Tributaries of the Palouse River Monitoring Report 2002

A Water Quality Sampling Project for the 303 (d) listed Tributaries of the Palouse River

Developed for:

Latah Soil and Water Conservation District
Idaho Soil Conservation Commission
Idaho State Department of Agriculture
Idaho Department of Environmental Quality

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Introduction

The Idaho Association of Soil Conservation Districts (IASCD) collected water quality data from several tributaries to the Palouse River from November 2001 through November 2002. This monitoring project was initiated to provide background data on the State of Idaho's §303 (d) listed tributaries of the Palouse River to aid in Total Maximum Daily Load (TMDL) development. The TMDL for the Palouse River Watershed is due in 2004. In addition to providing baseline data from which to develop a TMDL, this data will also enable managers to determine where loads are entering the streams to allow for prioritization for the implementation of Best Management Practices (BMPs). In the end, continued monitoring at these sites will provide long-term data with which one will be able to evaluate the condition of the streams both pre and post implementation of BMPs.

This report reviews monitoring results for the following parameters:

-Total Phosphorus (TP)
-Bacteria (*Escherichia coli)*
-Nitrogen Components—NO_2, NO_3, NH_3
-Total Suspended Solids (TSS)
-Instantaneous Water Temperature
-Turbidity
-Dissolved Oxygen (DO)
-Percent (%) Saturation
-Total Dissolved Solids (TDS)

The University of Idaho Analytical Science Laboratory (UIASL) conducted all inorganic parameter testing. The State of Idaho Health and Welfare Laboratory in Coeur d' Alene performed bacteria analysis. Ken Clark or Cary Myler of the IASCD performed all other measurements.

This project was a cooperative effort between IASCD, Idaho State Department of Agriculture (ISDA), Idaho Department of Environmental Quality (DEQ), and the Idaho Soil Conservation Commission (ISCC). ISDA and IASCD provided the personnel, sampling equipment, and technical expertise. DEQ paid for all laboratory costs incurred at the UIASL and the State of Idaho Health and Welfare Laboratory for the duration of the project, as well as funding a position at the Latah Soil and Water Conservation District (LSWCD) to collect the data.

Palouse River Subbasin

The Palouse River Subbasin, 4th field hydrologic unit code (HUC) #17060108, drains approximately 377,221 acres in Latah County, Idaho. It is comprised of two major forks, the South Fork and North Fork. Each of these segments originates in forested regions of Idaho and flows independently to Washington, where they meet in the town of Colfax.

The Idaho portion of the Palouse River Subbasin is comprised of both steep rocky areas and areas of deposition, characterized by rolling silt and sand topography. On the eastern border of the watershed one finds the Palouse Range, a region of steeply sloped, forested hills topping out at an elevation of approximately 5,300 feet. Progressing west, smaller buttes ranging from 2,500 to 4,000 feet appear. Surrounding these buttes are the rolling eolian (wind borne) deposits that typically characterize the Palouse region. These loess deposits have depths from 100 to 300 feet deep in places (Walters and Glancy, 1969) but heavy erosion often exposes layers of buried ancient soils, called paleosols, within the loess. Exposure of these paleosols by erosion dramatically impacts soil productivity. Although loess has the ability to absorb a great deal of water, little is actually held longer than one growing season in the Palouse, since most of the precipitation falls in the winter, when the ground is frozen (Steiner, 1987).

It takes 300 to 1,000 years to create one inch of topsoil, but the average loss on the Palouse since the 1920's is one inch per twelve years (Soule and Piper, 1992). In some areas of the Palouse, one inch is lost in 1.6 years. According to Beus (1990), the Palouse region is "one of the most erosive areas in the United States. Average annual erosion in the heart of the basin amounts to twenty tons per acre. Each year, three million tons of sediment is carried out of the basin with runoff water. In the last fifty years, the equivalent of 360 tons of soil has been lost from every acre of cropland in the Palouse River Basin, averaging out to 12 tons per year in the eastern portion of the basin, [where this study was carried out]. All of the original topsoil has been lost from ten percent of the land". All of the streams sampled were listed for sediment on the §303 (d) list, and it will continue to be a challenging issue throughout the subbasin.

