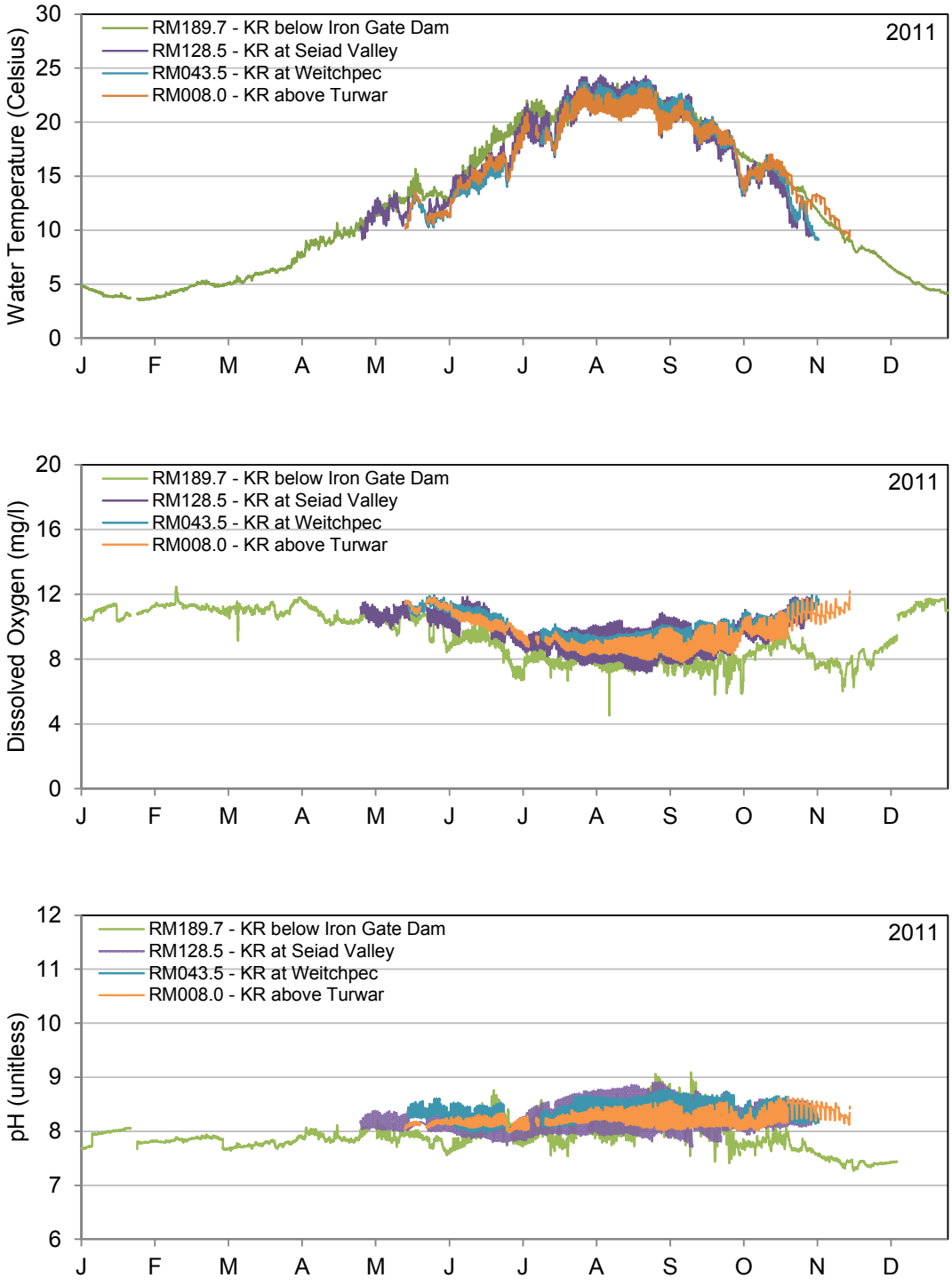

Figure 11. Continuous water temperature, dissolved oxygen, and pH data (2011) for the Klamath River below Iron Gate Dam (RM 189.73; Baseline), Klamath River below Seiad (RM 128.5; Baseline), Klamath River at Weitchpec (RM 43.5; Baseline), and Klamath River above Turwar (RM 8.0).

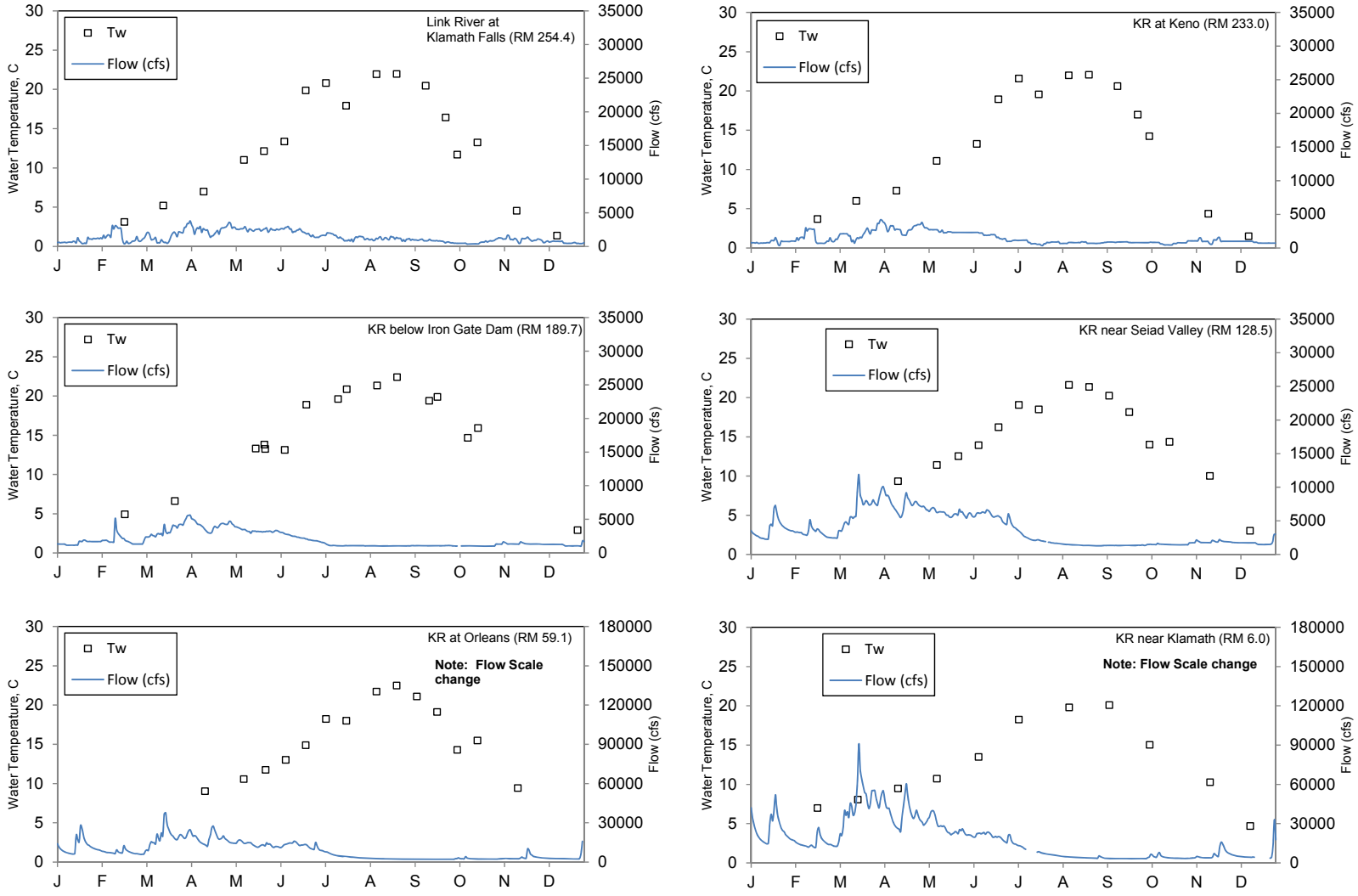

Figure 12. Discrete 2011 water temperature (T_W) measured during grab sampling and mean daily flow at USGS flow gage locations for: Link River at Klamath Falls (USGS Gage 11507500), Klamath River at Keno (USGS Gage 11509500), Klamath River below Iron Gate Dam (USGS Gage 11516530), Klamath River near Seiad Valley (USGS Gage 11520500), Klamath River at Orleans (USGS Gage 11523000), and Klamath River near Klamath (USGS Gage 11530500). Note the scale change for the secondary y-axis for Klamath River at Orleans (RM 59.1; Baseline) and Klamath River near Klamath (RM 6.0; Baseline).

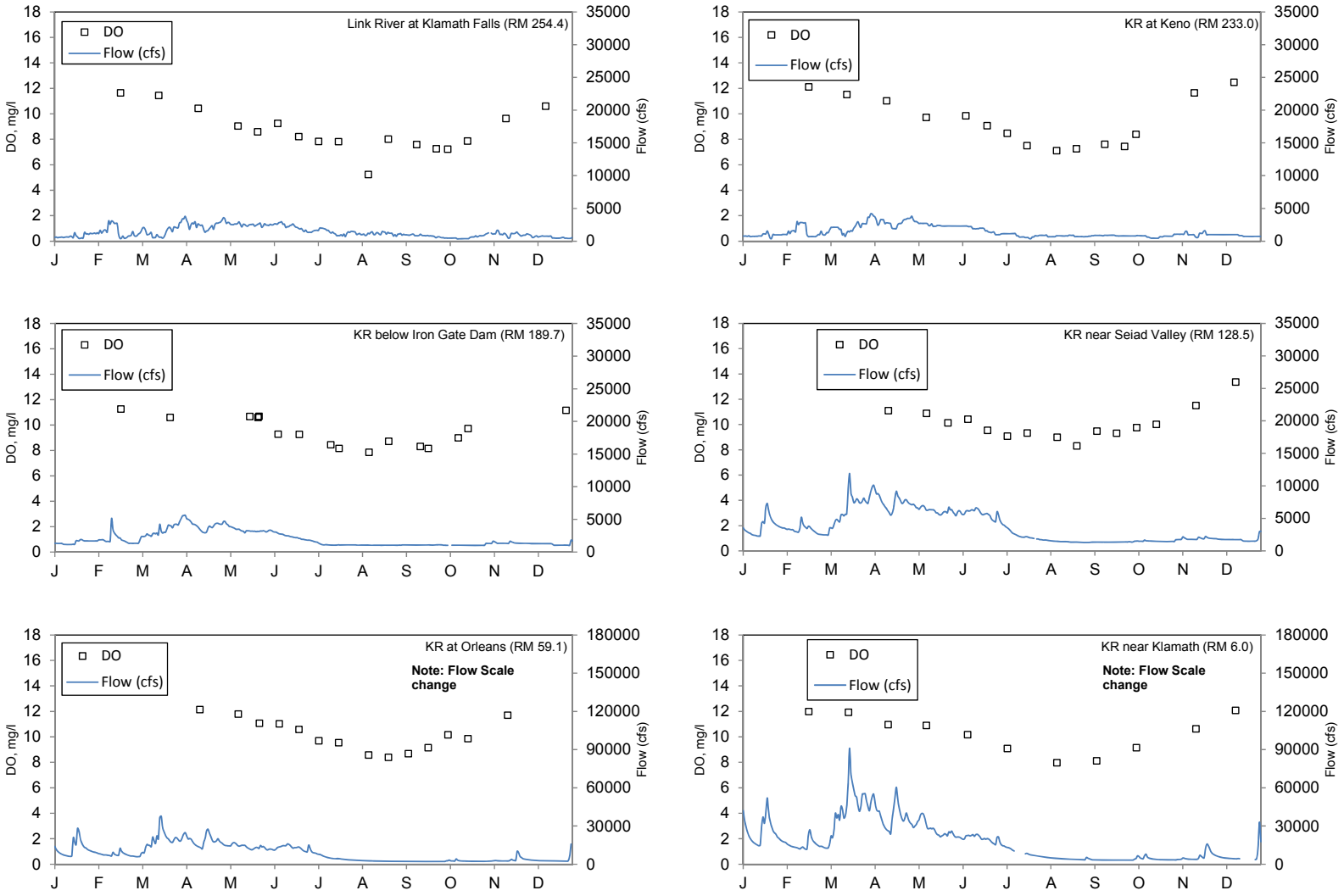

Figure 13. Discrete 2011 dissolved oxygen (DO) measured during grab sampling and mean daily flow at USGS flow gage locations for: Link River at Klamath Falls (USGS Gage 11507500), Klamath River at Keno (USGS Gage 11509500), Klamath River below Iron Gate Dam (USGS Gage 11516530), Klamath River near Seiad Valley (USGS Gage 11520500), Klamath River at Orleans (USGS Gage 11523000), and Klamath River near Klamath (USGS Gage 11530500). Note the scale change for the secondary y-axis for Klamath River at Orleans (RM 59.1; Baseline) and Klamath River near Klamath (RM 6.0; Baseline).

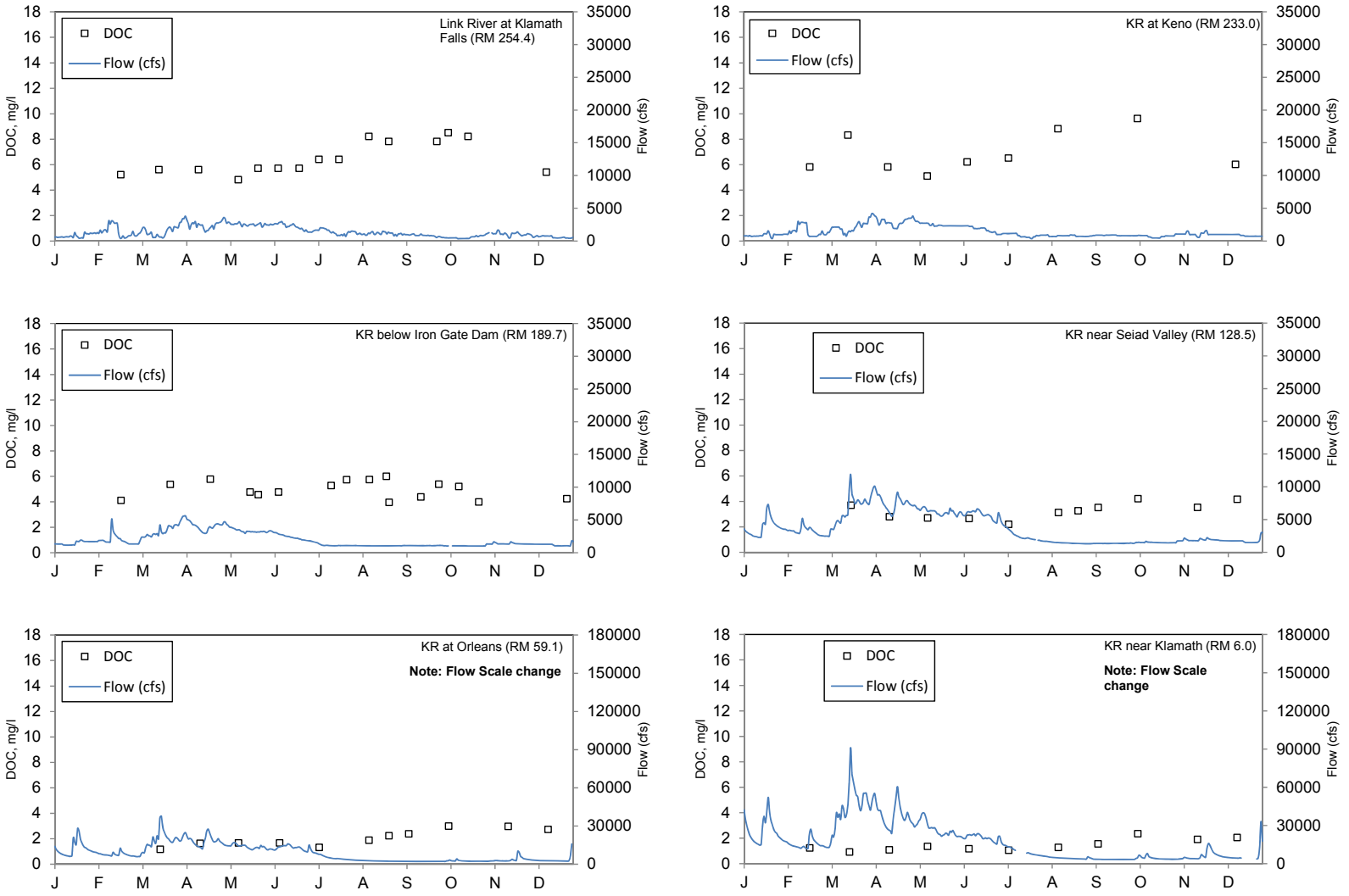

Figure 14. Discrete 2011 dissolved organic carbon (DOC) measured during grab sampling and mean daily flow at USGS flow gage locations for: Link River at Klamath Falls (USGS Gage 11507500), Klamath River at Keno (USGS Gage 11509500), Klamath River below Iron Gate Dam (USGS Gage 11516530), Klamath River near Seiad Valley (USGS Gage 11520500), Klamath River at Orleans (USGS Gage 11523000), and Klamath River near Klamath (USGS Gage 11530500). Note the scale change for the secondary y-axis for Klamath River at Orleans (RM 59.1; Baseline) and Klamath River near Klamath (RM 6.0; Baseline).

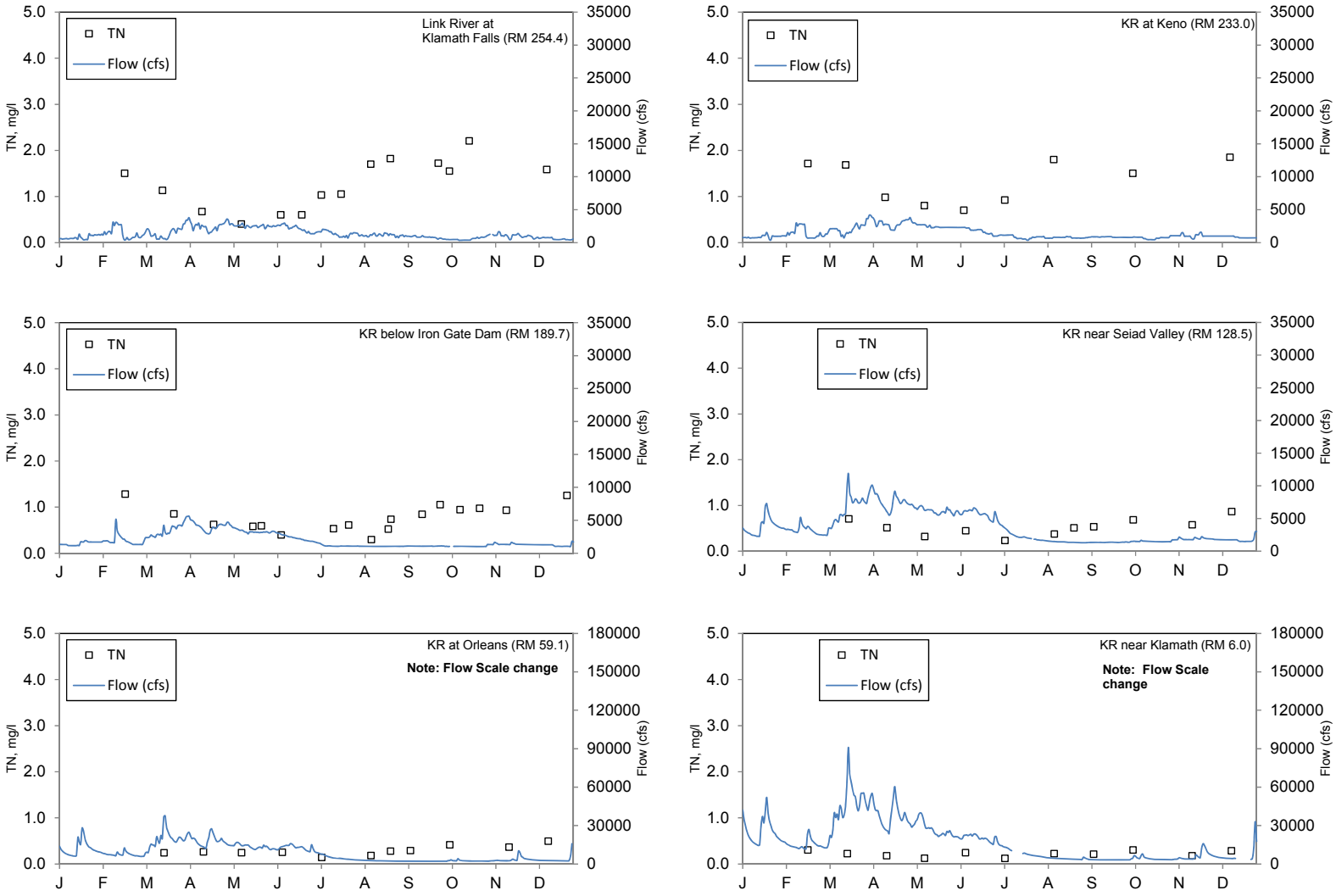

Figure 15. Discrete 2011 total nitrogen (TN) measured during grab sampling and mean daily flow at USGS flow gage locations for: Link River at Klamath Falls (USGS Gage 11507500), Klamath River at Keno (USGS Gage 11509500), Klamath River below Iron Gate Dam (USGS Gage 11516530), Klamath River near Seiad Valley (USGS Gage 11520500), Klamath River at Orleans (USGS Gage 11523000), and Klamath River near Klamath (USGS Gage 11530500). Note the scale change for the secondary y-axis for Klamath River at Orleans (RM 59.1; Baseline) and Klamath River near Klamath (RM 6.0; Baseline).

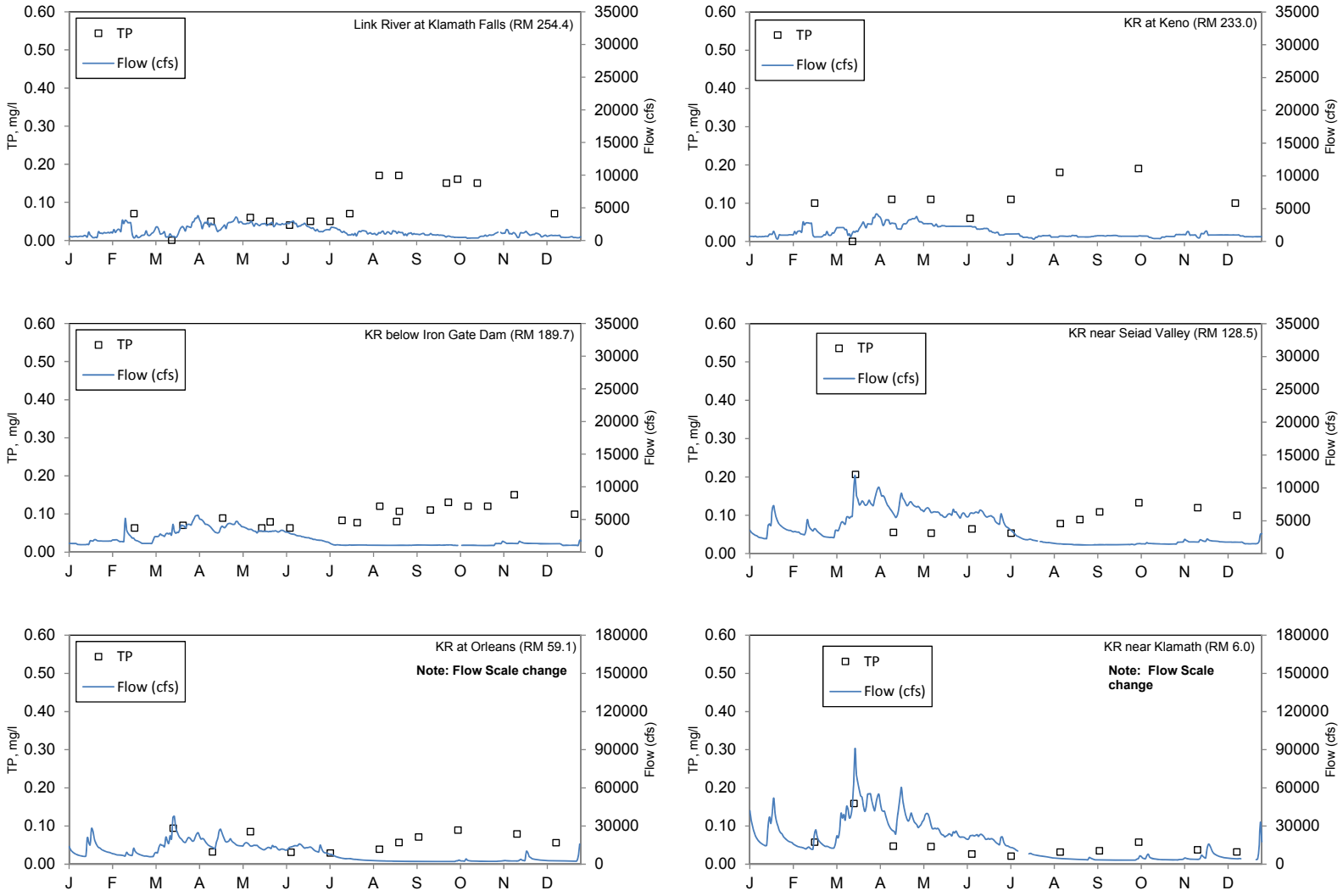

Figure 16. Discrete 2011 total phosphorus (TP) measured during grab sampling and mean daily flow at USGS flow gage locations for: Link River at Klamath Falls (USGS Gage 11507500), Klamath River at Keno (USGS Gage 11509500), Klamath River below Iron Gate Dam (USGS Gage 11516530), Klamath River near Seiad Valley (USGS Gage 11520500), Klamath River at Orleans (USGS Gage 11523000), and Klamath River near Klamath (USGS Gage 11530500). Note the scale change for the secondary y-axis for Klamath River at Orleans (RM 59.1; Baseline) and Klamath River near Klamath (RM 6.0; Baseline).

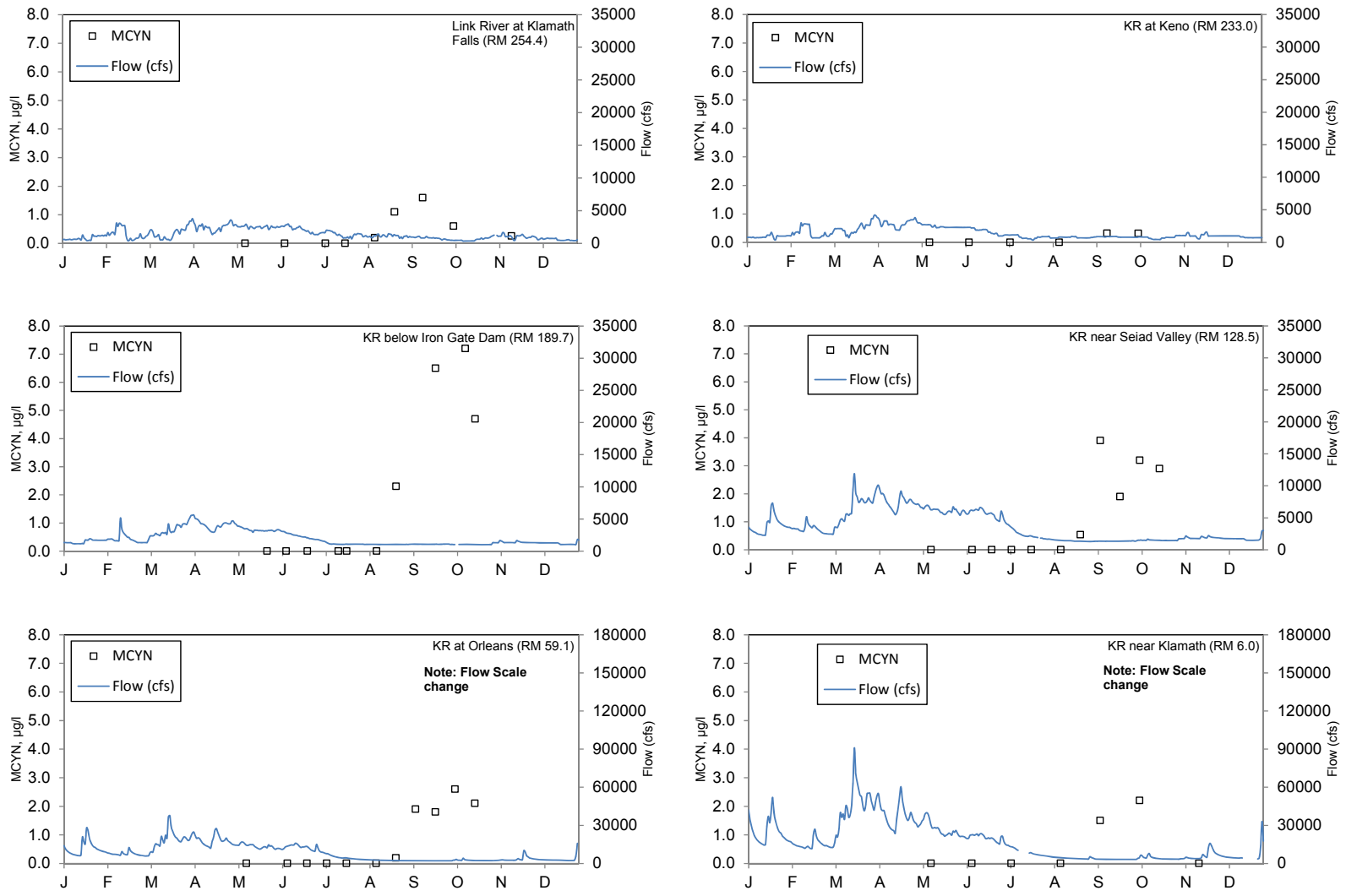

Figure 17. Discrete 2011 microcystin (MCYN) measured during grab sampling and mean daily flow at USGS flow gage locations for: Link River at Klamath Falls (USGS Gage 11507500), Klamath River at Keno (USGS Gage 11509500), Klamath River below Iron Gate Dam (USGS Gage 11516530), Klamath River near Seiad Valley (USGS Gage 11520500), Klamath River at Orleans (USGS Gage 11523000), and Klamath River near Klamath (USGS Gage 11530500). Note the scale change for the secondary y-axis for Klamath River at Orleans (RM 59.1; Baseline) and Klamath River near Klamath (RM 6.0; Baseline). Only surface samples are taken into consideration. Non-detect values are presented as zeros.

5. Summary

The KHSA baseline water quality sampling program is an interagency cooperative effort to characterize water quality conditions in the Klamath Basin in support of ongoing and future measures pertaining to restoration, dam removal studies, public health, and other factors. The program was successfully implemented in 2009 and third year monitoring was completed during 2011. Quality assurance measures have been incorporated into the process and final data sets are available to all interested parties (http://kbmp.net/). The 2011 planning and monitoring effort has laid the groundwork for continued cooperation and quality data collection in the Klamath River basin.

6. References

Karuk Tribe (Karuk). 2009. Mid-Klamath River Nutrient, Periphyton, Phytoplankton and Algal Toxin Sampling Analysis Plan (SAP). February.

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Appendix A. Baseline Water Quality Sampling Sites

Table A-1. 2011 baseline water quality sampling locations in the Klamath River mainstem and major tributaries.

Site ID	Location	Site Type	River Mile	Sampling Entity
KR25444	Link Dam (RM 254.44; Baseline)	Mainstem	254.44	USBR
KR24600	Keno Reservoir at Miller Island (RM 246.0; Baseline)	Mainstem	246.00	USBR
KR23340	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	Mainstem	233.40	USBR
KR22822	Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)	Mainstem	228.22	PacifiCorp
KR22478	J.C. Boyle Reservoir (RM 224.78; Baseline)	Reservoir	224.78	PacifiCorp
KR22460	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	Mainstem	224.60	PacifiCorp
KR21950	Klamath River below USGS Gage (RM 219.50; Baseline)	Mainstem	219.50	PacifiCorp
KR20642	Klamath River above Shovel Creek (RM 206.42; Baseline)	Mainstem	206.42	PacifiCorp
KR19874	Copco Reservoir (RM 198.74; Baseline)(0.5 m, thermocline, 0.5 m from bottom, and 0-8m integrated)	Reservoir	198.74	PacifiCorp
KR19645	Klamath River below Copco Dam (RM 196.45; Baseline)	Mainstem	196.45	PacifiCorp
KR19019	Iron Gate Reservoir (RM 190.19; Baseline)(0.5 m, thermocline, 0.5 m from bottom, and 0-8m integrated)	Reservoir	190.19	PacifiCorp
KR18973	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	Mainstem	189.73	PacifiCorp
KR15626	Klamath River at Walker Bridge (RM 156.26; Baseline)	Mainstem	156.26	Karuk
KR12850	Klamath River below Seiad (RM 128.5; Baseline)	Mainstem	128.50	Karuk
KR10130	Klamath River below Happy Camp (RM 101.3; Baseline)	Mainstem	101.30	Karuk
KR05910	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Mainstem	59.10	Karuk
KR04350	Klamath River at Weitchpec (RM 43.5; Baseline)	Mainstem	43.50	Yurok
KR03850	Klamath River below Trinity River (RM 38.5; Baseline)	Mainstem	38.50	Yurok
KR00600	Klamath River near Klamath (RM 6.0; Baseline)	Mainstem	6.00	Yurok
KR00050	Klamath River Estuary (RM 0.5; Baseline)	Mainstem	0.50	Yurok
SH00000	Shasta River near mouth (Baseline)	Tributary	-	Karuk
SC00000	Scott River near mouth (Baseline)	Tributary	-	Karuk
SA00000	Salmon River near mouth (Baseline)	Tributary	-	Karuk
TR00000	Trinity River near mouth (Baseline)	Tributary	-	Yurok

Appendix B. 2011 Baseline Data Summary

Appendix Table B-1 presents the complete general water quality and nutrient data set for the 2011 KHSA baseline sampling. The four sampling entities are United States Bureau of Reclamation (USBR), PacifiCorp, the Karuk Tribe, and the Yurok Tribe.

Table B-1. 2011 Klamath River Baseline Data Summary

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate-Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KHSA2011-001	2/16/2011	11:45	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	3.11	8.08	110	11.63	16.0	10.0	48.0	5.20	2.63	<3	0.29	0.24		1.3	1.50	<0.05	0.07			15.4	25.0	5.0	
KHSA2011-008	3/15/2011	10:25	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	5.18	8.12	112	11.43	18.0	<6	48.0	5.60	3.10	<3	0.06	0.09		1.0	1.13	<0.05	<0.05			18.8	34.0	6.0	
KHSA2011-014	4/12/2011	10:00	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	6.96	7.96	113	10.41	6.0	<6	49.0	5.60	1.48	<3	0.13	<0.05		0.7	0.67	<0.05	0.05			13.1	18.0	<5.0	
KHSA2011-019	5/10/2011	10:15	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	10.99	7.89	108	9.02	13.0	4.0	48.0	4.80	1.32	<3	<0.5	<0.05		0.4	0.40	<0.05	0.06			13.0	12.0	<5.0	<0.18
KHSA2011-026	5/24/2011	8:00	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	12.13	7.81	108	8.58	<6	6.0	49.0	5.70	0.94	<3	0.07	0.06		0.5		<0.05	0.05			9.4	5.0	<5.0	
KHSA2011-029	6/7/2011	11:15	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	13.34	8.18	108	9.24	6.0	<6	47.0	5.70	1.61	<3	0.12	<0.05		0.6	0.60	<0.05	0.04			8.9	6.0	<5.0	<0.18
KHSA2011-036	6/22/2011	7:50	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	19.84	8.31	105	8.19	8.0	<6	47.0	5.70		<3	0.07	<0.05		0.6	0.60	<0.05	0.05			5.3	<5.0	<5.0	
KHSA2011-041	7/6/2011	7:55	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	20.80	8.50	108	7.81	34.0	<6	49.0	6.40	2.78	4	0.07	<0.05		1.0	1.03	<0.05	0.05			5.8	8.0	<5.0	<0.18
KHSA2011-047	7/20/2011	8:00	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	17.91	9.27	106	7.80	50.0	<6	49.0	6.40	2.98	4	0.09	<0.05		1.0	1.05	<0.05	0.07			5.1	<5.0	<5.0	<0.18
KHSA2011-052	8/10/2011	9:15	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	21.91	8.75	110	5.21	40.0	<6	50.0	8.20		6	0.22	0.11		1.6	1.70	0.07	0.17			6.6	7.0	<5.0	0.20
KHSA2011-058	8/24/2011	9:00	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	21.95	9.10	113	8.00	114.0	<6	52.0	7.80	3.38	4	0.16	<0.05		1.8	1.82	0.06	0.17			4.8	11.0	7.0	1.10
KHSA2011-063	9/13/2011	9:30	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	20.44	8.87	115	7.57					3.17											6.8			1.60
KHSA2011-069	9/27/2011	9:07	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	16.41	9.11	113	7.25	27.0	<6	54.0	7.80	4.08	4	0.09	0.05		1.7	1.72	0.03	0.15			8.7	12.0	6.0	
KHSA2011-074	10/5/2011	7:25	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	11.68	8.71	112	7.21	46.0	6.0	53.0	8.50	5.93	4	0.12	<0.05		1.5	1.55	<0.05	0.16			8.8	15.0	6.0	0.60
KHSA2011-080	10/19/2011	8:45	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	13.21	8.45	114	7.85	22.0	<6	54.0	8.20		8	0.12	0.05		2.2	2.20	<0.05	0.15			7.3	15.0	9.0	
KHSA2011-084	11/15/2011	12:00	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	4.51	7.62	120	9.62																6.5			0.26
KHSA2011-090	12/13/2011	12:15	Link Dam (RM 254.44; Baseline)	USBR	0.5	R	1.36	7.62	120	10.58	<6	<6	53.0	5.40	1.52	<3	0.59	0.32		1.3	1.58	<0.05	0.07			8.4	5.0	<5.0	
KHSA2011-005	2/16/2011	8:50	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	3.42	7.57	136	11.04	14.0	<6	89.0	5.00	2.20	<3	0.28	0.34		1.1	1.40	<0.05	0.08			15.1	23.0	<5.0	
KHSA2011-010	3/15/2011	7:20	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	5.63	7.79	182	10.48	21.0	7.0	73.0	6.60	3.11	<3	0.22	0.29		1.2	1.49	<0.05	<0.05			23.1	35.0	7.0	

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KHSA2011-016	4/12/2011	7:00	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	7.41	7.85	130	10.48	14.0	<6	55.0	5.90	1.83	<3	0.14	0.05		0.7	0.79	<0.05	0.08			13.7	21.0	<5.0	
KHSA2011-022	5/10/2011	9:13	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	11.20	7.83	120	8.79	6.0	<6	54.0	4.90	1.19	<3	0.08	<0.05		0.6	0.60	0.01	0.06			12.5	13.0	<5.0	<0.18
KHSA2011-032	6/7/2011	9:30	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	14.19	8.15	113	9.27	<6	<6	49.0	5.90	1.13	<3	0.16	<0.05		0.7	0.70	0.01	0.06			8.5	7.0	<5.0	<0.18
KHSA2011-043	7/6/2011	9:40	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	21.53	8.13	115	7.86	16.0	<6	50.0	6.30	1.14	<3	0.08	<0.05		0.8	0.80	0.02	0.06			6.2	5.0	<5.0	<0.18
KHSA2011-054	8/10/2011	8:20	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	22.70	7.52	120	2.93	27.0	<6	54.0	7.40		4	0.58	0.10		1.8	1.90	0.06	0.15			5.3	7.0	<5.0	<0.18
KHSA2011-065	9/13/2011	8:15	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	20.61	7.92	138	5.89					2.50											4.9			0.58
KHSA2011-076	10/5/2011	10:00	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	13.00	8.05	171	6.67	31.0	9.0	79.0	8.40	2.70	<3	0.15	0.07		1.4	1.47	0.06	0.19			6.2	11.0	5.0	0.45
KHSA2011-086	11/15/2011	9:00	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	4.56	7.43	126	9.90																5.6			
KHSA2011-092	12/13/2011	9:00	Keno Reservoir at Miller Island (RM 246.0; Baseline)	USBR	0.5	P	1.09	7.70	149	11.10	<6	<6	65.0	5.70	1.12	<3	0.58	0.37		1.3	1.65	0.02	0.07			8.8	<5.0	<5.0	
KHSA2011-006	2/16/2011	10:30	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	3.67	7.90	152	12.09	16.0	6.0	60.0	5.80	2.22	<3	0.31	0.43		1.3	1.71	<0.05	0.10			15.3	22.0	*4.0*	
KHSA2011-011	3/15/2011	9:00	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	6.00	7.85	210	11.51	26.0	12.0	79.0	8.30	3.75	3	0.10	0.21		1.5	1.68	<0.05	<0.05			41.9	55.0	11.0	
KHSA2011-017	4/12/2011	9:00	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	7.28	7.94	150	11.01	14.0	7.0	60.0	5.80	2.13	<3	0.16	0.07		0.9	0.98	<0.05	0.11			16.3	28.0	5.0	
KHSA2011-023	5/10/2011	7:30	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	11.07	7.79	129	9.70	6.0	<6	56.0	5.10	1.78	<3	0.09	<0.05		0.7	0.80	0.03	0.11			14.6	18.0	<5.0	<0.18
KHSA2011-033	6/7/2011	8:00	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	13.23	8.28	122	9.83	6.0	<6	52.0	6.20	1.95	<3	0.12	<0.05		0.7	0.70	<0.05	0.06			11.1	13.0	<5.0	<0.18
KHSA2011-038	6/22/2011	6:45	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	18.93	8.69	116	9.06						<3										8.2			
KHSA2011-044	7/6/2011	11:30	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	21.57	8.74	122	8.45	17.0	6.0	52.0	6.50	1.37	3	0.06	<0.05		0.9	0.92	0.03	0.11			6.0	<5.0	<5.0	<0.18
KHSA2011-049	7/20/2011	9:30	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	19.54	8.19	133	7.49						<3										3.5			
KHSA2011-055	8/10/2011	7:15	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	21.97	8.21	141	7.09	32.0	<6	61.0	8.80		4	0.41	<0.05		1.8	1.80	0.08	0.18			6.8	9.0	5.0	<0.18
KHSA2011-060	8/24/2011	7:53	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	22.03	7.91	132	7.25						3										5.8			
KHSA2011-066	9/13/2011	6:30	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	20.59	7.74	141	7.59																5.2			0.32
KHSA2011-071	9/27/2011	7:45	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	16.96	7.71	178	7.42						<3										6.2			
KHSA2011-077	10/5/2011	9:15	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	14.22	7.73	184	8.38	<6	47.0	83.0	9.60	2.85	<3	0.27	<0.05		1.5	1.50	0.08	0.19			7.7	12.0	6.0	0.31
KHSA2011-087	11/15/2011	10:40	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	4.35	7.53	138	11.62																5.1			

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KHSA2011-093	12/13/2011	10:50	Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline)	USBR	0.5	P	1.47	7.76	158	12.45	6.0	<6	67.0	6.00	1.30	<3	0.63	0.38		1.5	1.85	0.02	0.10			12.0	13.0	<5.0	
KR11045	4/12/2011	10:45	Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)	PacifiCorp	0.5	P					13.4	7.3	60.3	6.55	1.63		<0.05	0.13	0.24	1.04	0.86	0.041	0.099				20.4	<2.0	
KR11073	5/17/2011	10:30	Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)	PacifiCorp	0.5	P	11.57	7.78	118	9.25	3.8	3.6	50.7	5.71	0.80		<0.05	0.083	0.11	0.74	0.75	0.043	0.071				7.2	<2.0	
KR11090	6/8/2011	13:30	Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)	PacifiCorp	0.5	P	13.78	8.17	124.5	8.71	3.6	3.6	49.0	5.51	0.83		0.06	0.078	0.10	0.74	0.58	0.026	0.058				11.6	8.8	
KR11114	7/13/2011	9:15	Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)	PacifiCorp	0.5	P	18.98	7.78	134.6	7.48	5.6	4.9	54.3	6.99	1.34		0.15	0.25	0.19	1.36	1.18	0.061	0.19				6.0	3.2	
KR11138	8/9/2011	15:40	Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)	PacifiCorp	0.5	P	22.86	8.12	139.4	7.14	2.5	3.0	57.4	9.86	0.86		<0.05	0.49	0.14	1.63	1.48	0.12	0.18				4.7	3.3	<0.18
KR11162	9/14/2011	16:20	Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)	PacifiCorp	0.5	P	20.02	7.68	150.2	7.24	13.5	13.6	61.0	7.18	1.48		0.1	0.54	0.23	1.50	1.84	0.1	0.18				8.0	2.4	
KR11186	10/11/2011	16:40	Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)	PacifiCorp	0.5	P	11.61	8.01	186.6	8.71	25.8	20.9	82.4	7.96	1.59		0.066	0.19	0.25	1.46	1.48	0.061	0.15				8.0	3.2	
KR11210	11/14/2011	15:30	Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)	PacifiCorp	0.5	P					1.4	2.1	57.2		0.83		0.45	0.32	0.11	1.78	1.91	0.057	0.13				3.2	2.8	
KR11232	12/26/2011	15:30	Klamath River above J.C. Boyle Reservoir (RM 228.22; Baseline)	PacifiCorp	0.5	P	0.99	7.79	163.2	11.62	1.5	2.2	63.1	5.04	0.44		0.33	0.59	0.06	1.24	1.79	0.043	0.08				2.0	<2.0	
KR11024	3/15/2011	10:40	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	0.5	P	5.00	7.95	280.7	11.48	17.5	10.1	101.0	8.41	2.60		<0.05	0.43	0.32	1.52	1.84	0.072	0.2				24.0	4.0	
KR11025	3/15/2011	10:50	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	8	P	4.91	7.93	282.1	12.26	18.7	10.8	102.0	9.02	3.10		0.065	0.44	0.41	1.63	1.9	0.077	0.2				22.0	6.0	
KR11046	4/12/2011	11:25	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	0.5	P							61.1	6.66			<0.05	0.12		2.61	0.92	0.041	0.084				21.6	4.4	
KR11047	4/12/2011	11:35	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	8	P					0.7	0.3	60.6	7.33	0.13		0.052	0.12	0.02	<0.20	0.9	0.036	0.088				18.0	<2.0	
KR11071	5/17/2011	17:30	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	0.5	P	11.94	7.70	118	8.66	2.7	2.8	50.2	5.99	0.58		<0.05	0.097	0.08	0.77	0.75	0.047	0.082				7.2	<2.0	<0.18
KR11072	5/17/2011	17:40	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	8	P					3.5	3.9	50.0	5.41	1.01		<0.05	0.091	0.14	0.86	0.79	0.046	0.072				13.6	<2.0	
KR11091	6/8/2011	12:40	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	0.5	P	13.11	7.95	128.1	8.57	3.7	3.6	51.8	5.42	1.07		0.052	0.065	0.14	0.69	0.52	0.028	0.054				7.2	7.6	<0.18
KR11092	6/8/2011	12:50	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	8	P	12.08	7.75	129.7	8.12	4.4	4.2	51.6	5.50	1.35		0.05	0.069	0.17	0.76	0.57	0.029	0.059				6.8	4.8	<0.18
KR11115	7/13/2011	12:10	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	0.5	P	21.22	7.93	135	7.20	2.7	2.4	55.2	7.83	0.65		0.2	0.15	0.09	0.97	0.87	0.063	0.088				4.8	4.8	<0.18
KR11116	7/13/2011	12:15	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	8	P	19.41	7.19	131.5	5.51	2.2	2.7	54.2	6.72	0.83		0.21	0.15	0.11	1.08	0.87	0.066	0.096				4.8	4.0	<0.18
KR11139	8/9/2011	17:00	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	0.5	P	21.58	7.99	147.1	6.69	5.8	2.7	61.6	9.38	1.10		0.095	0.43	0.19	1.28	1.35	0.13	0.19				<2.0	2.7	<0.18
KR11140	8/9/2011	17:10	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	8	P	20.22	8.40	149	3.85	4.4	4.1	61.8	8.99	1.08		0.21	0.45	0.17	1.44	1.4	0.14	0.17				2.0	2.7	
KR11163	9/14/2011	15:10	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	0.5	P	20.91	7.53	144.8	7.05	7.6	6.2	59.8	7.44	1.13		0.13	0.47	0.18	1.30	1.64	0.1	0.17				4.0	2.4	<0.18

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KR11164	9/14/2011	15:20	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	8	P	19.15	8.14	144.6	6.33	8.1	8.4	60.6	8.29	0.97		0.13	0.47	0.16	1.4	1.66	0.11	0.25				4.4	<2.0	<0.18
KR11187	10/11/2011	15:20	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	0.5	P	11.21	7.76	177.2	9.37	26.7	20.2	79.9	9.05	1.55		0.1	0.2	0.24	1.41	1.46	0.057	0.15				5.6	4.8	<0.18
KR11188	10/11/2011	15:40	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	8	P	10.74	8.66	176.7	8.23	22.4	19.3	78.7	7.76	1.32		0.1	0.2	0.21	1.32	1.45	0.064	0.15				6.8	<2.0	
KR11211	11/14/2011	13:25	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	0.5	P					1.8	2.5	58.2		0.62		0.46	0.3	0.07	1.50	2.02	0.059	0.11				1.6	<2.0	
KR11212	11/14/2011	13:35	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	8	P					1.7	2.5	57.5		0.59		0.47	0.3	0.08	1.34	1.79	0.056	0.1				1.6	<2.0	
KR11233	12/26/2011	not sampled	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	0.5	P																							
KR11234	12/26/2011	not sampled	J.C. Boyle Reservoir (RM 224.78; Baseline)	PacifiCorp	8	P																							
KR11003	2/17/2011	11:20	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R	3.65	7.45	158.4	12.07	9.0	6.7	55.8	5.34	0.73		0.17	0.55	0.10	1.16	1.54	0.021	0.073				11.6	2.8	
KR11022	3/15/2011	10:00	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R	5.02	7.98	285	11.93	18.4	10.3	105.0	8.70	2.53		0.061	0.46	0.32	1.59	1.8	0.08	0.2				18.0	10.0	
KR11044	4/12/2011	11:20	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R					13.9	7.6	59.9	6.51	1.94		0.1	0.12	0.27	0.97	0.93	0.041	0.096				22.8	2.8	
KR11066	5/17/2011	12:20	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R	11.59	7.89	117.8	9.48	4.0	4.3	50.4	5.62	1.23		<0.05	0.1	0.18	0.83	0.85	0.05	0.16				11.2	<2.0	
KR11089	6/8/2011	10:30	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R	12.42	8.02	128.6	8.95	4.3	4.2	51.4	5.73	0.99		0.063	0.079	0.11	0.78	0.56	0.033	0.058				7.6	7.2	
KR11113	7/13/2011	11:13	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R	20.13	7.85	134.8	7.67	1.6	1.5	55.7	7.16	0.70		0.13	0.16	0.09	1.09	0.87	0.068	0.11				4.0	2.8	
KR11137	8/9/2011	18:40	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R	20.67	7.68	146.3	7.30	2.5	3.1	61.7	8.75	0.85		0.16	0.46	0.11	1.50	1.44	0.14	0.18				<2.0	4.0	
KR11161	9/14/2011	14:20	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R	19.70	7.48	144.5	7.66	6.1	5.6	60.4	8.03	1.01		0.1	0.48	0.16	1.23	1.71	0.11	0.16				6.4	2.4	
KR11185	10/11/2011	14:30	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R	10.84	7.60	177.5	9.29	19.3	17.4	79.0	6.49	1.35		0.084	0.21	0.20	1.39	1.48	0.069	0.15				8.4	3.2	
KR11209	11/14/2011	14:40	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R					1.7	2.4	58.3		0.56		0.46	0.31	0.07	1.54	2	0.059	0.12				5.2	2.8	
KR11231	12/26/2011	14:35	Klamath River below J.C. Boyle Dam (RM 224.60; Baseline)	PacifiCorp	0.5	R	0.00	7.49	160.1	12.37	1.5	2.2	62.5	5.08	0.45		0.36	0.58	0.06	1.34	1.87	0.044	0.068				1.2	<2.0	
KR11029	3/15/2011	9:00	Klamath River at Spring Island (RM 220.0; Baseline)	PacifiCorp	0.5	P	5.03	7.88	287.7	11.25	14.7	9.2	105.0	8.89	2.61		0.056	0.47	0.33	1.53	2.14	0.081	0.22				24.0	<2.0	
KR11051	4/12/2011	9:00	Klamath River at Spring Island (RM 220.0; Baseline)	PacifiCorp	0.5	P					17.5	8.6	61.0	7.25	2.23		<0.05	0.11	0.31	1.06	0.89	0.034	0.09				21.2	<2.0	
KR11067	5/17/2011	11:30	Klamath River at Spring Island (RM 220.0; Baseline)	PacifiCorp	0.5	P	11.78	7.69	118	9.05	3.5	3.9	49.2	5.54	0.77		<0.05	0.11	0.11	0.81	0.82	0.048	0.099				9.6	<2.0	
KR11096	6/8/2011	11:50	Klamath River at Spring Island (RM 220.0; Baseline)	PacifiCorp	0.5	P	12.62	7.89	129.1	8.65	3.5	3.4	51.1	5.47	1.24		0.067	0.086	0.14	0.59	0.5	0.029	0.08				8.8	6.8	<0.18
KR11120	7/13/2011	10:40	Klamath River at Spring Island (RM 220.0; Baseline)	PacifiCorp	0.5	P	16.42	7.91	137.4	8.22	2.0	2.0	58.3	4.96	0.74		0.054	0.21	0.10	0.73	0.65	0.066	0.083				5.6	2.0	<0.18

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KR11144	8/9/2011	18:00	Klamath River at Spring Island (RM 220.0; Baseline)	PacifiCorp	0.5	P	20.48	7.58	146.7	6.50	2.1	3.0	60.3	8.89	1.05		0.12	0.48	0.14	1.44	1.34	0.13	0.16				<2.0	2.0	<0.18
KR11168	9/14/2011	13:20	Klamath River at Spring Island (RM 220.0; Baseline)	PacifiCorp	0.5	P	19.44	7.24	144.3	7.53	9.9	8.5	59.4	7.50	1.05		0.19	0.51	0.17	1.3	1.71	0.11	0.16				4.4	0.8	<0.18
KR11192	10/11/2011	13:30	Klamath River at Spring Island (RM 220.0; Baseline)	PacifiCorp	0.5	P	10.96	7.51	175.7	9.28	24.4	19.4	79.1	6.56	1.41		<0.05	0.23	0.22	1.36	1.39	0.062	0.12				6.4	2.8	<0.18
KR11216	11/14/2011	14:15	Klamath River at Spring Island (RM 220.0; Baseline)	PacifiCorp	0.5	P					2.1	2.8	57.2		0.62		0.43	0.32	0.08	1.64	1.7	0.057	0.11				4.4	2.4	
KR11238	12/26/2011	13:30	Klamath River at Spring Island (RM 220.0; Baseline)	PacifiCorp	0.5	P	0.58	6.84	158.6	11.83	1.3	1.9	61.1	4.48	0.51		0.44	0.56	0.06	1.16	1.66	0.041	0.068				2.0	<2.0	
KR11008	2/16/2011	14:30	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P	5.74	7.53	159.4	11.29	7.3	4.8	58.1	4.62	0.81	<2	<0.05	0.6	0.11	0.87	1.52	0.022	0.073				10.4	4.4	
KR11031	3/23/2011	13:45	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P	6.72	8.04	224.8	11.41	12.2	10.9	80.8	7.35	2.30	<2	<0.05	0.39	0.28	1.49	1.55	0.06	0.18				26.0	4.0	
KR11058	4/20/2011	11:15	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P					21.5	9.8	58.8	6.42	1.70	<2	<0.05	0.17	0.25	0.98	0.71	0.043	0.098				17.2	2.0	
KR11075	5/24/2011	10:00	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P					1.0	1.1	52.6	5.00	0.41		<0.05	0.15	0.05	0.63	0.64	0.058	0.063				3.6	<2.0	<0.18
KR11098	6/8/2011	8:00	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P	12.09	8.06	131.9	9.25	2.5	2.6	53.3	4.82	1.21	<2	<0.05	0.14	0.15	0.57	0.47	0.038	0.096				8.0	5.2	<0.18
KR11112	6/30/2011	10:15	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P										<2													
KR11122	7/14/2011	15:00	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P	16.24	8.46	135.5	9.11	1.9	1.9	60.8	3.30	0.71	<2	<0.05	0.19	0.08	0.43	0.48	0.072	0.098				4.4	2.0	<0.18
KR11136	7/25/2011	11:40	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P										<2													
KR11146	8/10/2011	13:30	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P	18.18	8.50	146.3	9.14	1.2	1.4	63.0	6.01	0.59	<2	<0.05	0.46	0.07	0.83	0.84	0.11	0.15				<2.0	<2.0	<0.18
KR11160	8/22/2011	17:40	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P										<2													
KR11170	9/15/2011	10:40	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P	14.96	8.45	144.3	9.22	3.9	3.7	63.0	3.03	0.75	<2	0.077	0.36	0.11	0.6	0.85	0.083	0.11				4.8	<2.0	<0.18
KR11184	9/28/2011	12:30	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P										<2													
KR11194	10/12/2011	12:15	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P	9.99	8.22	168.1	10.88	7.2	6.3	76.8	4.39	0.64	<2	<0.05	0.29	0.09	0.76	0.91	0.064	0.084				2.8	2.0	<0.18
KR11208	10/26/2011	12:00	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P										<2													
KR11218	11/14/2011	14:20	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P					1.6	2.3	58.6		0.47	<2	0.2	0.42	0.06	1.13	1.69	0.057	0.1				2.4	<2.0	
KR11240	12/27/2011	15:25	Klamath River above Shovel Creek (RM 206.42; Baseline)	PacifiCorp	0.5	P	2.37	8.19	156.4	11.95	1.3	1.8	61.5	3.95	0.52	<2	0.15	0.63	0.07	0.87	1.47	0.045	0.078				<2.0	<2.0	
KR11010	2/16/2011	15:45	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P	5.25	7.65	168.2	11.75	11.9	9.8	61.5	5.30	1.10		0.11	0.61	0.15	1.05	1.53	0.019	0.064				8.8	4.4	
KR11011	2/16/2011	16:00	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P	5.06	7.66	169.9	10.33	11.5	10.3	61.8	4.85	1.05		0.12	0.61	0.14	1.07	1.74	0.019	0.069				10.4	4.4	

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KR11012	2/16/2011	16:15	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P	5.04	7.63	173.3	10.20	12.4	9.7	61.8	4.97	0.99		0.11	0.59	0.15	1.15	1.54	0.02	0.056				9.2	2.4	
KR11033	3/23/2011	12:00	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P	6.71	7.83	185.1	10.73	7.5	4.3	69.5	7.27	0.99		<0.05	0.34	0.12	0.80	1.13	0.035	0.096				9.6	<2.0	
KR11034	3/23/2011	12:20	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P	6.51	7.81	188.2	11.49	9.2	5.3	69.6	6.16	1.27		<0.05	0.34	0.17	0.83	1.21	0.038	0.12				10.4	<2.0	
KR11035	3/23/2011	12:10	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P	6.55	7.80	187.6	11.56	6.7	4.9	69.9	6.17	1.12		<0.05	0.34	0.15	0.87	1.13	0.037	0.098				10.8	<2.0	
KR11054	4/21/2011	10:30	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0-8	I					3.9	2.0			1.40				0.23										
KR11055	4/20/2011	12:00	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P					2.0	0.7	60.0	5.77	0.92		<0.05	0.19	0.16	0.76	0.59	0.043	0.082				<2.0	<2.0	
KR11056	4/20/2011	10:10	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P					4.2	2.8	59.3	5.92	0.82		0.064	0.19	0.10	0.67	0.62	0.049	0.082				4.4	<2.0	
KR11057	4/20/2011	10:20	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P					4.0	3.4	58.0	6.72	0.70		0.15	0.19	0.10	0.99	0.77	0.084	0.13				3.6	<2.0	
KR11076	5/24/2011	14:50	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0-8	I					0.9	1.2			0.55				0.06										
KR11077	5/24/2011	14:45	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P	15.43	7.90	126.6	9.02	0.5	0.8	52.9	5.27	0.30		<0.05	0.15	0.04	0.58	0.65	0.048	0.062				2.4	<2.0	<0.18
KR11078	5/24/2011	15:10	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P	12.36	7.55	127.3	7.52	1.0	1.3	53.7	4.70	0.30		0.056	0.14	0.05	0.56	0.66	0.063	0.072				4.0	<2.0	
KR11079	5/24/2011	15:00	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P	10.74	7.12	143.5	1.80	0.6	1.0	59.0	4.85	0.40		0.44	0.068	0.05	1.17	1	0.2	0.26				4.0	<2.0	
KR11099	6/7/2011	10:45	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0-8	I					0.7	0.8			0.71				0.08										
KR11100	6/7/2011	10:30	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P	13.75	7.98	132.2	9.36	0.7	0.7	51.9	5.07	0.50		<0.05	0.12	0.06	0.49	0.46	0.036	0.056				3.2	<2.0	
KR11101	6/7/2011	10:50	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P	10.87	7.67	128.8	8.07	1.0	1.4	51.1	4.75	0.64		0.18	0.12	0.07	0.62	0.56	0.09	0.1				2.4	<2.0	
KR11102	6/7/2011	10:40	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P	10.20	7.34	135.3	4.36	0.7	0.8	51.0	4.96	0.59		0.065	0.13	0.08	0.50	0.44	0.049	0.062				3.2	<2.0	
KR11123	7/14/2011	12:45	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0-8	I																							<0.18
KR11124	7/14/2011	12:30	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P	20.57	8.06	138.4	7.89	1.0	1.0	57.2	5.08	0.35		<0.05	0.14	0.06	0.64	0.69	0.071	0.098				<2.0	<2.0	<0.18
KR11125	7/14/2011	12:40	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P	14.18	7.12	134	2.01	1.2	1.4	58.1	5.27	0.31		0.088	0.14	0.05	0.64	0.67	0.079	0.089				<2.0	3.6	
KR11126	7/14/2011	12:50	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P	11.00	6.96	135.6	0.00	0.7	0.7	56.6	4.75	0.55		0.43	0.11	0.07	1.16	0.98	0.22	0.24				2.0	2.0	
KR11147	8/10/2011	11:25	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0-8	I					16.2	0.9			1.29				0.22										1.80
KR11148	8/10/2011	11:20	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P	21.04	8.57	144	8.71	0.6	0.6	62.4	5.67	0.13		<0.05	0.21	0.01	0.88	0.56	0.089	0.11				<2.0	<2.0	<0.18
KR11149	8/10/2011	11:55	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P	14.39	8.25	140.9	0.03	0.9	1.0	60.4	4.80	0.30		<0.05	0.39	0.04	0.44	0.5	0.18	0.19				<2.0	<2.0	

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KR11150	8/10/2011	11:45	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P	11.28	7.23	147.2	0.00	0.5	0.9	61.5	5.39	0.62		0.76	<0.01	0.09	1.63	0.98	0.37	0.47				3.0	3.0	
KR11171	9/15/2011	13:30	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0-8	I					32.9	1.8			2.85				0.57										14.00
KR11172	9/15/2011	13:00	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P	19.30	9.18	144.6	13.62	54.0	<0.68	64.3	5.71	3.92		<0.05	<0.01	0.76	1.5	1.33	0.06	0.15				12.0	10.0	41.00
KR11173	9/15/2011	13:15	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P	16.46	7.47	147.9	1.11	1.9	1.6	62.0	5.13	0.63		0.13	0.31	0.08	0.8	1.14	0.12	0.14				3.6	<2.0	
KR11174	9/15/2011	13:20	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P					1.8	1.5	67.4	4.73	1.01		1.56	<0.01	0.17	2.5	2.31	0.48	0.84				4.4	<2.0	
KR11195	10/19/2011	18:15	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0-8	I					29.5	2.2			2.28				0.48										20.00
KR11196	10/19/2011	13:10	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P	13.42	8.90	155.5	12.32	29.1	1.0	71.2	4.64	1.95		<0.05	<0.01	0.39	1.01	0.87	0.075	0.12				4.0	4.4	
KR11197	10/19/2011	19:00	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P	11.52	8.17	167.6	6.82	6.3	2.4	73.6	5.06	0.84		0.15	0.19	0.15	0.87	1.11	0.11	0.14				<2.0	2.0	
KR11198	10/19/2011	19:10	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P	11.21	7.89	172.9	5.10	3.6	2.7	77.0	4.76	0.66		0.21	0.19	0.10	1.07	1.13	0.085	0.098				<2.0	<2.0	
KR11219	11/15/11	15:25	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0-8	I					1.4	2.0			0.51				0.06										
KR11220	11/14/2011	15:20	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P					1.0	1.4	71.4		0.45		0.16	0.17	0.03	0.88	1.07	0.061	0.096				2.4	<2.0	
KR11221	11/14/2011	15:30	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P					1.7	2.2	66.0		0.38		0.15	0.22	0.04	1.01	1.14	0.057	0.1				2.4	<2.0	
KR11222	11/14/2011	15:35	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P							66.1				0.2	0.22		1.13	1.16	0.062	0.12				4.0	<2.0	
KR11241	12/27/2011	11:10	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0-8	I					1.2	1.9			0.87				0.10										
KR11242	12/27/2011	10:40	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	0.5	P	0.80	7.26	155.8	11.73	1.0	1.5	63.0	3.86	0.36		0.16	0.57	0.05	0.83	1.4	0.04	0.07				<2.0	<2.0	
KR11243	12/27/2011	11:00	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	15	P	1.43	8.21	154.8	10.90	1.0	1.7	63.2	4.00	0.23		0.25	0.52	0.03	0.91	1.42	0.042	0.076				<2.0	<2.0	
KR11244	12/27/2011	10:50	Copco Reservoir (RM 198.74; Baseline)	PacifiCorp	29	P	1.56	7.73	157.1	9.98			62.8	3.90			0.24	0.51		0.87	1.42	0.046	0.073				<2.0	<2.0	
KR11013	2/16/2011	11:00	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P	5.15	7.54	169.8	10.71	12.0	8.0	62.7	4.92	0.83		0.099	0.59	0.12	1.08	1.83	0.018	0.056				9.6	2.0	
KR11036	3/23/2011	11:20	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P	6.55	7.84	188.4	10.65	7.8	5.3	68.9	6.25	1.14		<0.05	0.35	0.15	0.78	1.14	0.036	0.096				11.6	<2.0	
KR11053	4/19/2011	9:40	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P					0.7	0.3	<5.0	5.67	0.48		0.058	0.2	0.06	0.73	0.77	0.051	0.091				3.2	<2.0	
KR11080	5/18/2011	10:20	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P					3.4	3.9	51.3	4.95	0.87	3.7	<0.05	0.14	0.11	0.69	0.75	0.048	0.071				8.4	<2.0	<0.18
KR11103	6/7/2011	9:30	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P	12.19	7.47		8.79	0.9	1.1	51.8	4.99	0.54		0.059	0.13	0.08	0.57	0.46	0.043	0.055				4.0	<2.0	<0.18
KR11127	7/14/2011	13:40	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P	19.21	7.84	138.2	7.08	2.2	2.3	57.7	5.26	2.36		0.098	0.15	0.16	0.72	0.68	0.088	0.12				<2.0	<2.0	<0.18

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KR11151	8/10/2011	10:20	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P	20.48	8.25	144.5	7.42	1.2	0.9	62.5	5.84	0.32		<0.05	0.23	0.05	0.81	0.55	0.1	0.13				<2.0	2.0	1.80
KR11175	9/15/2011	10:55	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P	18.30	8.53	145.3	8.45	19.7	2.0	63.4	5.15	1.57		<0.05	0.15	0.34	1.0	1.11	0.085	0.14				6.0	3.2	15.00
KR11199	10/12/2011	10:30	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P	13.19	7.89	154.2	9.40	4.7	1.3	70.7	4.26	0.65		0.086	0.19	0.11	0.97	0.98	0.11	0.14				<2.0	<2.0	4.50
KR11223	11/14/2011	9:40	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P					1.3	1.9	67.5		0.34		0.15	0.21	0.04	0.94	1.01	0.058	0.093				<2.0	3.6	
KR11245	12/27/2011	12:00	Klamath River below Copco Dam (RM 196.45; Baseline)	PacifiCorp	0.5	P	1.31	7.89	156.1	11.21	1.1	1.6	62.8	3.76	0.54		0.16	0.54	0.07	0.89	1.41	0.042	0.076				<2.0	<2.0	
KR11015	2/16/2011	19:25	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P	4.93	7.61	190.5	10.78	3.3	3.3	125.0	4.19	0.54		0.068	0.67	0.06	0.61	1.42	0.063	0.068				<2.0	<2.0	
KR11016	2/16/2011	19:45	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P	4.96	7.57	190	10.65	4.6	<0.68	70.1	4.20	0.34		0.092	0.69	0.05	0.62	1.57	0.06	0.076				<2.0	<2.0	
KR11017	2/16/2011	20:20	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P	4.84	7.57	189.7	10.07	3.9	3.5	71.4	4.10	0.52		0.082	0.68	0.07	0.72	1.45	0.059	0.068				2.4	<2.0	
KR11038	3/23/2011	15:00	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P	6.68	7.75	165.2	11.71	5.9	3.9	64.3	5.22	0.70		<0.05	0.32	0.09	0.70	1.08	0.022	0.065				7.6	<2.0	
KR11039	3/23/2011	15:20	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P	6.34	7.68	166.2	11.38	5.9	4.7	65.1	6.00	1.09		<0.05	0.35	0.14	0.70	1.1	0.028	0.074				5.2	<2.0	
KR11040	3/23/2011	15:10	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P	5.61	7.50	180.7	9.47	2.4	3.1	67.8	5.12	0.74		0.05	0.53	0.09	0.88	1.47	0.052	0.097				5.2	<2.0	
KR11059	4/21/2011	12:35	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0-8	I					4.8	2.5			0.67				0.10										
KR11060	4/20/2011	12:30	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P					5.1	1.8	61.0	5.74	0.52		<0.05	0.19	0.07	0.65	0.67	0.035	0.073				2.0	<2.0	
KR11061	4/20/2011	12:40	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P					2.9	2.5	57.7	5.47	0.63		0.054	0.23	0.08	0.75	0.68	0.041	0.085				2.8	<2.0	
KR11062	4/20/2011	12:50	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P					2.1	2.4	59.2	6.21	0.49		0.12	0.34	0.07	0.90	0.87	0.064	0.098				2.0	<2.0	
KR11081	5/24/2011	12:40	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0-8	I					2.2	2.0			0.77				0.10										
KR11082	5/24/2011	12:35	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P	14.22	7.78	129.6	9.07	0.9	1.2	54.3	4.97	0.22		<0.05	0.12	0.03	0.61	0.66	0.062	0.1				2.0	<2.0	<0.18
KR11083	5/24/2011	12:45	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P	12.16	7.52	131.3	7.71	0.7	0.9	72.6	5.39	0.31		0.085	0.54	0.04	0.58	1.13	0.14	0.16				<2.0	<2.0	<0.18
KR11084	5/24/2011	12:55	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P	6.67	7.26	188.2	4.81	1.0	1.2	65.1	4.57	0.35		<0.05	0.38	0.04	0.58	0.85	0.064	0.076				3.6	<2.0	
KR11104	6/7/2011	13:00	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0-8	I					0.9	1.0			0.50				0.06										<0.18
KR11105	6/7/2011	12:55	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P	14.61	8.05		9.33	1.0	0.9	54.1	4.70	0.43		<0.05	0.13	0.05	0.54	0.41	0.051	0.088				2.0	<2.0	<0.18
KR11106	6/7/2011	13:30	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P	10.79	7.55	133.1	7.41	0.7	0.6	63.2	4.49	0.51		<0.05	0.4	0.06	0.33	0.65	0.077	0.085				2.4	<2.0	
KR11107	6/7/2011	13:15	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P	5.13	7.28	199.9	3.12	0.7	0.6	69.9	5.11	0.47		<0.05	0.6	0.06	0.45	0.9	0.13	0.12				3.2	<2.0	

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KR11128	7/14/2011	10:20	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0-8	I					3.9	2.5			0.67				0.09										<0.18
KR11129	7/14/2011	10:30	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P	21.49	8.49	137.8	9.75	4.5	2.3	57.8	5.50	0.44		<0.05	<0.01	0.06	0.64	0.45	0.04	0.082				2.0	2.0	<0.18
KR11130	7/14/2011	10:40	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P	14.34	7.49	129.9	5.10	0.7	0.9	56.0	4.18	0.51		<0.05	0.18	0.08	0.54	0.48	0.063	0.064						
KR11131	7/14/2011	10:50	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P	5.33	6.93	188.9	0.05	0.7	0.7	71.6	4.91	0.43		<0.05	0.59	0.06	0.85	1.12	0.15	0.15				<2.0	<2.0	
KR11152	8/10/2011	14:40	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0-8	I					1.0	0.7			0.42				0.04										1.60
KR11153	8/10/2011	14:45	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P	23.61	8.88	144.3	9.14	1.3	0.6	62.7	5.70	0.35		<0.05	<0.01	0.04	0.79	0.28	0.037	0.075				<2.0	3.5	2.70
KR11154	8/10/2011	15:10	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P	16.38	8.04	139.6	2.51	0.3	0.4	57.5	4.28	0.16		<0.05	0.27	0.02	0.42	0.26	0.088	0.097				<2.0	<2.0	
KR11155	8/10/2011	15:00	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P	5.42	7.18	192.4	0.00			72.3	5.40			0.15	0.44		0.83	0.78	0.22	0.22				<2.0	<2.0	
KR11176	9/15/2011	16:00	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0-8	I					18.9	1.0			1.90				0.38										5.40
KR11177	9/15/2011	16:05	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P	20.56	9.31	148.1	12.03	22.6	1.2	64.5	5.31	1.76		<0.05	<0.01	0.37	1.0	0.96	0.032	0.079				6.4	4.4	8.00
KR11178	9/15/2011	16:20	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P	17.89	7.31	148.1	2.25	2.8	1.1	62.7	4.26	0.52		0.1	0.28	0.09	0.9	1.06	0.11	0.14				2.0	<2.0	
KR11179	9/15/2011	16:10	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P					0.8	0.7	72.2	4.59	0.91		0.31	0.34	0.17	0.9	1.14	0.21	0.22				2.8	<2.0	
KR11200	10/19/2011	16:15	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0-8	I					8.2	1.3			0.95				0.17										4.60
KR11201	10/19/2011	16:50	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P	14.72	8.47	148.4	11.96			67.8	3.87			<0.05	<0.01		0.87	0.93	0.072	0.11				<2.0	3.6	14.00
KR11202	10/19/2011	17:00	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P	13.20	8.92	153.2	5.60	0.7	0.5	70.8	4.05	0.78		0.2	0.42	0.15	0.75	1.08	0.18	0.17				<2.0	<2.0	
KR11203	10/19/2011	17:20	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P	5.68	7.26	193.6	0.00			84.1	4.58			1.08	<0.01		1.88	1.76	0.46	0.52				5.2	2.8	
KR11224	11/15/2011	12:35	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0-8	I					0.8	0.4			0.28				0.03										
KR11225	11/14/2011	12:30	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P					0.6	0.4	75.0		0.23		0.081	0.17	0.02	0.86	0.83	0.099	0.12				2.0	2.0	
KR11226	11/14/2011	12:50	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P					0.9	1.3	73.3		0.31		0.2	0.16	0.04	1.00	0.99	0.11	0.15				3.2	<2.0	
KR11227	11/14/2011	12:45	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P							84.7				1.19	<0.01		1.94	1.8	0.38	0.42				6.0	2.8	
KR11246	12/27/2011	13:35	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0-8	I					0.4	0.6			0.41				0.05										
KR11247	12/27/2011	13:05	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	0.5	P	3.34	7.82	155.6	9.33	0.6	0.9	66.5	4.07	0.34		0.23	0.38	0.02	0.86	1.28	0.066	0.097				<2.0	<2.0	
KR11248	12/27/2011	13:25	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	12	P	2.75	7.82	155.7	9.02	0.4	0.7	66.6	4.56	0.26		0.27	0.37	0.03	0.92	1.28	0.072	0.095				<2.0	<2.0	

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KR11249	12/27/2011	13:15	Iron Gate Reservoir (RM 190.19; Baseline)	PacifiCorp	40	P	2.62	7.68	156.1	8.86			65.5	4.28			0.22	0.38		0.88	1.2	0.075	0.098				<2.0	<2.0	
IG052511-OC	5/25/2011	1:30	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	Karuk	0.5	P	13.24	8.21	134	10.68																2.8			<0.18
IG062211-OC	6/22/2011	13:25	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	Karuk	0.5	P	18.88	8.59	130	9.25																0.0			<0.18
IG072011-OC	7/20/2011	13:27	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	Karuk	0.5	P	20.84	7.97	145	8.14						<2.0													<0.18
IG082411-OC	8/24/2011	13:00	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	Karuk	0.5	P	22.38	8.70	150	8.70	9.6	2.5	72.4	3.95			<0.010	0.16			0.73	0.08	0.11				2.7	2.3	2.30
IG092111-OC	9/21/2011	13:28	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	Karuk	0.5	P	19.86	8.42	149	8.15																			6.50
IG101911-OC	10/19/2011	13:42	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	Karuk	0.5	P	15.89	8.22	155	9.71																			4.70
KR11018	2/16/2011	17:25	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R	4.90	7.57	191.4	11.25	2.8	2.8	71.5	4.10	0.53	<2	0.061	0.68	0.07	0.67	1.28	0.059	0.063				2.0	3.2	
KR11030	3/23/2011	9:20	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R	6.59	7.83	186.6	10.59	6.2	4.1	64.8	5.35	0.66	<2	<0.05	0.32	0.09	0.79	0.85	0.024	0.07				4.8	12.0	
KR11052	4/20/2011	13:30	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R					4.9	2.7	55.2	5.76	0.54	<2	<0.05	0.2	0.07	0.80	0.62	0.043	0.089				3.2	<2.0	
KR11074	5/18/2011	12:30	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R	13.29	7.99	133.4	10.66	2.0	2.0		4.74	0.37	3.9	<0.05	0.079	0.06	0.57	0.58		0.063						
KR11088	5/24/2011	11:30	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	P	13.77	7.95	130.4	10.58	1.4	1.4	55.1	4.55	0.39		<0.05	0.12	0.04	0.63	0.59	0.065	0.079				3.2	<2.0	
KR11097	6/7/2011	14:30	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R	13.10	7.88		9.27	1.1	1.1	52.0	4.75	0.42	2.2	<0.05	0.14	0.06	0.44	0.39	0.053	0.063				<2.0	<2.0	<0.18
KR11111	6/30/2011	11:00	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	P										<2													
KR11121	7/14/2011	16:00	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R	19.60	7.89	137.5	8.43	2.5	1.8	58.2	5.26	0.39	<2	0.14	0.095	0.05	1.15	0.53	0.067	0.083				<2.0	<2.0	<0.18
KR11135	7/25/2011	12:40	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	P							60.8	5.72		<2	<0.05	0.11		0.66	0.61	0.067	0.077				<2.0	4.0	
KR11145	8/10/2011	16:00	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R	21.31	8.25	146.5	7.84	3.9	1.6	63.0	5.73	0.40	<2	<0.05	0.14	0.06	0.65	0.29	0.077	0.12				<2.0	2.5	<0.18
KR11159	8/22/2011	15:15	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	P					2.5	1.6	41.6	5.98	0.50	4.6	<0.05	0.13	0.07	0.64	0.52	0.11	0.08				16.0	9.0	
KR11169	9/15/2011	17:40	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R	19.37	8.77	147.9	8.29	11.9	1.8	64.0	4.37	1.42	<2	<0.05	0.097	0.26	0.8	0.84	0.068	0.11				4.8	3.6	
KR11183	9/28/2011	11:30	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	P					12.2	3.7	64.3	5.36	0.83	<2	<0.05	0.084	0.15	1.0	1.05	0.089	0.13				6.0	4.0	
KR11193	10/12/2011	14:00	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R	14.65	7.88	147.8	8.97	10.7	3.2	65.6	5.19	1.00	<2	<0.05	0.18	0.20	0.79	0.94	0.094	0.12				2.0	1.6	7.20
KR11207	10/26/2011	13:20	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	P							57.8	3.98		2.4	<0.05	0.17		0.92	0.97	0.34	0.12				4.8	3.6	
KR11217	11/14/2011	11:25	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R					1.0	0.6	74.4		0.34	<2	0.13	0.17	0.03	0.85	0.93	0.11	0.15				<2.0	<2.0	

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
KR11239	12/27/2011	14:15	Klamath River below Iron Gate Dam (RM 189.73; Baseline)	PacifiCorp	0.5	R	2.89	7.73	157	11.15			64.6	4.23		<2	0.21	0.39		0.89	1.25	0.069	0.099				<2.0	<2.0	
WA031711-OC	3/17/2011	11:23	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P					7.5	5.2	120.0	4.18			0.022	0.396			1.03	0.054	0.117				29.0	6.5	
WA041311-OC	4/13/2011	11:53	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	9.18	8.32	200	11.02	8.5	1.9	91.8	3.53			<0.010	0.196			0.669	0.026	0.069				10.0	3.0	
WA051011-OC	5/10/2011	12:15	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	12.13	8.25	163	10.76	13.0	3.3	76.2	3.50			0.016	0.037			0.467	0.028	0.074			12.9	11.0	2.5	<0.18
WA052511-OC	5/25/2011	12:00	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	12.12	8.02	153	10.00																0.0			<0.18
WA060811-OC	6/8/2011	12:38	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	14.36	8.03	159	10.05	2.9	1.9	78.7	3.26			<0.010	0.134			0.565	0.044	0.075			7.6	6.3	1.8	<0.18
WA062211-OC	6/22/2011	12:00	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	17.22	8.05	147	9.54																1.8			<0.18
WA070611-OC	7/6/2011	12:36	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	20.29		166	9.04	0.8	1.4	78.8	3.34			<0.010	0.077			0.359	0.054	0.082			1.1	4.6	1.6	<0.18
WA072011-OC	7/20/2011	12:01	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	18.82	8.33	183	9.11																			<0.18
WA081011-OC	8/10/2011	12:10	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	22.19	8.36	175	8.66	1.3	<0.1	293.0	4.70			0.01	<0.010			0.446	0.166	0.215				3.3	1.5	<0.18
WA082411-OC	8/24/2011	11:31	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	22.06	8.29	175	8.45	3.2	3.3	87.6	3.80			0.01	0.17			0.73	0.10	0.13				3.5	1.4	0.97
WA090711-OC	9/7/2011	12:04	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	20.75	8.49	177	9.32	7.5	3.7	89.6	3.94			0.011	0.133			0.716	0.087	0.128				3.5	2.2	4.70
WA092111-OC	9/21/2011	11:40	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	19.08	8.32	184	9.30																			4.30
WA100511-OC	10/5/2011	13:02	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	14.59	8.33	200	9.89	4.8	4.2	101.0	4.71			0.011	0.22			0.724	0.11	0.147				4.5	2.2	4.50
WA101911-OC	10/19/2011	12:15	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	15.02	8.27	207	10.02																			2.30
WA111611-OC	11/16/2011	12:35	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	10.27	8.35	207	11.28	2.1	2.7	105.0	4.15			0.022	0.238			0.663	0.112	0.13				1.9	0.9	
WA121411-OC	12/14/2011	12:30	Klamath River at Walker Bridge (RM 156.26; Baseline)	Karuk	0.5	P	3.88	8.28	199	12.87	2.1	2.7	101.0	4.52			0.097	0.457			0.971	0.076	0.116				2.4	1.0	
SV031711-OC	3/17/2011	10:23	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P					4.8	4.5	101.0	3.69		<2.00	0.015	0.256			0.705	0.04	0.206				96.0	9.5	
SV041311-OC	4/13/2011	10:43	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	9.32	8.17	200	11.07	6.4	1.8	96.8	2.78		<2.00	<0.010	0.197			0.508	0.02	0.055				13.0	3.5	
SV051011-OC	5/10/2011	11:12	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	11.40	8.16	154	10.87	11.0	1.5	75.8	2.68		<2.00	<0.010	0.031			0.319	0.019	0.053			19.8	14.0	1.8	<0.18
SV052511-OC	5/25/2011	11:00	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	12.52	8.08	145	10.11																10.0			
SV060811-OC	6/8/2011	11:13	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	13.90	8.08	144	10.41	5.3	2.9	73.6	2.64			<0.010	0.091			0.445	0.026	0.064			7.9	17.0	2.8	<0.18
SV062211-OC	6/22/2011	11:01	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	16.20	8.03	124	9.53																7.9			<0.18

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
SV070611-OC	7/6/2011	10:45	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	19.05		142	9.07	1.3	1.3	69.5	2.18		<2.00	<0.010	0.067			0.228	0.027	0.053			3.4	8.3	2.0	<0.18
SV072011-OC	7/20/2011	10:48	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	18.46	8.28	179	9.31																			<0.18
SV081011-OC	8/10/2011	10:46	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	21.59	8.40	190	8.97	1.6	1.4	92.4	3.11		<2.00	0.015	0.047			0.373	0.057	0.078				27.0	2.0	<0.18
SV082411-OC	8/24/2011	10:05	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	21.34	8.13	187	8.29	3.5	3.4	94.0	3.24			<0.010	0.08			0.51	0.07	0.09				3.0	1.3	0.54
SV090711-OC	9/7/2011	10:32	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	20.22	8.42	187	9.47	8.3	4.8	91.7	3.51			<0.010	0.052			0.533	0.07	0.108				4.0	1.6	3.90
SV092111-OC	9/21/2011	10:04	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	18.13	8.23	192	9.30																			1.90
SV100511-OC	10/5/2011	11:09	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	13.99	8.21	208	9.74	6.4	5.9	106.0	4.20		<2.00	<0.010	0.211			0.681	0.088	0.132				7.8	2.0	3.20
SV101911-OC	10/19/2011	10:52	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	14.32	8.21	213	10.00																			2.90
SV111611-OC	11/16/2011	11:07	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	10.00	8.38	213	11.49	4.3	4.0	112.0	3.52		<2.00	<0.010	0.233			0.574	0.098	0.119				16.0	1.9	
SV121411-OC	12/14/2011	11:16	Klamath River below Seiad (RM 128.5; Baseline)	Karuk	0.5	P	3.00	8.32	207	13.34	3.7	2.2	107.0	4.15			0.057	0.448			0.862	0.067	0.099				2.9	1.3	
HC031711-OC	3/17/2011	9:03	Klamath River below Happy Camp (RM 101.3; Baseline)	Karuk	0.5	P					5.3	3.3	85.4	2.75			0.011	0.176			0.549	0.028	0.127				79.0	9.0	
HC041311-OC	4/13/2011	9:57	Klamath River below Happy Camp (RM 101.3; Baseline)	Karuk	0.5	P	8.95	8.07	184	11.45	4.3	0.6	91.8	2.53			<0.010	0.152			0.383	0.016	0.049				10.0	2.8	
HC051011-OC	5/10/2011	10:18	Klamath River below Happy Camp (RM 101.3; Baseline)	Karuk	0.5	P	10.41	8.00	143	11.14	8.0	1.0	70.5	2.25			<0.010	0.017			0.237	0.015	0.043			5.5	9.5	1.5	<0.18
HC060811-OC	6/8/2011	10:20	Klamath River below Happy Camp (RM 101.3; Baseline)	Karuk	0.5	P	13.19	7.91	133	10.46	5.3	3.2	67.7	2.31			<0.010	0.056			0.361	0.019	0.055			5.9	9.0	1.8	
HC070611-OC	7/6/2011	9:35	Klamath River below Happy Camp (RM 101.3; Baseline)	Karuk	0.5	P	18.58		136	9.23	1.9	0.7	66.7	2.15			<0.010	0.053			0.202	0.025	0.045			3.2	7.2	1.5	<0.18
HC081011-OC	8/10/2011	10:02	Klamath River below Happy Camp (RM 101.3; Baseline)	Karuk	0.5	P	21.44	8.28	185	8.33	1.1	1.0	92.8	2.75			0.016	<0.010			0.276	0.046	0.063				2.0	1.0	<0.18
HC090711-OC	9/7/2011	9:36	Klamath River below Happy Camp (RM 101.3; Baseline)	Karuk	0.5	P	20.41	8.30	185	8.84	5.6	4.9	94.6	3.12			<0.010	0.033			0.463	0.065	0.097				4.8	1.8	1.90
HC100511-OC	10/5/2011	10:11	Klamath River below Happy Camp (RM 101.3; Baseline)	Karuk	0.5	P	13.79	8.10	193	9.86	9.1	5.1	97.2	3.67			<0.010	0.164			0.579	0.072	0.109				7.7	1.5	2.10
HC111611-OC	11/16/2011	10:19	Klamath River below Happy Camp (RM 101.3; Baseline)	Karuk	0.5	P	9.44	8.24	211	11.38	5.9	5.3	107.0	3.35			<0.010	0.183			0.499	0.083	0.106				3.1	1.5	
HC121411-OC	12/14/2011	10:30	Klamath River below Happy Camp (RM 101.3; Baseline)	Karuk	0.5	P	2.79	8.34	206	13.57	4.3	2.8	103.0	3.75			0.028	0.392			0.737	0.059	0.085				2.6	1.3	
OR031611-OC	3/16/2011	8:51	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P					4.8	0.8	54.5	1.16			<0.010	0.076			0.239	0.008	0.094				87.0	15.0	
OR041311-OC	4/13/2011	8:30	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	9.01	7.89	85	12.13	4.0	0.1	77.2	1.63			<0.010	0.084			0.26	0.01	0.032				8.5	1.7	
OR051011-OC	5/10/2011	8:52	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	10.56	7.97	116	11.78	14.0	2.6	59.4	1.65			<0.010	<0.010			0.243	0.005	0.085			5.1	40.0	8.8	<0.18

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
OR052511-OC	5/25/2011	8:40	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	11.72	8.09	109	11.05																4.0			
OR060811-OC	6/8/2011	9:00	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	12.99	8.02	106	11.00	3.7	2.2	54.3	1.65			<0.010	0.025			0.249	0.012	0.031			4.1	7.0	1.8	<0.18
OR062211-OC	6/22/2011	7:42	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	14.87	7.85	91	10.57																2.5			<0.18
OR070611-OC	7/6/2011	7:50	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	18.19		109	9.68	1.6	0.6	52.3	1.30			<0.010	0.032			0.136	0.014	0.029			1.7	5.8	1.3	<0.18
OR072011-OC	7/20/2011	8:09	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	17.97	8.13	143	9.52																			<0.18
OR081011-OC	8/10/2011	8:25	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	21.68	8.21	166	8.56	0.2	<0.1	82.7	1.87			0.015	<0.010			0.181	0.028	0.039				1.0	0.6	<0.18
OR082411-OC	8/24/2011	7:51	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	22.47	8.24	168	8.38	1.3	0.5	83.6	2.21			<0.010	<0.010			0.27	0.04	0.06				1.3	<0.50	0.19
OR090711-OC	9/7/2011	7:52	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	21.07	8.24	168	8.66	5.1	2.6	84.6	2.36			<0.010	<0.010			0.288	0.04	0.071				3.8	2.1	1.90
OR092111-OC	9/21/2011	7:42	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	19.11	8.21	183	9.13																			1.80
OR100511-OC	10/5/2011	8:27	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	14.27	8.11	171	10.14	8.0	9.6	83.3	2.97			<0.010	0.094			0.414	0.051	0.089				13.0	2.8	2.60
OR101911-OC	10/19/2011	8:15	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	15.47	8.08	190	9.84																			2.10
OR111611-OC	11/16/2011	8:44	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P	9.40	8.19	195	11.68	5.9	5.7	99.8	2.95			<0.010	0.113			0.363	0.062	0.079				2.8	1.0	
OR121411-OC	12/14/2011	8:30	Klamath River at Orleans (USGS) (RM 59.1; Baseline)	Karuk	0.5	P					1.6	2.1	94.2	2.71			0.039	0.267			0.491	0.039	0.056				2.1	1.0	
WE021611-OC	2/16/2011	11:40	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	6.28	8.79	124	12.57	1.5	<0.1	58.4	1.56			<0.010	0.181			0.310	0.018	0.036			14	7.8	1.4	
WE031611-OC	3/16/2011	11:30	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	7.59	8.00	107	12.43	4.8	0.8	57.8	1.05			0.015	0.069			0.265	0.008	0.213			70	160.0	15.0	
WE041311-OC	4/13/2011	11:16	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	8.89	8.14	142	11.92	4.1	<0.1	73.4	1.80			<0.010	0.074			0.213	0.011	0.036			3.9	16.3	1.5	
WE051011-OC	5/10/2011	11:18	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	10.39	8.07	111	11.56	5.9	0.1	57.4	2.14	0.57		<0.010	0.019			0.160	0.011	0.027			2.5	8.8	1.5	<0.18
WE060811-OC	6/8/2011	11:36	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	13.35	8.26	103	10.98	5.3	2.5	54.1	1.58	0.7		<0.010	0.019			0.304	0.013	0.035			2.1	8.8	1.0	<0.18
WE070611-OC	7/6/2011	11:25	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	18.66	8.05	103	9.64	1.3	1.3	53.2	1.33	0.262		<0.010	0.031			0.163	0.019	0.029			1.6	6.6	1.5	<0.18
WE081011-OC	8/10/2011	11:15	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	21.81	8.40	157	8.77	0.9	<0.1	79.2	2.06	0.262		<0.010	<0.010			0.206	0.025	0.037			0.18	0.9	<0.50	<0.18
WE090711-OC	9/7/2011	11:19	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	20.64	8.33	173	9.11	6.7	2.5	89.2	2.19	0.707		<0.010	<0.010			0.299	0.032	0.059			0.85	3.3	1.6	2.10
WE100511-OC	10/5/2011	11:40	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	14.53	8.26	172	9.91	10.1	12.3	85.9	2.84	1.69		<0.010	0.067			0.465	0.045	0.085			2.0	16.2	4.0	1.60
WE111611-OC	11/16/2011	12:07	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	10.11	8.48	192	11.77	0.5	1.1	94.4	0.69	0.421		<0.010	<0.010			<0.050	0.001	0.008			0.45	1.4	1.0	

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
WE121411-OC	12/14/2011	11:55	Klamath River at Weitchpec (RM 43.5; Baseline)	Yurok	0.5	P	3.13	8.30	176	13.44	1.6	1.9	91.2	2.54	0.25		<0.010	0.252			0.437	0.037	0.053			0.57	1.3	<0.50	
TC021611-OC	2/16/2011	11:02	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	6.55	8.78	128	12.37	3.7	2.6	61.6	1.73			0.032	0.130			0.235	0.012	0.104			61	97.5	8.5	
TC031611-OC	3/16/2011	10:33	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	7.64	8.03	106	12.37	4.3	1.7	57.5	1.12			0.016	0.068			0.337	0.008	0.274			73	191.0	16.0	
TC041311-OC	4/13/2011	10:36	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	9.03	8.12	144	11.73	2.6	<0.1	77.2	1.25			<0.010	0.058			0.156	0.009	0.036			5.4	18.0	1.5	
TC051011-OC	5/10/2011	10:26	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	10.22	8.04	111	11.36	4.3	0.2	58.6	1.51	0.737		<0.010	0.024			0.119	0.059	0.059			8.3	34.0	3.3	<0.18
TC060811-OC	6/8/2011	10:46	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	13.06	8.28	106	10.65	4.3	1.9	57.4	1.10	0.729		<0.010	0.018			0.335	0.008	0.032			3.0	11.3	2.4	<0.18
TC070611-OC	7/6/2011	10:39	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	18.35	8.04	107	9.49	1.6	<0.1	55.4	1.08	0.241		<0.010	0.022			0.110	0.010	0.025			1.9	6.5	1.0	<0.18
TC081011-OC	8/10/2011	10:24	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	21.31	8.33	156	8.65	0.9	<0.1	78.4	1.22	0.241		<0.010	<0.010			0.178	0.017	0.025			0.28	0.8	<0.50	<0.18
TC090711-OC	9/7/2011	10:35	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	20.34	8.28	170	8.87	4.0	2.3	87.3	1.70	0.624		<0.010	<0.010			0.211	0.023	0.040			0.55	2.6	1.1	1.10
TC100511-OC	10/5/2011	10:53	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	14.32	8.23	163	9.86	8.0	8.4	80.8	2.25	1.74		<0.010	0.070			0.381	0.032	0.068			0.86	16.3	4.2	0.74
TC111611-OC	11/16/2011	11:11	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	9.96	8.44	189	11.53	5.6	7.5	100.0	2.50	0.596		<0.010	0.074			0.298	0.053	0.069			0.66	2.5	0.8	<0.18
TC121411-OC	12/14/2011	10:50	Klamath River below Trinity River (RM 38.5; Baseline)	Yurok	0.5	P	3.62	8.22	175	13.28	2.4	1.3	91.6	2.12	0.213		<0.010	0.172			0.344	0.028	0.041			0.52	2.0	0.9	
TG021611-OC	2/16/2011	8:21	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	6.96	8.71	126	11.98	3.2	0.2	59.0	1.22			0.011	0.190			0.301	0.014	0.057			29	33.5	3.5	
TG031611-OC	3/16/2011	8:23	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	8.03	7.93	101	11.92	3.2	0.9	55.0	0.90			0.013	0.079			0.223	0.007	0.159			58	125.5	10.5	
TG041311-OC	4/13/2011	8:31	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	9.46	7.98	143	10.94	3.4	<0.1	74.6	1.06			<0.010	0.088			0.174	0.009	0.047			5.9	15.5	1.3	
TG051011-OC	5/10/2011	8:22	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	10.70	7.90	112	10.89	4.1	<0.1	58.6	1.34	0.516		<0.010	0.044			0.120	0.009	0.046			9.0	30.8	1.8	<0.18
TG060811-OC	6/8/2011	8:33	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	13.46	8.24	112	10.16	2.4	0.4	61.5	1.15	0.42		0.034	0.047			0.242	0.009	0.027			3.5	9.3	1.3	<0.18
TG070611-OC	7/6/2011	8:16	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	18.23	8.11	110	9.07	1.6	0.5	57.5	1.03	0.471		<0.010	0.026			0.117	0.007	0.021			1.9	5.5	0.7	<0.18
TG081011-OC	8/10/2011	7:54	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	19.76	7.93	159	7.96	3.7	3.0	82.8	1.26	0.471		<0.010	0.031			0.223	0.010	0.031			0.73	10.3	1.1	<0.18
TG090711-OC	9/7/2011	8:07	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	20.06	8.22	168	8.11	6.4	1.6	84.3	1.53	0.805		<0.010	<0.010			0.207	0.015	0.035			0.75	3.0	1.6	1.50
TG100511-OC	10/5/2011	8:20	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	15.01	8.15	165	9.13	6.9	7.6	82.9	2.34	1.07		<0.010	0.065			0.300	0.030	0.057			0.88	8.0	2.3	2.20
TG111611-OC	11/16/2011	8:33	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	10.26	8.19	185	10.61	5.3	3.6	99.8	1.89	0.377		<0.010	0.028			0.175	0.027	0.037			0.47	1.8	0.9	<0.18
TG121411-OC	12/14/2011	8:16	Klamath River near Klamath (RM 6.0; Baseline)	Yurok	0.5	P	4.68	8.10	171	12.07	1.4	0.6	89.6	2.04	0.241		<0.010	0.167			0.285	0.023	0.032			0.42	0.9	0.6	

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
LES021611-OC	2/16/2011	7:31	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	7.18	8.62	123	11.85	2.6	<0.1	56.5	1.16			0.011	0.247			0.307	0.014	0.039			21	18.5	2.5	
LES031611-OC	3/16/2011	7:17	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	8.09	7.88	102	11.85	3.2	0.9	52.7	0.97			<0.010	0.098			0.263	0.007	0.172			60	135.5	7.5	
LES041311-OC	4/13/2011	7:22	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	9.32	8.11	140	11.22	2.6	<0.1	73.4	1.31		2.1	<0.010	0.073		0.21	0.163	0.009	0.041			7.4	17.8	2.3	
LES051011-OC	5/10/2011	7:48	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	10.59	8.01	109	11.02	3.8	<0.1	56.8	1.29	0.561		<0.010	0.030			0.109	0.008	0.045			9.3	34.5	2.5	<0.18
LES060811-OC	6/8/2011	7:16	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	13.45	8.31	110	10.29	2.7	0.9	58.0	1.08	0.715		<0.010	0.017			0.309	0.008	0.032			3.3	10.7	1.8	<0.18
LES070611-OC	7/6/2011	7:04	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	18.21	8.15	108	9.07	1.1	0.8	56.0	0.86	0.203	<2.00	<0.010	0.023		<0.200	0.117	0.006	0.020			1.8	5.0	0.6	<0.18
LES081011-OC	8/10/2011	6:59	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	20.90	8.19	740	7.93	1.3	<0.1	79.9	1.40	0.203		0.024	0.019			0.279	0.017	0.034			0.21	1.9	0.6	<0.18
LES090711-OC	9/7/2011	7:22	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	18.85	8.21	3150	8.41	3.7	1.3	88.5	1.87	0.615		0.011	0.011			0.225	0.014	0.034			0.64	1.8	0.8	1.60
LES100511-OC	10/5/2011	7:34	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	14.54	7.97	2250	8.87	4.5	3.1	75.3	2.36	0.695		0.027	0.216			0.482	0.027	0.053			1.8	4.0	1.2	4.30
LES111611-OC	11/16/2011	7:09	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	10.15	8.25	528	11.11	2.7	2.6	91.7	1.83	0.666	<2.00	<0.010	0.023		0.565	0.198	0.027	0.038			0.68	1.8	0.6	<0.18
LES121411-OC	12/14/2011	7:10	Klamath River Estuary (RM 0.5; Baseline)	Yurok	0.5	P	5.07	7.74	294	12.25	0.9	0.2	87.4	1.98	0.338		<0.010	0.167			0.364	0.021	0.031			0.48	0.8	<0.50	
SA031611-OC	3/16/2011	9:10	Salmon River near mouth (Baseline)	Karuk	0.5	P					3.7	1.1	44.5	1.13			<0.010	0.025			0.127	0.004	0.069				65.0	14.0	
SA041311-OC	4/13/2011	8:55	Salmon River near mouth (Baseline)	Karuk	0.5	P	7.73	7.98	107	11.97	<0.1	<0.1	58.0	0.592			<0.010	<0.010			0.075	0.002	0.006				1.0	0.6	
SA051011-OC	5/10/2011	9:19	Salmon River near mouth (Baseline)	Karuk	0.5	P	7.67	12.11	77	12.11	0.5	<0.1	39.3	0.934			<0.010	0.024			<0.050	0.002	0.004			0.4	1.9	0.6	
SA052511-OC	5/25/2011	9:15	Salmon River near mouth (Baseline)	Karuk	0.5	P	9.37	7.96	67	11.53																0.3			<0.18
SA060811-OC	6/8/2011	9:30	Salmon River near mouth (Baseline)	Karuk	0.5	P	9.99	7.88	61	11.47	1.9	0.2	32.7	0.97			<0.010	0.016			0.192	0.001	0.011			3.3	3.3	1.0	
SA062211-OC	6/22/2011	8:18	Salmon River near mouth (Baseline)	Karuk	0.5	P	11.40	7.57	48	11.23																2.8			
SA070611-OC	7/6/2011	8:27	Salmon River near mouth (Baseline)	Karuk	0.5	P	15.44		60	10.11	1.3	1.3	29.1	0.857			<0.010	0.013			<0.050	0.002	0.009			1.3	4.6	1.1	
SA072011-OC	7/20/2011	8:40	Salmon River near mouth (Baseline)	Karuk	0.5	P	15.79	7.94	83	9.81																			
SA081011-OC	8/10/2011	9:07	Salmon River near mouth (Baseline)	Karuk	0.5	P	18.97	8.06	112	8.99	1.5	<0.1	55.8	0.527			0.010	<0.010			0.082	0.002	0.021				9.8	2.1	
SA082411-OC	8/24/2011	8:25	Salmon River near mouth (Baseline)	Karuk	0.5	P	19.34	8.05	119	8.93	1.7	<0.1	60.4	0.55			<0.010	0.01			0.10	0.00	0.02				6.8	<0.50	
SA090711-OC	9/7/2011	8:24	Salmon River near mouth (Baseline)	Karuk	0.5	P	18.19	8.07	133	9.27	2.7	0.7	68.4	0.414			<0.010	<0.010			0.085	0.003	0.031				20.0	4.5	
SA092111-OC	9/21/2011	8:16	Salmon River near mouth (Baseline)	Karuk	0.5	P	16.34	8.14	133	9.5																			

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
SA100511-OC	10/5/2011	8:56	Salmon River near mouth (Baseline)	Karuk	0.5	P	12.22	8.09	117	10.44	8.0	7.7	61.5	1.950			<0.010	0.025			0.261	0.007	0.054				24.0	9.3	
SA101911-OC	10/19/2011	8:53	Salmon River near mouth (Baseline)	Karuk	0.5	P	12.94	8.02	124	10.3																			
SA111611-OC	11/16/2011	9:08	Salmon River near mouth (Baseline)	Karuk	0.5	P	8.24	8.14	134	11.83	1.5	<0.1	67.7	0.634			<0.010	<0.010			<0.050	0.004	0.008				<0.50	<0.50	
SA121411-OC	12/14/2011	9:00	Salmon River near mouth (Baseline)	Karuk	0.5	P					25.0	19	65.2	0.997			<0.010	0.014			0.455	<0.001	0.102				87.0	25.0	
SC031711-OC	3/17/2011	11:00	Scott River near mouth (Baseline)	Karuk	0.5	P					3.7	0.4	91.2	2.62			<0.010	0.128			0.366	0.015	0.068				38.0	3.0	
SC041311-OC	4/13/2011	11:24	Scott River near mouth (Baseline)	Karuk	0.5	P	8.47	8.34	200	11.42	0.3	<0.1	109.0	1.17			<0.010	0.277			0.340	0.004	0.015				5.8	1.0	
SC051011-OC	5/10/2011	11:57	Scott River near mouth (Baseline)	Karuk	0.5	P	10.00	8.28	137	11.29	0.7	<0.1	73.2	1.55			<0.010	0.088			0.134	0.002	0.015			4.4	6.0	1.1	
SC052511-OC	5/25/2011	11:30	Scott River near mouth (Baseline)	Karuk	0.5	P	10.23	8.19	126	10.76																3.9			<0.18
SC060811-OC	6/8/2011	11:52	Scott River near mouth (Baseline)	Karuk	0.5	P	11.92	8.22	118		6.1	1.9	65.8	1.33			0.011	0.057			0.264	<0.001	0.023			8.8	15.0	2.3	
SC062211-OC	6/22/2011	11:45	Scott River near mouth (Baseline)	Karuk	0.5	P	13.27	8.03	90	10.25																12.0			
SC070611-OC	7/6/2011	11:42	Scott River near mouth (Baseline)	Karuk	0.5	P	16.88		112	9.65	1.1	1.9	59.4	1.33			<0.010	0.088			0.148	0.005	0.017			4.9	10.0	1.9	
SC072011-OC	7/20/2011	11:20	Scott River near mouth (Baseline)	Karuk	0.5	P	16.53	8.49	162	9.31																			
SC081011-OC	8/10/2011	11:28	Scott River near mouth (Baseline)	Karuk	0.5	P	19.60	8.59	227	9.38	0.9	<0.1	121.0	1.10			0.012	0.267			0.328	0.003	0.010				0.9	0.8	
SC082411-OC	8/24/2011	10:45	Scott River near mouth (Baseline)	Karuk	0.5	P	19.19	8.53	235	9.59	1.9	0.19	127.6	0.95			<0.010	0.14			0.26	0.00	0.01				1.4	0.8	
SC090711-OC	9/7/2011	11:15	Scott River near mouth (Baseline)	Karuk	0.5	P	18.93	8.68	254	10.13	2.7	<0.1	133.0	0.787			<0.010	0.256			0.299	<0.001	0.006				1.5	0.9	
SC092111-OC	9/21/2011	11:00	Scott River near mouth (Baseline)	Karuk	0.5	P	16.10	8.54	273	10.15																			
SC100511-OC	10/5/2011	12:15	Scott River near mouth (Baseline)	Karuk	0.5	P	12.07	8.54	255	10.64	3.7	1.7	136.0	1.58			<0.010	0.363			0.443	<0.001	0.011				3.0	1.3	
SC101911-OC	10/19/2011	11:30	Scott River near mouth (Baseline)	Karuk	0.5	P	13.46	8.49	267	10.57																			
SC111611-OC	11/16/2011	11:58	Scott River near mouth (Baseline)	Karuk	0.5	P	8.87	8.64	273	11.96	4.8	1.2	148.0	0.775			<0.010	0.405			0.413	0.002	0.005				1.1	0.6	
SC121411-OC	12/14/2011	12:00	Scott River near mouth (Baseline)	Karuk	0.5	P	1.56	8.40	266	13.64	2.1	<0.1	109.0	0.76			<0.010	0.470			0.480	<0.001	0.002				0.8	0.8	
SH031711-OC	3/17/2011	12:05	Shasta River near mouth (Baseline)	Karuk	0.5	P					4.8	3.0	251.0	7.75			<0.010	0.028			1.160	0.164	0.223				38.0	7.5	
SH041311-OC	4/13/2011	12:35	Shasta River near mouth (Baseline)	Karuk	0.5	P	11.02	8.55	504	11.03	3.2	0.2	270.0	2.79			<0.010	0.172			0.520	0.105	0.134				7.2	2.5	
SH051011-OC	5/10/2011	13:30	Shasta River near mouth (Baseline)	Karuk	0.5	P	15.07	8.78	480	10.46	3.2	0.2	229.0	3.60			<0.010	<0.010			0.264	0.101	0.126			1.0	4.1	0.6	<0.18

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
SH052511-OC	5/25/2011	13:00	Shasta River near mouth (Baseline)	Karuk	0.5	P	14.21	8.60	478	9.89																1.8			<0.18
SH060811-OC	6/8/2011	13:37	Shasta River near mouth (Baseline)	Karuk	0.5	P	18.51	8.61	492	9.4	2.1	1.6	260.0	4.23			<0.010	<0.010			0.596	0.114	0.140			3.6	7.0	1.5	
SH062211-OC	6/22/2011	13:12	Shasta River near mouth (Baseline)	Karuk	0.5	P	22.15	8.69	492	8.96																0.0			
SH070611-OC	7/6/2011	13:30	Shasta River near mouth (Baseline)	Karuk	0.5	P	23.55		444	8.63	1.6	0.6	229.0	3.97			<0.010	<0.010			0.359	0.146	0.185			2.5	8.0	2.8	
SH072011-OC	7/20/2011	12:52	Shasta River near mouth (Baseline)	Karuk	0.5	P	20.58	8.65	575	8.94																			
SH081011-OC	8/10/2011	13:21	Shasta River near mouth (Baseline)	Karuk	0.5	P	22.54	8.70	551	8.86	1.6	1.8	88.5	3.72			0.069	0.120			0.674	0.077	0.106				5.6	1.3	
SH082411-OC	8/24/2011	12:23	Shasta River near mouth (Baseline)	Karuk	0.5	P	21.51	8.67	510	9.02	1.9	0.93	271.5	3.91			<0.010	<0.010			0.43	0.17	0.20				3.4	1.3	
SH090711-OC	9/7/2011	12:04	Shasta River near mouth (Baseline)	Karuk	0.5	P	18.83	8.69	507	9.5																			
SH092111-OC	9/21/2011	12:35	Shasta River near mouth (Baseline)	Karuk	0.5	P	16.52	8.62	525	9.8																			
SH100511-OC	10/5/2011	13:50	Shasta River near mouth (Baseline)	Karuk	0.5	P	11.28	8.55	505	10.21	4.3	5.8	267.0	3.28			<0.010	0.079			0.518	0.173	0.253				24.0	5.0	
SH101911-OC	10/19/2011	13:06	Shasta River near mouth (Baseline)	Karuk	0.5	P	13.25	8.53	460	10.07																			
SH111611-OC	11/16/2011	13:20	Shasta River near mouth (Baseline)	Karuk	0.5	P	9.98	8.69	439	11.3	4.5	2.4	231.0	1.51			<0.010	0.136			0.284	0.151	0.180				9.9	2.5	
SH121411-OC	12/14/2011	13:12	Shasta River near mouth (Baseline)	Karuk	0.5	P	2.52	8.50	452	13.15	7.5	3.4	248.0	1.54			0.051	0.390			0.525	0.180	0.216				11.0	3.0	
TR021611-OC	2/16/2011	11:53	Trinity River near mouth (Baseline)	Yurok	0.5	P	6.66	8.81	138	12.25	4.806	3.42	65.0	1.36			0.055	0.070			0.200	0.007	0.160			96.0	153.5	8.0	
TR031611-OC	3/16/2011	11:42	Trinity River near mouth (Baseline)	Yurok	0.5	P	7.98	8.13	114	12.14	6.008	7.08	64.2	1.26			0.030	0.063			0.448	0.007	0.526			160.0	394.0	24.0	
TR041311-OC	4/13/2011	11:29	Trinity River near mouth (Baseline)	Yurok	0.5	P	9.14	8.15	147	11.52	2.2	<0.1	82.5	0.42			<0.010	0.018			0.068	0.006	0.039			6.5	19.0	1.5	
TR051011-OC	5/10/2011	11:36	Trinity River near mouth (Baseline)	Yurok	0.5	P	10.51	8.01	112	11.21	1.5	<0.1	59.6	0.85	0.644		<0.010	0.033			0.088	0.008	0.061			17.0	52.8	3.0	
TR060811-OC	6/8/2011	11:58	Trinity River near mouth (Baseline)	Yurok	0.5	P	13.05	8.25	112	10.59	1.1	<0.1	60.2	0.58	0.239		<0.010	<0.010			0.213	0.006	0.023			2.2	7.4	<0.50	<0.18
TR070611-OC	7/6/2011	11:52	Trinity River near mouth (Baseline)	Yurok	0.5	P	18.23	8.13	113	9.58	0.267	1.04	58.2	0.60	0.144		<0.010	<0.010			0.054	0.007	0.010			0.7	3.4	0.9	<0.18
TR081011-OC	8/10/2011	11:41	Trinity River near mouth (Baseline)	Yurok	0.5	P	21.20	8.29	155	8.92	0.2	<0.1	80.0	0.83	0.144		<0.010	0.012			0.121	0.003	0.008			0.2	1.1	<0.50	
TR090711-OC	9/7/2011	11:40	Trinity River near mouth (Baseline)	Yurok	0.5	P	19.84	8.27	161	9.42	0.7	<0.1	81.9	0.59	0.197		<0.010	<0.010			0.050	0.004	0.008			0.2	0.6	<0.50	
TR100511-OC	10/5/2011	12:07	Trinity River near mouth (Baseline)	Yurok	0.5	P	13.51	8.12	152	10.09	3.204	0.53	76.9	1.39	0.915		<0.010	0.032			0.174	0.004	0.022			2.1	9.2	2.3	
TR111611-OC	11/16/2011	12:31	Trinity River near mouth (Baseline)	Yurok	0.5	P	9.86	8.44	183	11.61	6.408	3.87	97.4	1.63	0.154		<0.010	0.026			0.188	0.027	0.038			0.5	0.9	<0.50	

Sample ID	Date	Time	Site Name	Agency	Depth, m	Type	Water Temperature	pH	Specific Conductivity	Dissolved Oxygen	Algae, Chlorophyll-a	Algae, Pheophytin	Alkalinity	Carbon, Dissolved Organic Carbon	Carbon, Particulate Carbon	Demand, Carbonaceous Biological Oxygen Demand	Nitrogen, Ammonia	Nitrogen, Nitrate+Nitrite	Nitrogen, Particulate Nitrogen	Nitrogen, Total Kjeldahl Nitrogen	Nitrogen, Total Nitrogen	Phosphorus, Phosphate	Phosphorus, Total Phosphorus	Phosphorus, Particulate Phosphorus	Phosphorus, Particulate Inorganic Phosphorus	Turbidity	Solids, Total Suspended Solids	Solids, Volatile Suspended Solids	Toxins, Microcystin
							C	-	uS/cm	mg/l	ug/l	ug/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	ppm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	NTU	mg/l	mg/l	ug/l
TR121411-OC	12/14/2011	12:19	Trinity River near mouth (Baseline)	Yurok	0.5	P	4.47	8.47	176	13.2	1.335	0.16	90.8	1.15	0.159		<0.010	<0.010			<0.050	<0.001	0.004			0.3	1.0	0.6	

All Non-detect values were replaced with "<" and the RL value.
Sample Types include: P- Production sample; R – Regular sample associated with QA sample set; I = Depth Integrated sample.

Appendix C. Selected Results of 2011 Baseline Phytoplankton Analysis

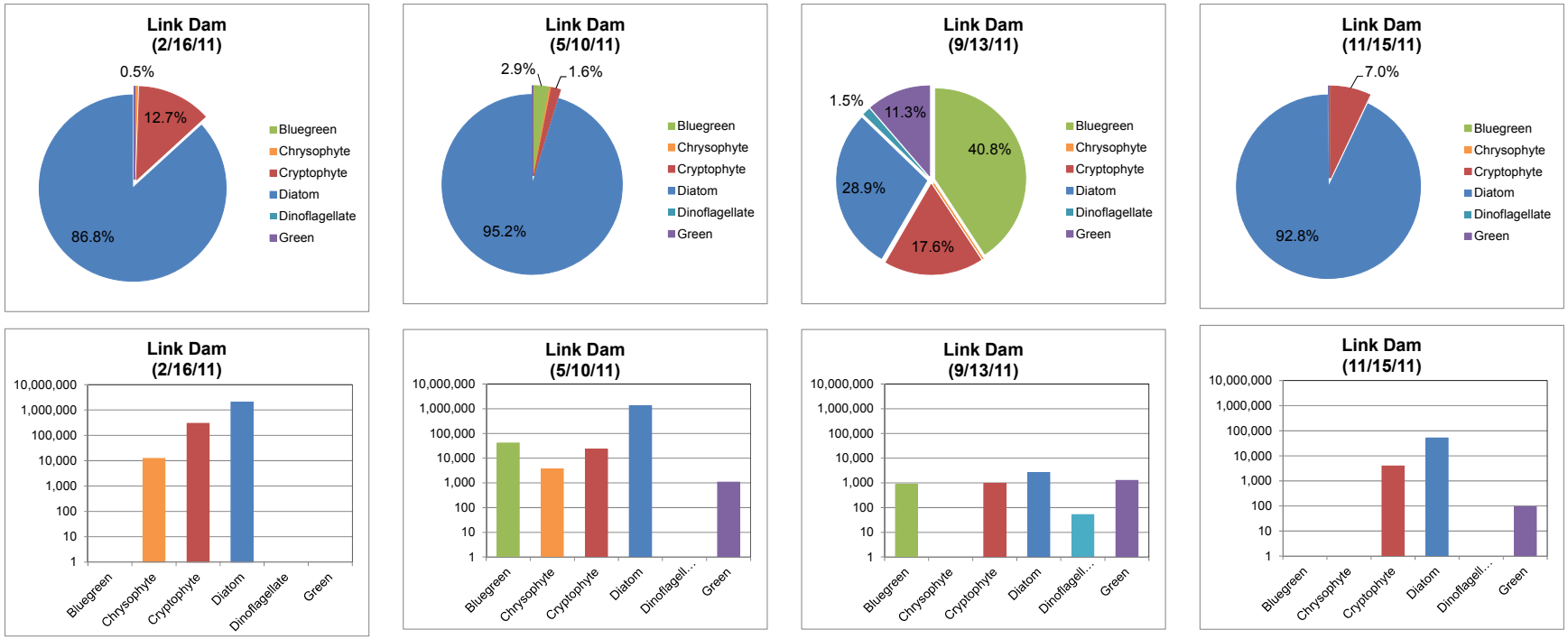

Figure C-1. Phytoplankton species (top) and biovolume (bottom) at Link River Dam for samples collected as part of Baseline sampling on 2/16/11, 5/10/11, 9/13/11, and 11/15/11. Note: y-axis in logarithmic scale.

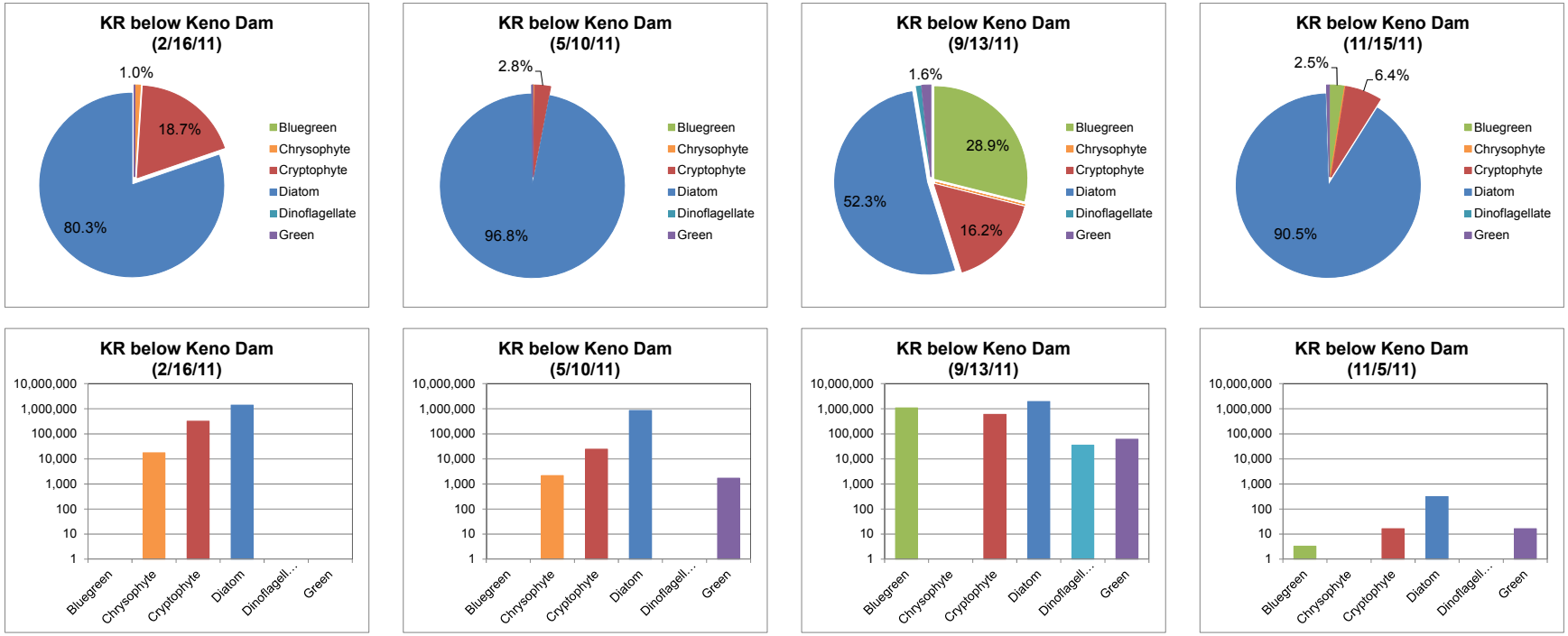

Figure C-2. Phytoplankton species (top) and biovolume (bottom) at Klamath River below Keno Dam near a USGS gage (RM 233.4; Baseline) for samples collected as part of Baseline sampling on 2/16/11, 5/10/11, 9/13/11, and 11/15/11. Note: y-axis in logarithmic scale.

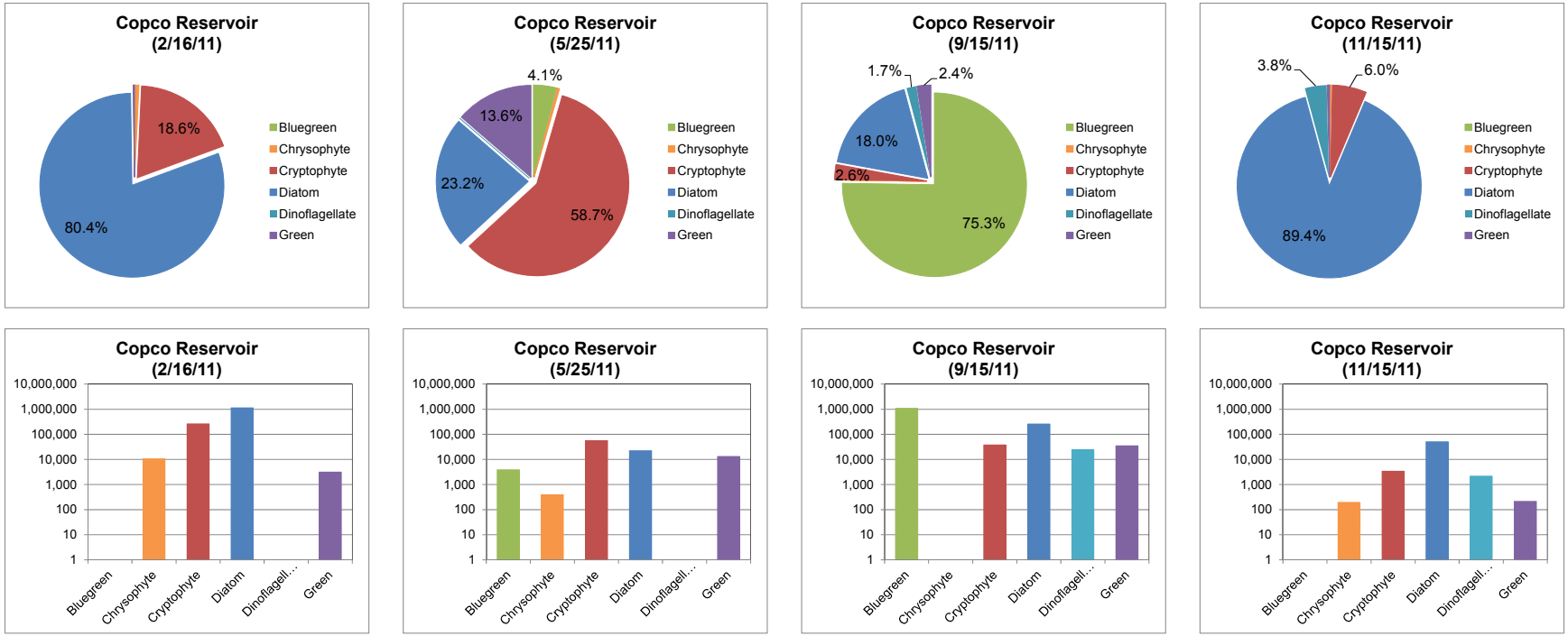

Figure C-3. Phytoplankton species (top) and biovolume (bottom) at Copco Reservoir near dam for samples collected as part of Baseline sampling on 2/16/11, 5/25/11, 9/15/11, and 11/15/11. Note: y-axis in logarithmic scale.

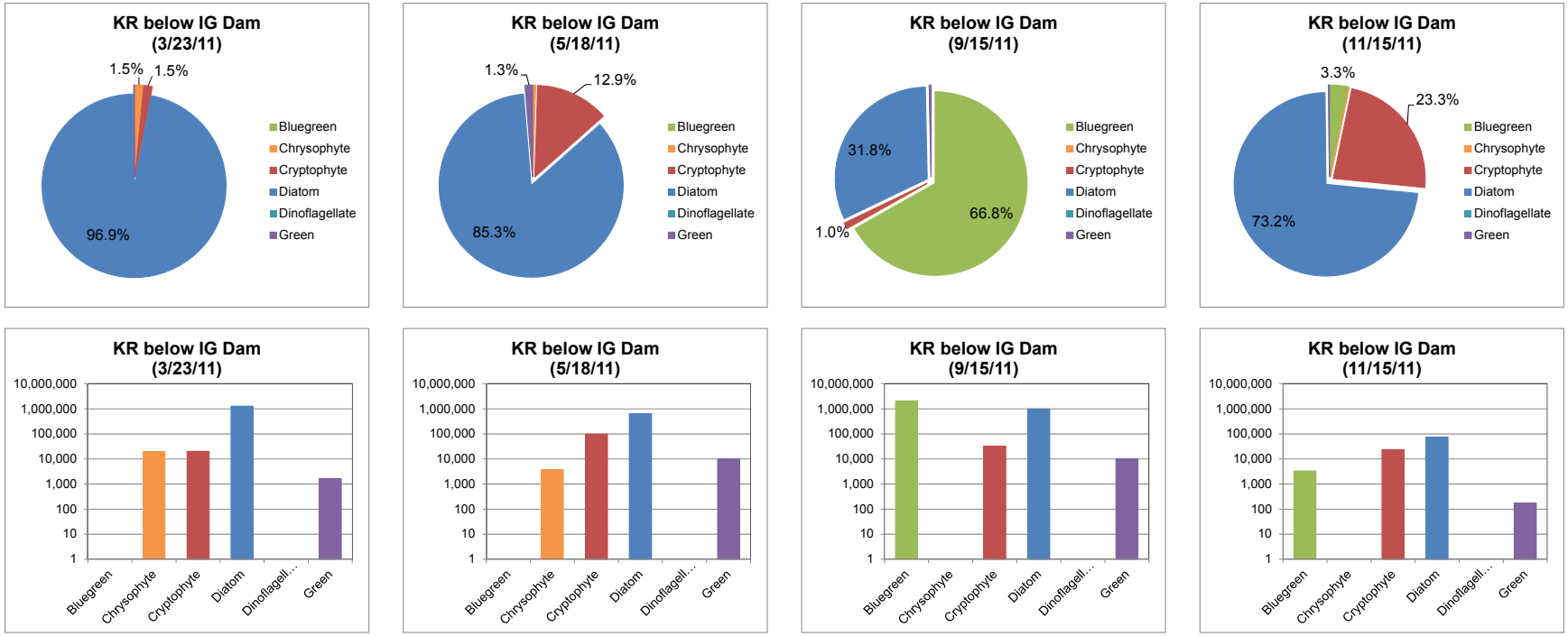

Figure C-4. Phytoplankton species (top) and biovolume (bottom) at Klamath River below Iron Gate Dam (RM 189.73; Baseline) for samples collected as part of Baseline sampling on 3/23/11, 5/18/11, 9/15/11, and 11/15/11. Note: y-axis in logarithmic scale.

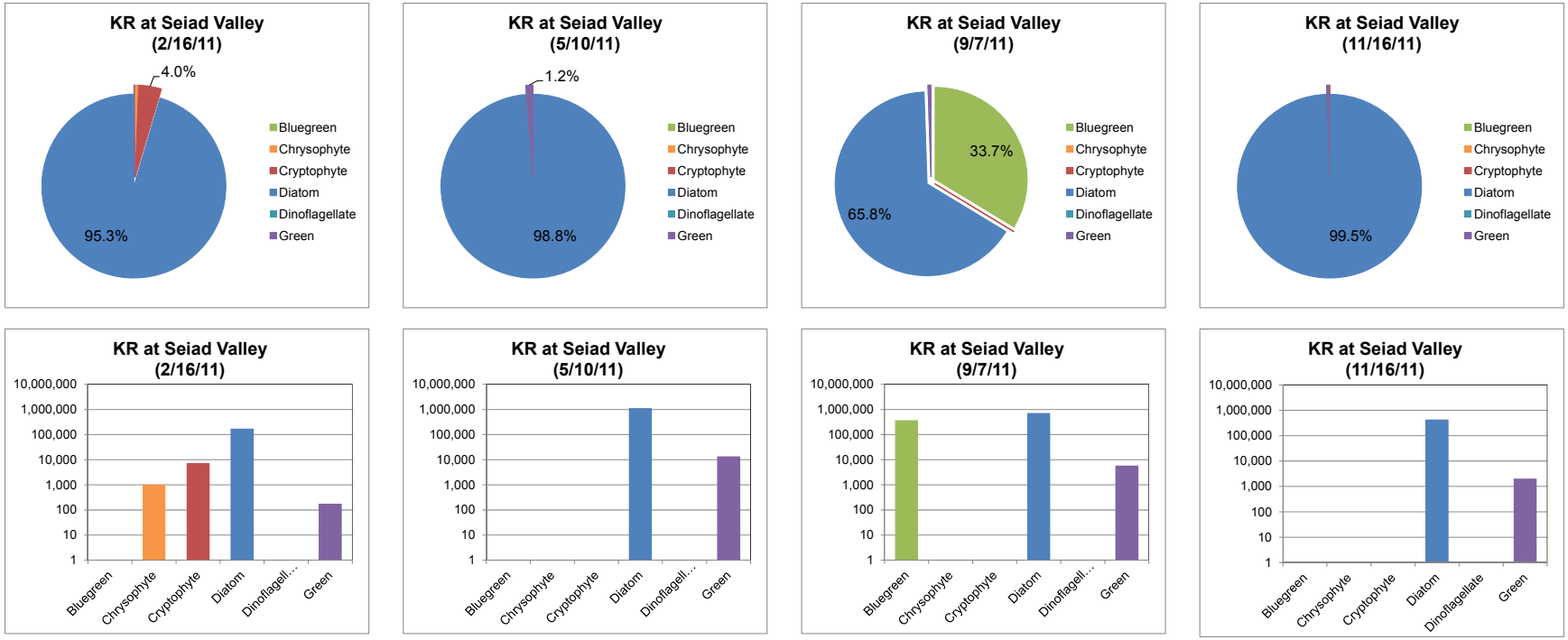

Figure C-5. Phytoplankton species (top) and biovolume (bottom) at Klamath River below Seiad (RM 128.5; Baseline) for samples collected as part of Baseline sampling on 2/16/11, 5/10/11, 9/7/11, and 11/16/11. Note: y-axis in logarithmic scale.

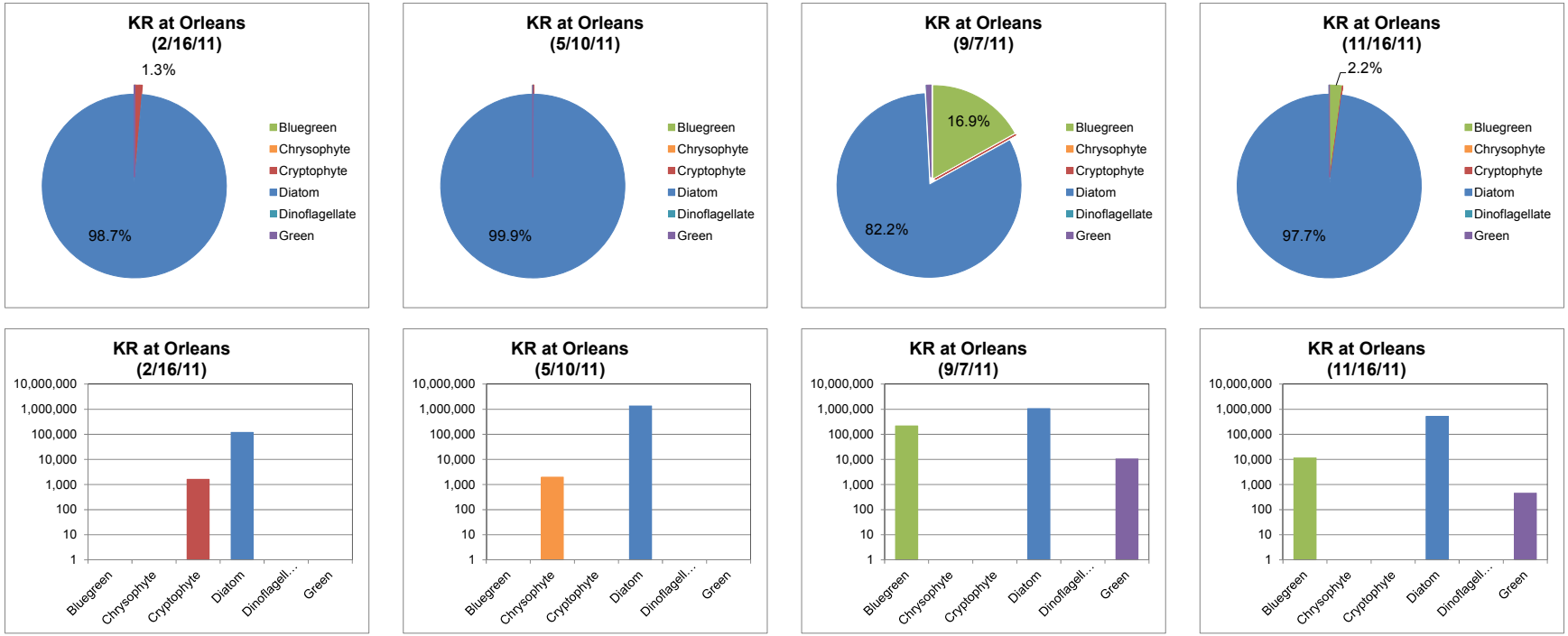

Figure C-6. Phytoplankton species (top) and biovolume (bottom) at Klamath River at Orleans (USGS) (RM 59.1; Baseline) for samples collected as part of Baseline sampling on 2/16/11, 5/10/11, 9/7/11, and 11/16/11. Note: y-axis in logarithmic scale.

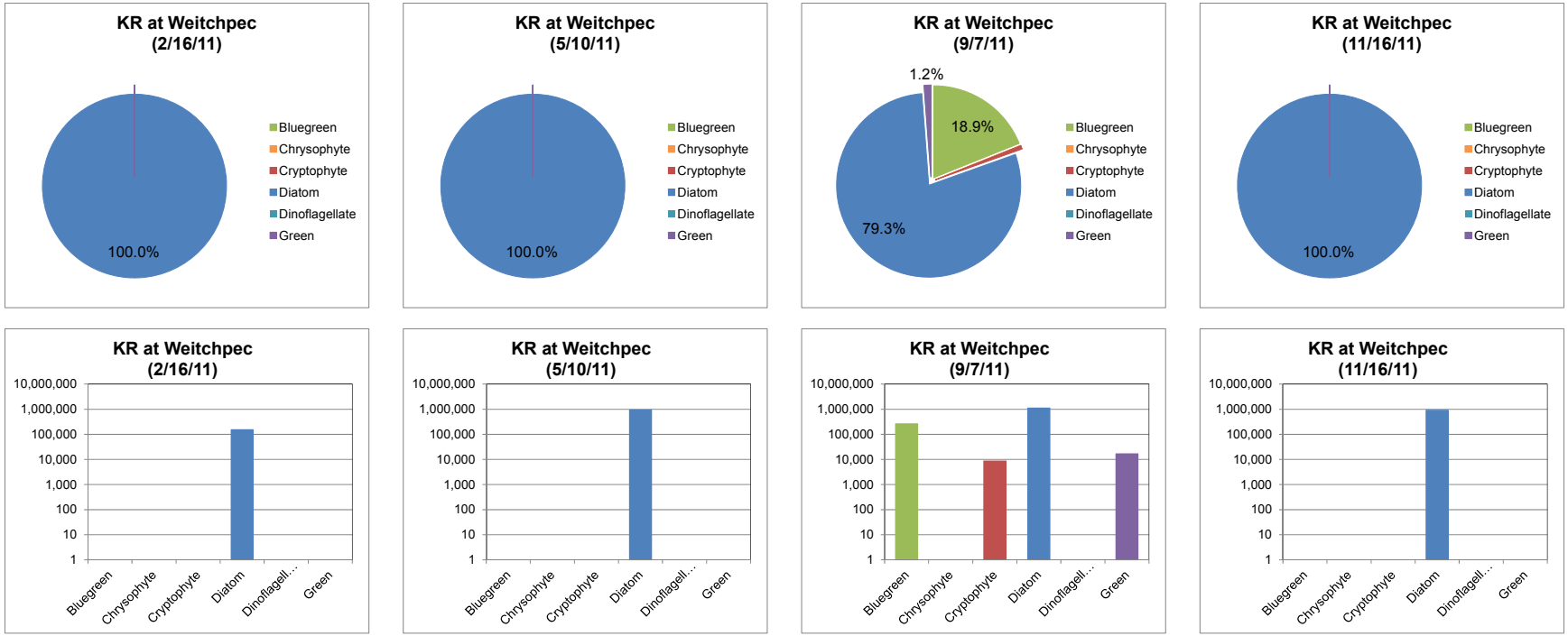

Figure C-7. Phytoplankton species (top) and biovolume (bottom) at Klamath River at Weitchpec (RM 43.5; Baseline) for samples collected as part of Baseline sampling on 2/16/11, 5/10/11, 9/7/11, and 11/16/11. Note: y-axis in logarithmic scale.

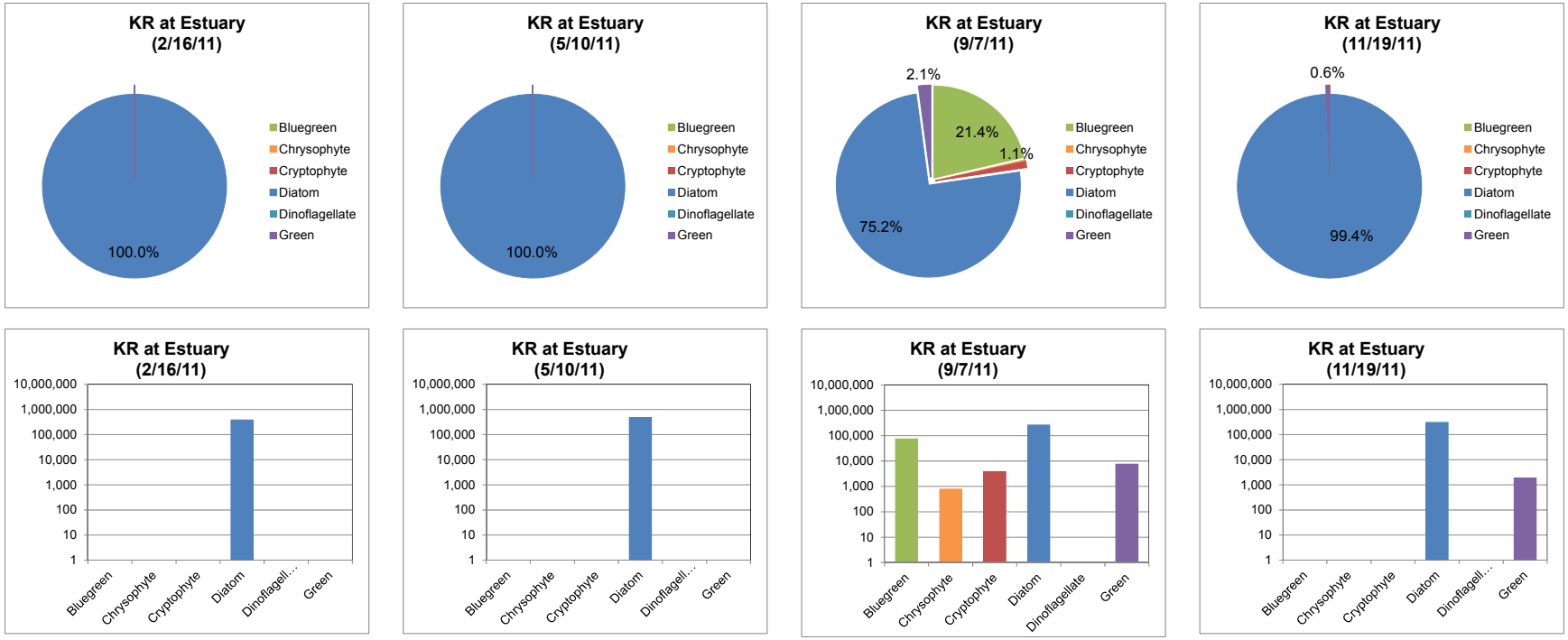

Figure C-8. Phytoplankton species (top) and biovolume (bottom) at Klamath River Estuary (RM 0.5; Baseline) for samples collected as part of Baseline sampling on 2/16/11, 5/10/11, 9/7/11, and 11/19/11. Note: y-axis in logarithmic scale.

Appendix D. 2011 Inter-laboratory Comparison

Watercourse Engineering Inc.

Technical Memorandum

Date: June 8, 2012

To: Crystal Bowman, Karuk Tribe
Rick Carlson, U.S. Bureau of Reclamation
Clayton Creager, North Coast Regional Water Quality Control Board
Ken Fetcho, Yurok Tribe
Sue Keydel, U.S. Environmental Protection Agency, Region 9
Steve Kirk, Oregon Department of Environmental Quality
Sam Mackey, E&S Environmental Chemistry
Linda Prendergast, PacifiCorp

From: Eric Miao, Watercourse Engineering, Inc.
Mike Deas, Watercourse Engineering, Inc.

Re: 2011 KHSA Laboratory Cross Comparison Memo

1. Introduction

Three laboratory cross comparisons sampling events occurred during the 2011 Klamath Hydroelectric Settlement Agreement (KHSA) Baseline Sampling program to provide insight into laboratory performance at the three principal laboratories employed: Basic Laboratory (Redding, CA), CH2MHill Applied Sciences Laboratory (Corvallis, Oregon) and Aquatic Research, Inc. (Seattle, WA).

A single surface grab sample was collected at the Klamath River Estuary on April 13, July 6, and November 16. Each sample was split into three separate bottles (triplicate sample set) via a churn-splitter and sent to the three laboratories. Water quality constituents analyzed include alkalinity, 5-day carbonaceous biological oxygen demand(CBOD), dissolved organic carbon (DOC), ammonia, nitrate plus nitrite (NO3+NO2), total nitrogen (TN), total Kjeldahl nitrogen (TKN), ortho-phosphate (OPO4), total phosphorus (TP), total suspended solids (TSS), and volatile suspended solids (VSS).

Even for an identical sample, laboratories may present different results simply due to the analytical equipment differences, experience of technicians, and varying methods. The cross comparison exercise is not intended to rate the performance of each laboratory, i.e., to determine which laboratory is "best". Such an undertaking would require a much more comprehensive study. Rather, the comparisons are intended to illustrate the range of conditions produced by the three laboratories for the various constituents over the sampling season.

This memo presents background information; an overview of each laboratory's methods, detection limits and reporting limits; inter-laboratory cross comparison method; presentation of data for each sampling date in the comparison; and a brief summary of results and findings.

2. Background

2011 was the third year of the KHSA cross comparison. To explore different water quality conditions as well as share the burden in collecting the cross comparison samples, the KHSA monitoring group unanimously decided to move sampling locations every two years. The sampling location for the cross comparison in 2009 and 2010 was Link Dam, near Klamath Falls (RM 254.4). In 2011, grab samples were collected at the Klamath River near the Estuary (RM 0.5).

One outcome of moving the sampling location from Link Dam to the estuary was a notable difference in overall water quality. Specifically, the Klamath River estuary exhibited lower concentrations for many constituents (Figure D-1). Although the timing of sample collection did not occur on the same Julian day for each year, examining the overall trends in Figure D-1 for TN, TP, DOC, and TSS suggests notably lower concentrations in the estuary than at Link Dam. Some constituents did not follow this trend (e.g., alkalinity).

The result was that when the inter-lab comparison was carried out, non-detect values that were required to be replaced with method reporting limit (RL) were more frequent in 2011 (37.4 percent) than in 2010 (14 percent) (i.e., the frequency of censored data increased). Censored data refers to laboratory results with "less than" (<), "non-detect" (ND), and (j)-flag data. Data sets with "less than" and "non-detect" are values below the method detection limit (MDL).

Method detection limit (MDL) is explicitly defined in Standard Methods (APHA 2005) as "the constituent concentration that, when processed through the complete method, produces a signal with a 99 percent probability that it is different than the blank". J-flag data refers to results above the laboratory MDL but below the RL[4]. The method reporting limit (RL) can be defined as lowest constituent concentration in a sample that can be quantitatively determined with statistical rigor. The issue of censored data for the 2011 inter-lab comparison will be addressed further in subsequent sections.

3. Overview of Laboratories: Methods, Detection and Reporting Limits

All methods used by the analytical laboratories were either EPA methods or Standard Methods. While laboratories used the same methods for certain constituent analysis, the method detection limit (MDL) and reporting limit (RL) were not necessarily the same. The analytical methods and associated limits for each constituent at each laboratory are presented in Table D-1. Laboratories may perform internal MDL tests to evaluate laboratory equipment, staff, and methods at any time. Aquatic Research added RL to this year's study for all but OPO4 and TP. CH2MHill made

[4] Certain analytical laboratories are adopting more formal names for MDL as the Limit of Detection (LOD) and RL as the Level of Quantitation (LOQ) or Minimum Level of Quantitation (MLQ).

several changes to the MDL for alkalinity, dissolved organic carbon, total suspended solids, and volatile suspended solids. Changes to the MDL did not affect the cross comparison, as the RL is used for analysis. The CH2MHill MDL/RL values presented in Table D-1 are for the November comparison. The previous MDL/RL for CH2MHill are presented in the appendix.

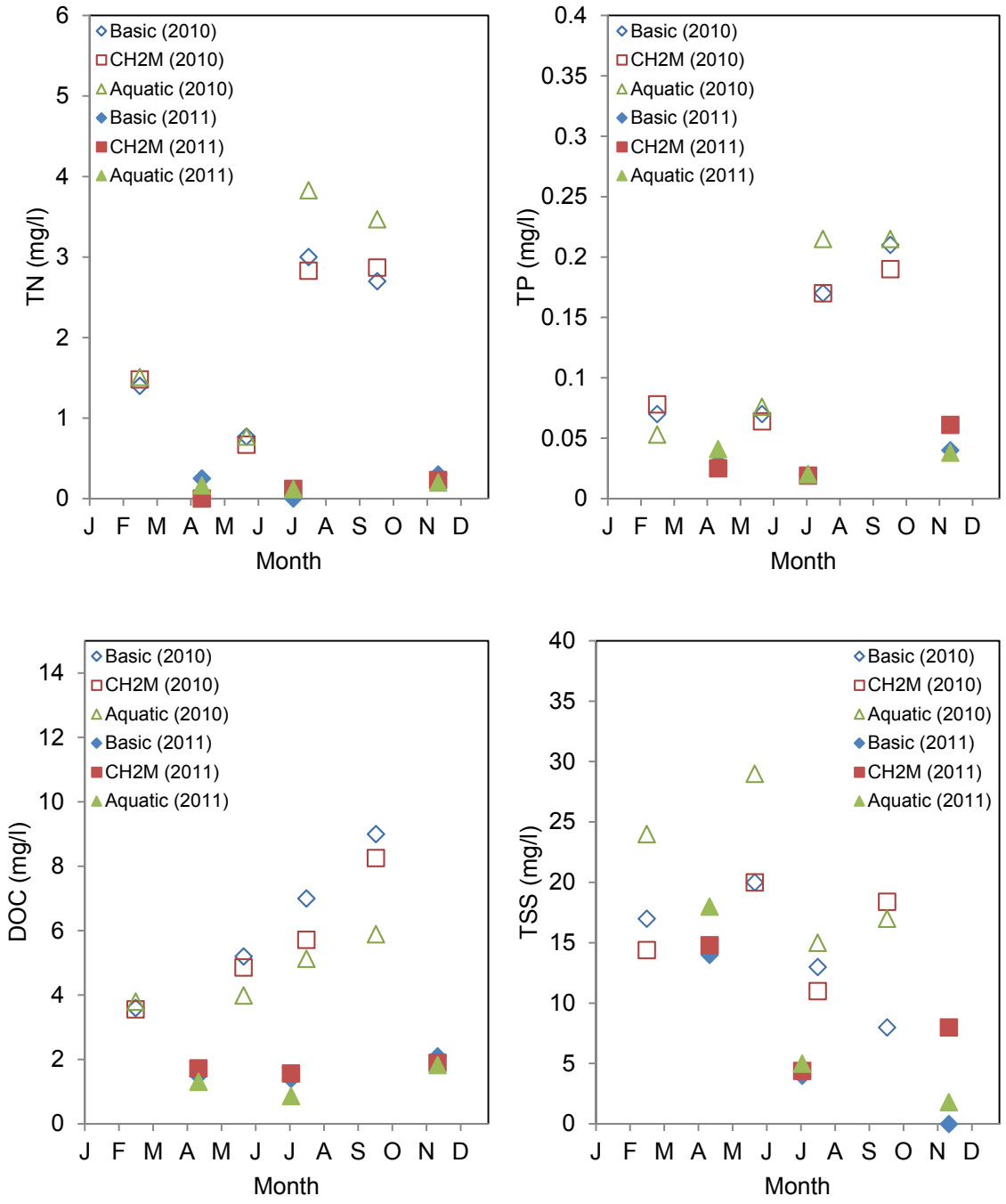

Figure D-1. 2010 and 2011 laboratory results (clockwise from top left) for total nitrogen (TN), total phosphorus (TP), dissolved organic carbon (DOC), and total suspended solids (TSS).

Table D-1. Methods, detection limits, and reporting limits for (top to bottom) Basic, CH2MHill, and Aquatic Research laboratories. (Updated January 2012)

			Basic	
Constituent	units	Method	MDL	RL
Alkalinity	mg/l	SM 2320B	1	5
Ammonia	mg/l	EPA 350.1	0.02	0.05
CBOD [a]	mg/l	SM 5210	3	3
DOC	mg/l	SM5310C	0.2	0.5
NO3+NO2	mg/l	EPA 353.2	0.01	0.05
TN	mg/l	EPA 351.2	(n/a)[b]	0.2
OPO4	mg/l	SM 4500P-E	0.01	0.05
TP	mg/l	SM 4500P-BE	0.02	0.05
TKN	mg/l	EPA 351.2	0.1	0.2
TSS	mg/l	SM 2540D	1	5
VSS	mg/l	SM 2540D	1	5

			CH2MHill	
Constituent	units	Method	MDL	RL
Alkalinity	mg/l	E310.1	n/a	5
Ammonia	mg/l	E350.1	0.014	0.05
CBOD [a]	mg/l	SM5210B	n/a	2
DOC	mg/l	SM5310B	0.1	0.5
NO3+NO2	mg/l	E353.2	0.003	0.01
TN	mg/l	SM4500-N C	0.062	0.2
OPO4	mg/l	E365.1	0.001	0.01
TP	mg/l	E365.4	0.024	0.05
TKN	mg/l	E351.2	0.044	0.2
TSS	mg/l	SM2540D	n/a	2
VSS	mg/l	E160.4	n/a	2

			Aquatic Research	
Constituent	units	Method	MDL	RL
Alkalinity	mg/l	SM18 2320B	0.2	1
Ammonia	mg/l	SM184500NH3H	0.006	0.01
CBOD [a]	mg/l	SM205210B	2	2
DOC	mg/l	SM205310B	0.095	0.25
NO3+NO2	mg/l	SM184500N03F	0.005	0.01
TN	mg/l	SM204500NC	0.03	0.05
OPO4	mg/l	SM18 4500PF	0.001	0.001[c]
TP	mg/l	SM18 4500PF	0.002	0.002[c]
TKN	mg/l	EPA 351.1	0.1	0.2
TSS	mg/l	SM20 2540D	0.1	0.5
VSS	mg/l	SM20 2540E	0.1	0.5

[a] MDL and RL for CBOD are often equal values at production laboratories such as those used in this study.

[b] There is no MDL for TN at Basic Laboratory, because TN is a calculated value at Basic Laboratory.

[c] The MDL and RL values were set at the same concentration for both OPO4 and TP at Aquatic Research.

Laboratory reporting levels for certain constituents varied notably. For the most part the RL were constrained to within a factor of 5. For example, the RL for ammonia ranged from 0.01 for Aquatic Analysts laboratory to 0.05 mg/l for Basic and CH2MHill laboratories – a maximum difference of a factor of 5. For TSS and VSS, this maximum difference (between Basic and Aquatic Analysts) was 10. For OPO4 and TP, the maximum difference was a factor of 50 and 25, respectively. In this case, Aquatic Analysts did not provide a distinct RL, but rather assumed the RL was equal to the MDL.

These differences are useful to note herein because of the increased level of censored data encountered in the 2011 laboratory cross comparison (greater than one in three samples). When reviewing results (below), consideration of the differences for TSS and VSS between Basic and the other two laboratories, and for OPO4 and TP between Aquatic Analysts and the other two laboratories may be useful.

4. Cross Comparison Method (RPD/AD)

To compare the results from each laboratory, calculations were made for following sets of pairs: Basic and CH2MHill, Basic and Aquatic Research, CH2MHill and Aquatic Research. The sample values used to calculate relative percent difference (RPD) or absolute difference (AD) for each sampling event are presented in Table D-2, Table D-4, and Table D-6. The three laboratories reported different significant figures and the data presented herein are taken directly from the laboratory reports.

The RPD and AD were calculated using the following formulae:

$$\text{RPD (percent)} = |(X1 - X2)|/((X1 + X2)/2) * 100 \qquad (1)$$

$$\text{AD (concentration)} = |X1 - X2| \qquad (2)$$

Where: X1 = Value of sample from laboratory 1
X2 = Value of sample from laboratory 2

For each comparison, if the sample value was equal to or greater than five times the reporting limit, the RPD was calculated. A RPD criteria of 20 percent was used to determine if two samples were similar (RPD of less than or equal to 20 percent) or dissimilar (RPD of greater than 20 percent) (USBR, 2009). If the RPD value was less than or equal to 20 percent, the two samples were deemed to be similar and the comparison was labeled with an "OK" value in Table D-3, Table D-5, Table D-7. If the RPD value was greater than 20 percent, the RPD value was presented within the table.

If the sample value was less than five times the reporting limit, the AD was calculated and an AD criteria of the reporting limit was used to determine if two samples were similar (AD less than or equal to the reporting limit) or dissimilar (AD greater than the reporting limit) (USBR, 2009). If the two laboratories used different reporting limits the larger of the two was used as the criteria. If the AD was less than the reporting limit for the sample comparison, the comparison was labeled with an "OK" value. If the AD was greater than the reporting limit for the sample comparison, the AD value was presented, along with a footnote of the laboratory reporting limit used. This process is illustrated in Figure D-2.

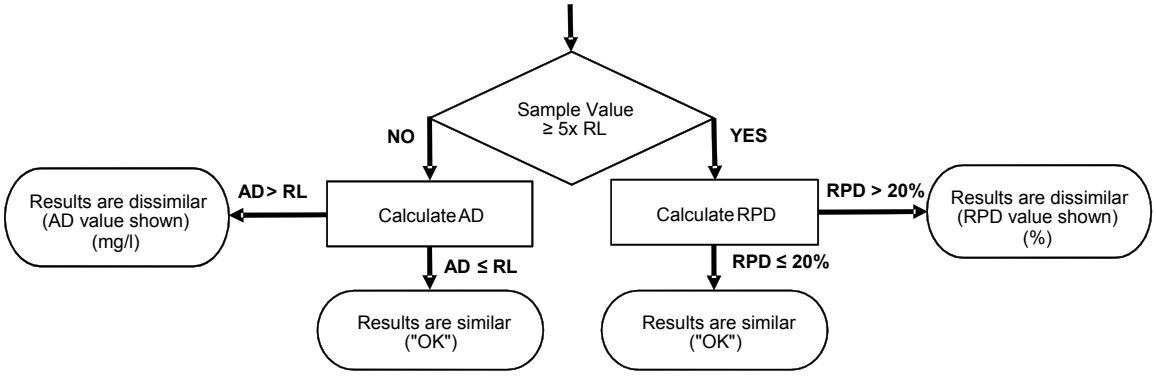

Figure D-2. Flow diagram for the comparison process. RPD = relative percent difference. RL = reporting limit. AD = absolute difference

Table D-2. Result values used to determine RPD or AD for April 13, 2011.

	Laboratory	Basic	CH2MHill Applied Sciences	Aquatic Research, Inc.
	Sample ID:	1040588-01	K160801	YUR001-86
	Unit			
Alkalinity	mg/l	65	55.7	73.4
Ammonia	mg/l	0.09	0.05[a]	0.01[b]
CBOD	mg/l	3[c]	2[d]	2.08
DOC	mg/l	1.5	1.73	1.31
NO3+NO2	mg/l	0.08	0.08	0.073
TN	mg/l	0.25	0.2[e]	0.163
OPO4	mg/l	0.05[f]	0.021	0.009
TP	mg/l	0.05[g]	0.025	0.041
TKN	mg/l	0.2	0.24	0.205
TSS	mg/l	14	14.8	18
VSS	mg/l	5[h]	2[i]	2.3

[a] CH2MHill reported result for ammonia was 0.0065 mg/l and was replaced with the laboratory RL.
[b] Aquatic Research reported result for ammonia was "ND" and was replaced with the laboratory RL.
[c] Basic Laboratory reported result for CBOD was "ND" and was replaced with the laboratory RL.
[d] CH2MHill reported result for CBOD was 1.9 mg/l and was replaced with the laboratory RL.
[e] CH2MHill reported result for TN was -0.072 mg/l and was replaced with the laboratory RL.
[f] Basic Laboratory reported result for OPO4 was 0.04 mg/l and was replaced with the laboratory RL.
[g] Basic Laboratory reported result for TP was 0.03 mg/l and was replaced with the laboratory RL.
[h] Basic Laboratory reported result for VSS was 1 mg/l and was replaced with the laboratory RL.
[i] CH2MHill reported result for VSS was 0.4 mg/l and was replaced with the laboratory RL.

Table D-3. Comparison of result pairs for April 13, 2011.

Constituent	Basic versus CH2MHill Applied Sciences	Basic versus Aquatic Research, Inc.	CH2MHill Applied Sciences versus Aquatic Research, Inc.
Alkalinity	OK	OK	**27.4%**
Ammonia	OK	**0.08 mg/l**[a]	OK
CBOD	OK	OK	OK
DOC	OK	OK	OK
NO3+NO2	OK	OK	OK
TN	OK	OK	OK
OPO4	OK	OK	**0.03 mg/l**[b]
TP	OK	OK	OK
TKN	OK	OK	OK
TSS	OK	OK	OK
VSS	OK	OK	OK

[a] CH2MHill ammonia reporting limit was 0.05 mg/l.
[b] CH2MHill OPO4 reporting limit was 0.01 mg/l.

Table D-4. Result values used to determine RPD or AD for July 6, 2011.

	Laboratory	Basic	CH2MHill Applied Sciences	Aquatic Research, Inc.
	Sample ID	*1070218-01*	*K218201*	*YUR001-93*
	Units			
Alkalinity	mg/l	50	48.8	56
Ammonia	mg/l	0.05[a]	0.05[b]	0.01[c]
CBOD[c]	mg/l	3[d]	2[e]	2[f]
DOC	mg/l	1.4	1.57	0.864
NO3+NO2	mg/l	0.05[g]	0.021	0.0226
TN	mg/l	0.2[h]	0.2[i]	0.1171
OPO4	mg/l	0.05[j]	0.01[k]	0.0064
TP	mg/l	0.05[l]	0.05[m]	0.0202
TKN	mg/l	0.2	0.2[n]	0.2[o]
TSS	mg/l	5[p]	4.4	5
VSS	mg/l	5[q]	2[r]	0.625

[a] Basic Laboratory reported result for ammonia was "ND" and was replaced with the laboratory RL.
[b] CH2MHill reported result for ammonia was "ND" and was replaced with the laboratory RL.
[c] Aquatic Research reported result for ammonia was "ND" and was replaced with the laboratory RL.
[d] Basic Laboratory reported result for CBOD was "ND" and was replaced with the laboratory RL.
[e] CH2MHill reported result for CBOD was 1 mg/l and was replaced with the laboratory RL.
[f] Aquatic Research reported result for CBOD was "ND" and was replaced with the laboratory RL.
[g] Basic Laboratory reported result for NO3+NO2 was 0.03 mg/l and was replaced with the laboratory RL.
[h] Basic Laboratory reported result for TN was "ND" and was replaced with the laboratory RL.
[i] CH2MHill reported result for TN was 0.12 mg/l and was replaced with the laboratory RL.
[j] Basic laboratory reported result for OPO4 was 0.01 mg/l and was replaced with the laboratory RL.
[k] CH2MHill reported result for OPO4 was 0.0085 mg/L and was replaced with the laboratory RL.
[l] Basic Laboratory reported result for TP was 0.02 mg/l and was replaced with the laboratory RL.
[m] CH2MHill reported result for TP was 0.019 mg/l and was replaced with the laboratory RL.
[n] CH2MHill reported result for TKN was 0.13 mg/L and was replaced with the laboratory RL.
[o] Aquatic Research reported result for TKN was "ND" and was replaced with the laboratory RL.
[p] Basic Laboratory reported result for OPO4 was 4 mg/l and was replaced with the laboratory RL.
[q] Basic Laboratory reported result for VSS was "ND" and was replaced with the laboratory RL.
[r] CH2MHill reported result for VSS was 1.2 mg/L and was replaced with the laboratory RL.

Table D-5. Comparison of result pairs for July 6, 2011.

Constituent	Basic versus CH2MHill Applied Sciences	Basic versus Aquatic Research, Inc.	CH2MHill Applied Sciences versus Aquatic Research, Inc.
Alkalinity	OK	OK	OK
Ammonia	OK	OK	OK
CBOD	OK	OK	OK
DOC	OK	**0.536 mg/l[a]**	**0.706 mg/l[b]**
NO3+NO2	OK	OK	OK
TN	OK	OK	OK
OPO4	OK	OK	OK
TP	OK	OK	OK
TKN	OK	OK	OK
TSS	OK	OK	OK
VSS	OK	OK	OK

[a] Basic Laboratory DOC reporting limit was 0.5 mg/l.
[b] CH2MHill DOC reporting limit was 0.5 mg/l.

Table D-6. Result values used to determine RPD or AD for November 16, 2011.

	Laboratory	Basic	CH2MHill Applied Sciences	Aquatic Research, Inc.
	Sample ID	1110717-01	K321801	YUR002-12
	Units			
Alkalinity	mg/l	83	79	91.7
Ammonia	mg/l	0.07	0.05[a]	0.01[b]
CBOD	mg/l	3[c]	2[d]	2[e]
DOC	mg/l	2.1	1.9	1.83
NO3+NO2	mg/l	0.05[f]	0.025	0.023
TN	mg/l	0.3	0.23	0.198
OPO4	mg/l	0.05[g]	0.026	0.027
TP	mg/l	0.05[h]	0.061	0.038
TKN	mg/l	0.2	0.39	0.565
TSS	mg/l	5[i]	8	1.8
VSS	mg/l	5[j]	1.2	0.63

[a] CH2MHill reported result for ammonia was -0.0061 mg/l and was replaced with the laboratory RL.
[b] Aquatic Research reported result for ammonia was "<0.01" and was replaced with the laboratory RL.
[c] Basic Laboratory reported result for CBOD was "ND" and was replaced with the laboratory RL.
[d] CH2MHill reported result for CBOD was 1.9 mg/L and was replaced with the laboratory RL.
[e] Aquatic Research reported result for CBOD was "<2" and was replaced with the laboratory RL.
[f] Basic Laboratory reported result for NO3+NO2 was 0.04 mg/l and was replaced with the laboratory RL.
[g] Basic Laboratory reported result for OPO4 was 0.03 mg/l and was replaced with the laboratory RL.
[h] Basic Laboratory reported result for TP was 0.04 mg/l and was replaced with the laboratory RL.
[i] Basic Laboratory reported result for TSS was "ND" and was replaced with the laboratory RL.
[j] Basic laboratory reported result for VSS was "ND" and was replaced with the laboratory RL.

Table D-7. Comparison of result pairs for November 16, 2011.

Constituent	Basic versus CH2MHill Applied Sciences	Basic versus Aquatic Research, Inc.	CH2MHill Applied Sciences versus Aquatic Research, Inc.
Alkalinity	OK	OK	OK
Ammonia	OK	**0.060 mg/l[a]**	OK
CBOD	OK	OK	OK
DOC	OK	OK	OK
NO3+NO2	OK	OK	OK
TN	OK	OK	OK
OPO4	OK	OK	OK
TP	OK	OK	OK
TKN	OK	**0.365 mg/l[b]**	OK
TSS	OK	OK	**6.2 mg/l[c]**
VSS	OK	OK	OK

[a] Basic Laboratory ammonia reporting limit was 0.05 mg/l.
[b] Basic Laboratory TKN reporting limit was 0.2 mg/l.
[c] CH2MHill TSS reporting limit was 2 mg/l.

4.1.1. Comparison Summary

For the 2011 inter-lab comparison of samples collected in the Klamath River estuary, comparisons were completed for alkalinity, CBOD, DOC, ammonia, NO3+NO2, TKN, TN, OPO4, TP, TSS, and VSS. A total of 99 laboratory cross comparisons were considered.

There were 73 similar pairs of results and 8 dissimilar pair of results. The 8 dissimilar pairs include: one alkalinity, one TKN, one TSS, one OPO4, two ammonia, and two DOC pairs. Ammonia and CBOD values were replaced by the reporting limit (RL) most frequently due to low concentrations in the estuary for both constituents. Additional laboratory comparison details are presented Table D-8.

A useful outcome of completing the inter-lab comparison at the Klamath Estuary site was that the even though a notable fraction of the samples were censored, the outcome of the comparison produced predominantly "similar" results. This outcome suggests that though the MLDs and RLs differed, this did not overly impact the comparison. Exceptions include TSS and VSS, with high reporting limits), and OPO4 and TP, where MLDs were used for RLs.

Another comparison was completed based on feedback from the KHSA group, wherein the paired lab comparisons were plotted against one another. The results for the various constituents of this graphical comparison are shown in Appendix D (Figure D-3 to Figure D-13). For this analysis the censored data were not replaced with the reporting limit, to focus on those data where concentrations were confirmed through laboratory analysis. A 1:1 line is included in these figures to indicate where theoretically identical results would fall. Also, a trend line and linear regression equation are included in the figures to indicate how a linear fit to the data compare to the 1:1 line. Finally, those samples collected in the estuary are shown as open symbols, compared to the 2009 and 2010 Link Dam data. These figures provide a different method of examining the data, yielding new insights. One of the most apparent differences is that for many constituents, the estuary samples have lower concentrations, and in some cases the estuary samples are censored (as noted above, for these figures the censored data were not replaced with the reporting limit and do not appear in the plots). Other observations in this lab-to-lab comparison include:

- Certain constituent data illustrate more scatter than others (e.g., TSS and VSS (Figure D-5)) illustrate greater scatter than, for example, TP (Figure D-6).

- Certain constituent data illustrate more scatter than others between specific laboratories (e.g., CBOD between Basic and Aquatic Research illustrate less scatter than between Basic and CH2MHill).

- For certain constituents there are times when one lab generally produces a higher or lower than another, and vice versa, indicating the typical variability that occurs within production analytical laboratories.

Caution should be used when interpreting the data because the sample size is small, particularly the estuary site where only three sample dates were available (and all three were not always available due to censored data).

A final important outcome of sampling the Klamath River estuary was that the lab cross comparison for 2012 was moved Weitchpec, above the Trinity River, where higher constituent concentrations are expected. The sampling periods remained the same: winter (to identify early spring water quality concentrations and potential elevated turbidity), summer (to represent seasonally warm conditions), and fall (to represent a period in transition from summer to winter).

Table D-8. Total number similar, dissimilar, and censored pairs per constituent (2011).

	Alkalinity	CBOD	DOC	Ammonia	NO3+ NO2	TN	TKN	OPO4	TP	TSS	VSS	Totals
Total Number of similar pairs of results	**8**	**2**	**7**	**2**	**9**	**7**	**8**	**7**	**8**	**8**	**7**	**73**
Total number of dissimilar pairs of results	**1**	**0**	**2**	**2**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**8**
Basic and CH2MHill	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Basic and Aquatic Research	*0*	*0*	*1*	*2*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*4*
CH2MHill and Aquatic Research	*1*	*0*	*1*	*0*	*0*	*0*	*0*	*1*	*0*	*1*	*0*	*4*
Total number of pairs excluded due to censored data	**0**	**7**	**0**	**5**	**0**	**1**	**1**	**1**	**1**	**0**	**2**	**18**
Basic and CH2MHill	*0*	*3*	*0*	*1*	*0*	*1*	*1*	*1*	*1*	*0*	*2*	*10*
Basic and Aquatic Research	*0*	*2*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*3*
CH2MHill and Aquatic Research	*0*	*2*	*0*	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*5*
TOTAL NUMBER OF PAIRS IN 2011	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**9**	**99**

5. References

U.S. Bureau of Reclamation (USBR). 2009. Standard Operating Procedures for Quality Assurance. Revision 2009-05. Environmental Monitoring Branch, Mid-Pacific Region, Sacramento, CA. May.

American Public Health Assc., American Water Works Assc., and Water Environment Federation (APHA). 2005. *Standard Methods for the Examination of Water and Wastewater*, 21st Ed. Eds. A.E. Eaton, L.S. Clesceri, E.W. Rice, and A.E. Greenberg. Washington D.C.

6. Interlab Nutrient Plots

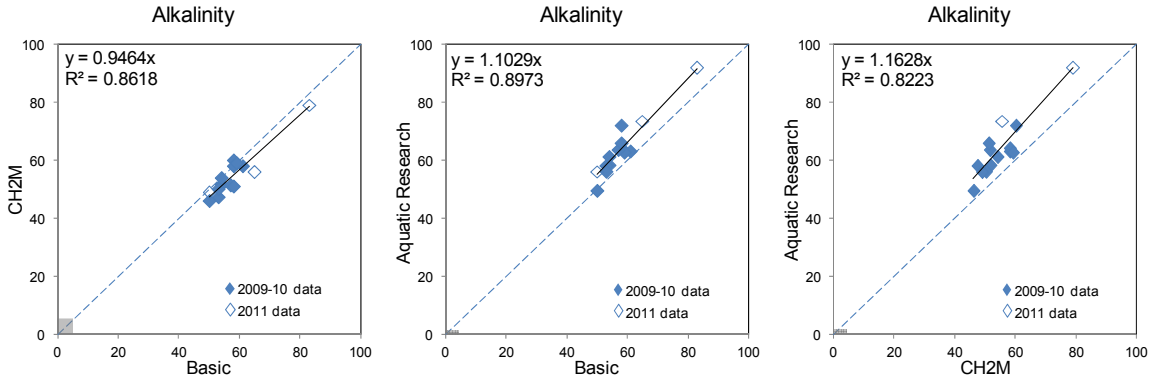

Figure D-3. KHSA inter-laboratory plots from 2009-2011 for Alkalinity. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

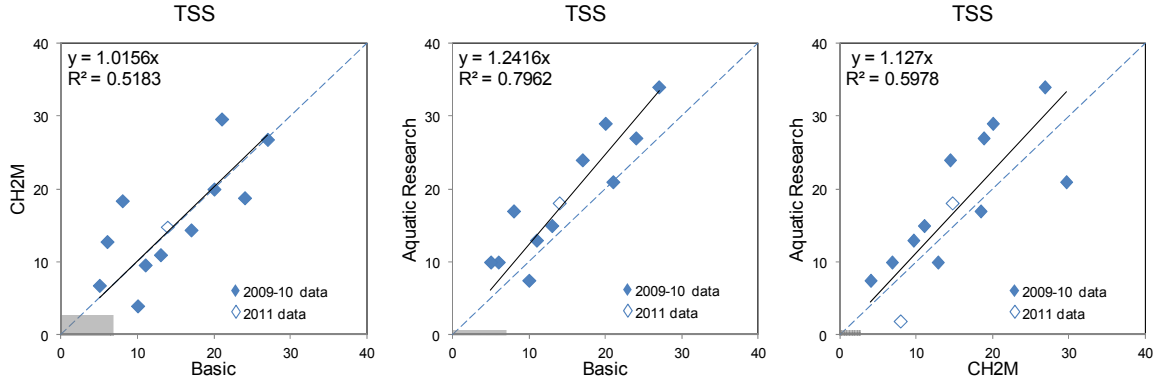

Figure D-4. KHSA inter-laboratory plots from 2009-2011 for Total Suspended Solids. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

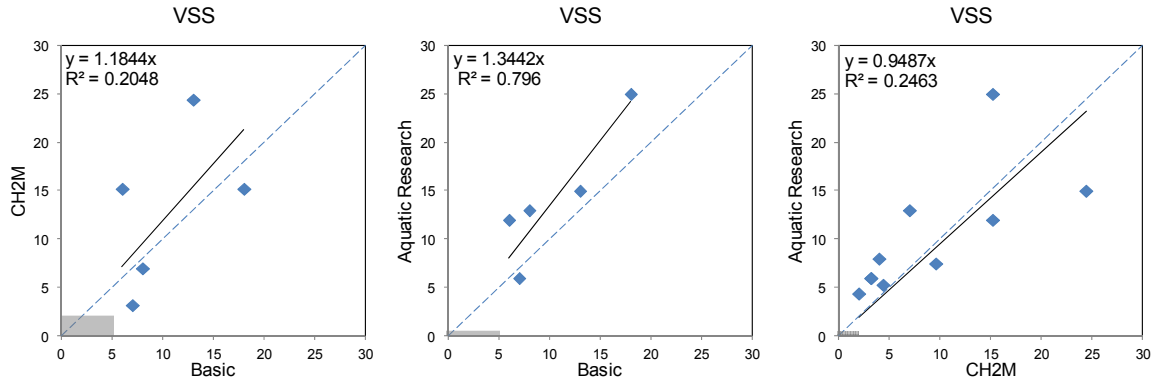

Figure D-5. KHSA inter-laboratory plots from 2009-2011 for Volatile Suspended Solids. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

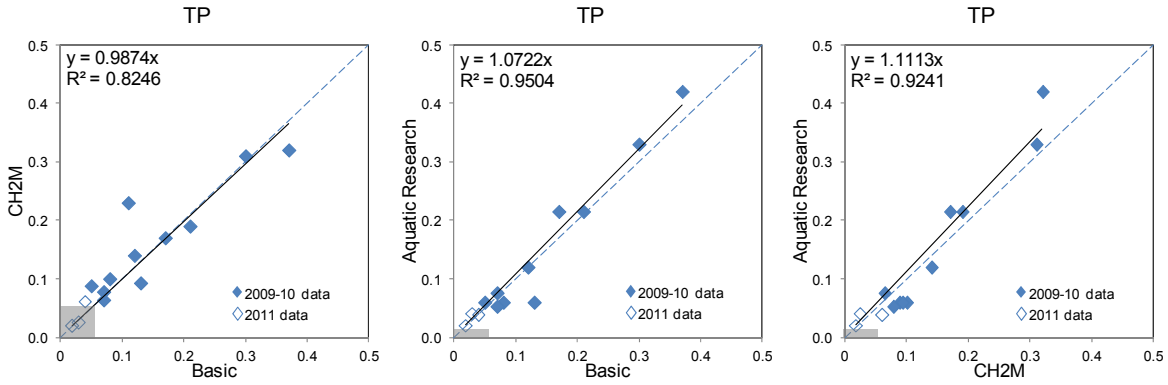

Figure D-6. KHSA inter-laboratory plots from 2009-2011 for Total Phosphorus. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

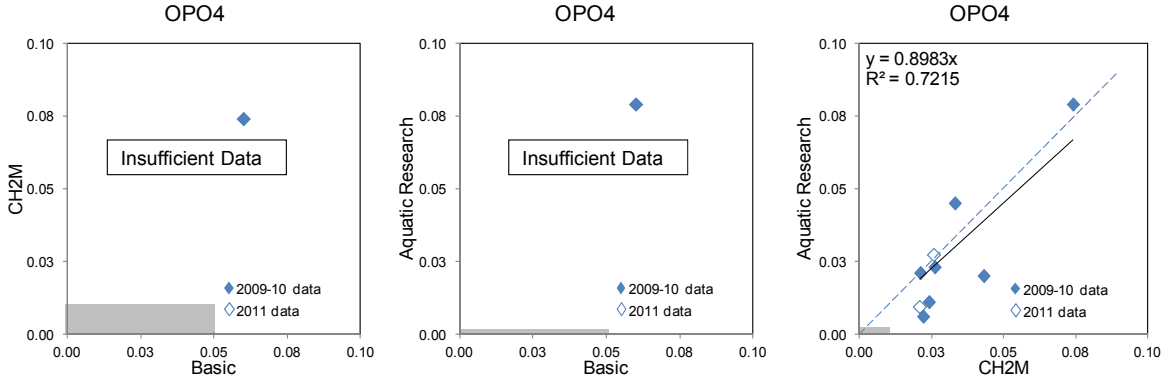

Figure D-7. KHSA inter-laboratory plots from 2009-2011 for Orthophosphate. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

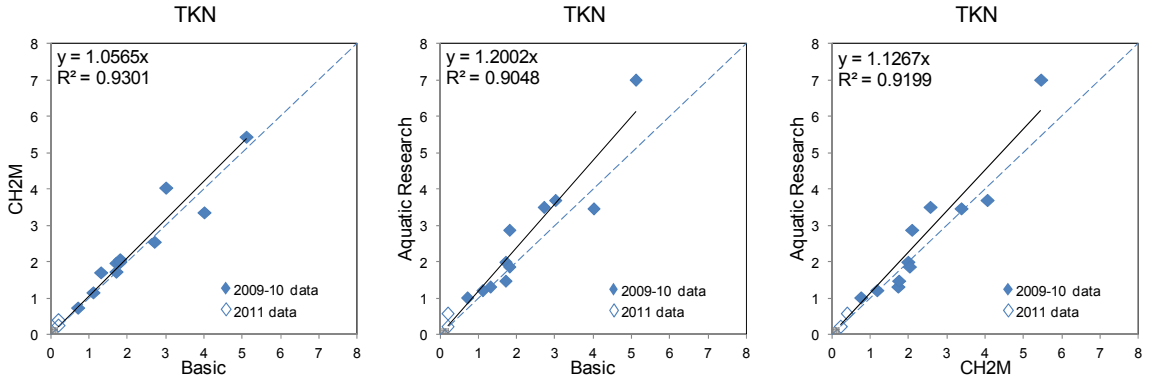

Figure D-8. KHSA inter-laboratory plots from 2009-2011 for Total Kjehldahl Nitrogen. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

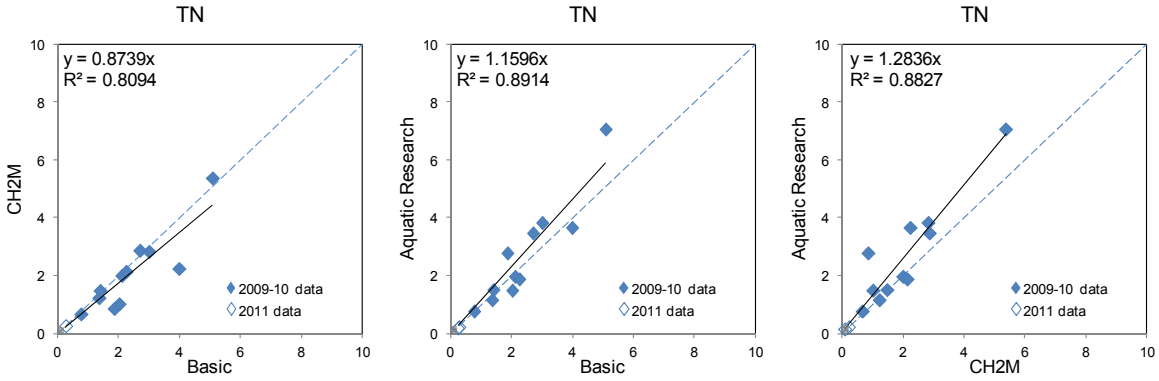

Figure D-9. KHSA inter-laboratory plots from 2009-2011 for Total Nitrogen. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

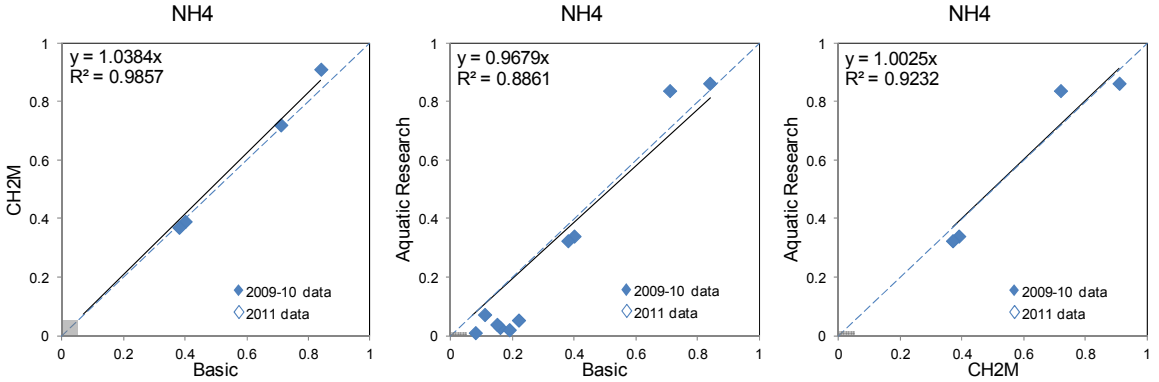

Figure D-10. KHSA inter-laboratory plots from 2009-2011 for Ammonia. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

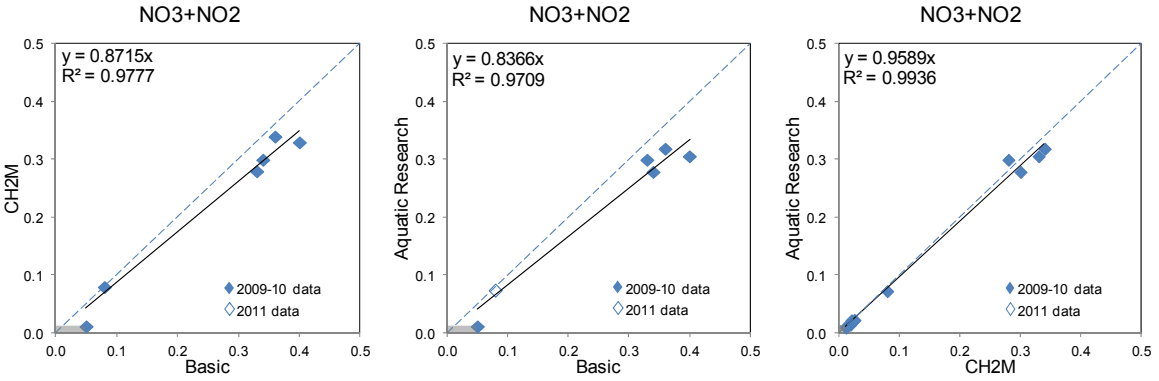

Figure D-11. KHSA inter-laboratory plots from 2009-2011 for Nitrate+Nitrite. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

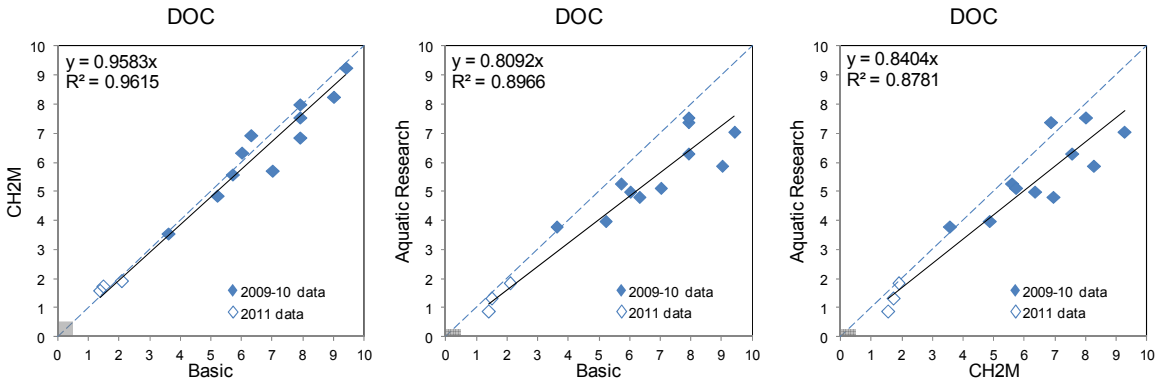

Figure D-12. KHSA inter-laboratory plots from 2009-2011 for Dissolved Organic Carbon. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

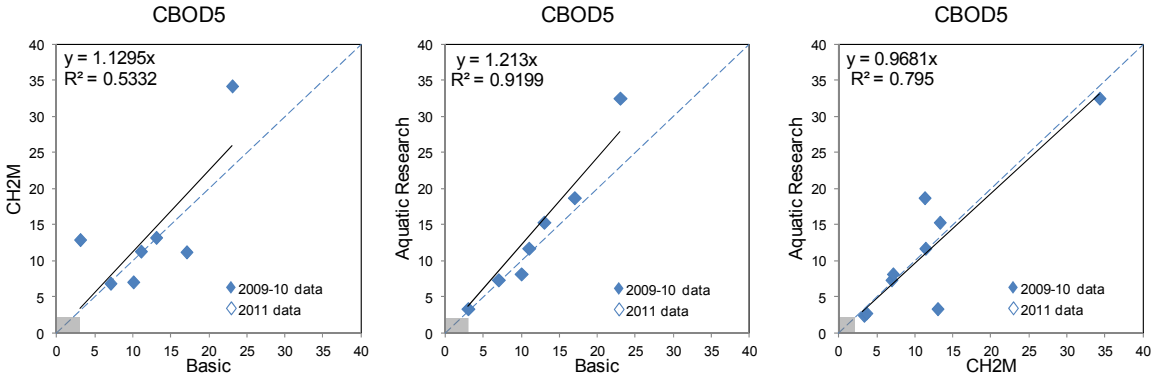

Figure D-13. KHSA inter-laboratory plots from 2009-2011 for Carbonaceous Biological Oxygen Demand. Units in milligrams per liter (mg/l). Grey region in lower left corner of each plot depicts concentrations below the reporting limits for respective laboratories in 2011.

Table D-9. CH2MHill method detection limits (MDL) and method reporting limits (RL). Changes from the 04/13/11 MDL/RL are bolded.

	04/13/11			07/26/11			11/16/11		
	MDL	**RL**	**METHOD**	**MDL**	**RL**	**METHOD**	**MDL**	**RL**	**METHOD**
NH4	0.014	0.05	E350.1	0.014	0.05	E350.1	0.014	0.05	E350.1
NO3+NO2	0.003	0.01	E353.2	0.003	0.01	E353.2	0.003	0.01	E353.2
TN	0.062	0.2	SM4500-N C	0.062	0.2	SM4500-N C	0.062	0.2	SM4500-N C
OPO4	0.001	0.01	E365.1	0.001	0.01	E365.1	0.001	0.01	E365.1
TP	0.024	0.05	E365.4	0.024	0.05	E365.4	0.024	0.05	E365.4
TKN	0.044	0.2	E351.2	0.044	0.2	E351.2	0.044	0.2	E351.2
ALK	0.6	5	E310.1	**N/A**	5.0	E310.1	**N/A**	5.0	E310.1
CBOD	N/A	2	SM5210B	N/A	2.0	SM5210B	N/A	2.0	SM5210B
DOC	0.08	0.5	SM5310B	0.08	0.5	SM5310B	**0.1**	0.5	SM5310B
TSS	1.2	2	E160.2	**N/A**	2.0	**SM2540D**	**N/A**	2.0	**SM2540D**
VSS	1.2	2	E160.4	**N/A**	2.0	**SM2540E**	**N/A**	2.0	E160.4