The South Fork of the Palouse River is listed on the 1998 §303 (d) list for Idaho as water quality limited from its headwaters to the Idaho-Washington border, for bacteria, flow alteration, habitat alteration, nutrients, sediment, and temperature. The South Fork of the Palouse River is a small watershed with 13.42 stream miles from the headwaters to the Idaho-Washington border. The stream originates in a forested area on the southwest slope of Moscow Mountain. Four main tributaries contribute the majority of flow to the stream, these being Howard Creek, Gnat Creek, Crumarine Creek, and Twin Creek. These tributaries are very small in size and only flow intermittently throughout the year. Gnat Creek, the last tributary to flow into the South Fork of the Palouse on the Idaho side, meets the stream near the intersection of Robinson Lake Road and Olsen Road. Up to this point, the South Fork passes through an area of mixed coniferous forest with interspersed areas of dry-land farming. From the Gnat Creek junction, the creek flows south through increasingly dominant agricultural lands outside of the city of Moscow. Several houses and small farmsteads lie within the watershed, providing a sub-urban aspect to the drainage.

The North Fork of the Palouse River originates on the western side of the Hoodoo Mountains in the St. Joe National Forest and then flows adjacent to the towns of Harvard, Princeton, and Potlatch before the river crosses into the State of Washington. The Palouse North Fork watershed drains 15 percent of the total river basin and yields 41 percent of the runoff (USDA, 1978). The Palouse River itself is not a §303 (d) listed waterbody but Deep, Gold, Big, Flannigan, West Fork of Rock and Hatter Creeks are §303 (d) impaired tributaries that are listed for bacteria, flow alteration, habitat alteration, temperature, nutrients, and sediment. These six streams account for a total of 53.62 stream miles. All of the streams that were sampled have their headwaters located on forested slopes and then continue to flow through predominantly agricultural lands until they reach the North Fork of the Palouse River.

Monitoring Site Descriptions

Seventeen monitoring sites were selected throughout the subbasin in November of 2001 (Figure 1). As a comparative tool each of the listed tributaries to the North Fork of the Palouse had at least two sites located on it, one as near to the headwaters as possible and one near the mouth. Watershed size and varied land use practices adjacent to the South Fork of the Palouse dictated that four sites be established on it. Site locations are defined by name and legal description in Table 1.

Table 1. Monitoring Sites in the Palouse River Subbasin

SITE ID	SITE NAME	LEGAL DESCRIPTION
PR-1	SOUTH FORK PALOUSE RIVER	R4W, T40N, SW SEC 30
PR-2	SOUTH FORK PALOUSE RIVER	R5W, T39N, NW SEC 1
PR-3	SOUTH FORK PALOUSE RIVER	R5W, T39N, NW SEC 21
PR-4	SOUTH FORK PALOUSE RIVER	R6W, T39N, SW SEC 24
PR-5	DEEP CREEK (LOWER)	R5W, T41N, NW SEC 2
PR-6	DEEP CREEK (MID)	R5W, T42N, SW SEC 23
PR-7	DEEP CREEK (UPPER)	R5W, T43N, NE SEC 36
PR-8	GOLD CREEK (UPPER)	R4W, T42N, NE SEC 15
PR-9	GOLD CREEK (LOWER)	R4W, T41N, NW SEC 8
PR-10	LAST CHANCE CREEK	R3W, T42N, NW SEC 23
PR-11	BIG CREEK (LOWER)	R3W, T42N, SW SEC 26
PR-12	HATTER CREEK (LOWER)	R4W, T41N, SE SEC 9
PR-13	HATTER CREEK (UPPER)	R4W, T41N, SE SEC 27
PR-14	ROCK CREEK (LOWER)	R4W, T41N, SW SEC 7
PR-15	W.F. ROCK CREEK (UPPER)	R4W, T41N, NW SEC 30
PR-16	FLANNIGAN CREEK (LOWER)	R5W, T41N, SE SEC 2
PR-17	FLANNIGAN CREEK (UPPER)	R5W, T41N, NW Sec 13

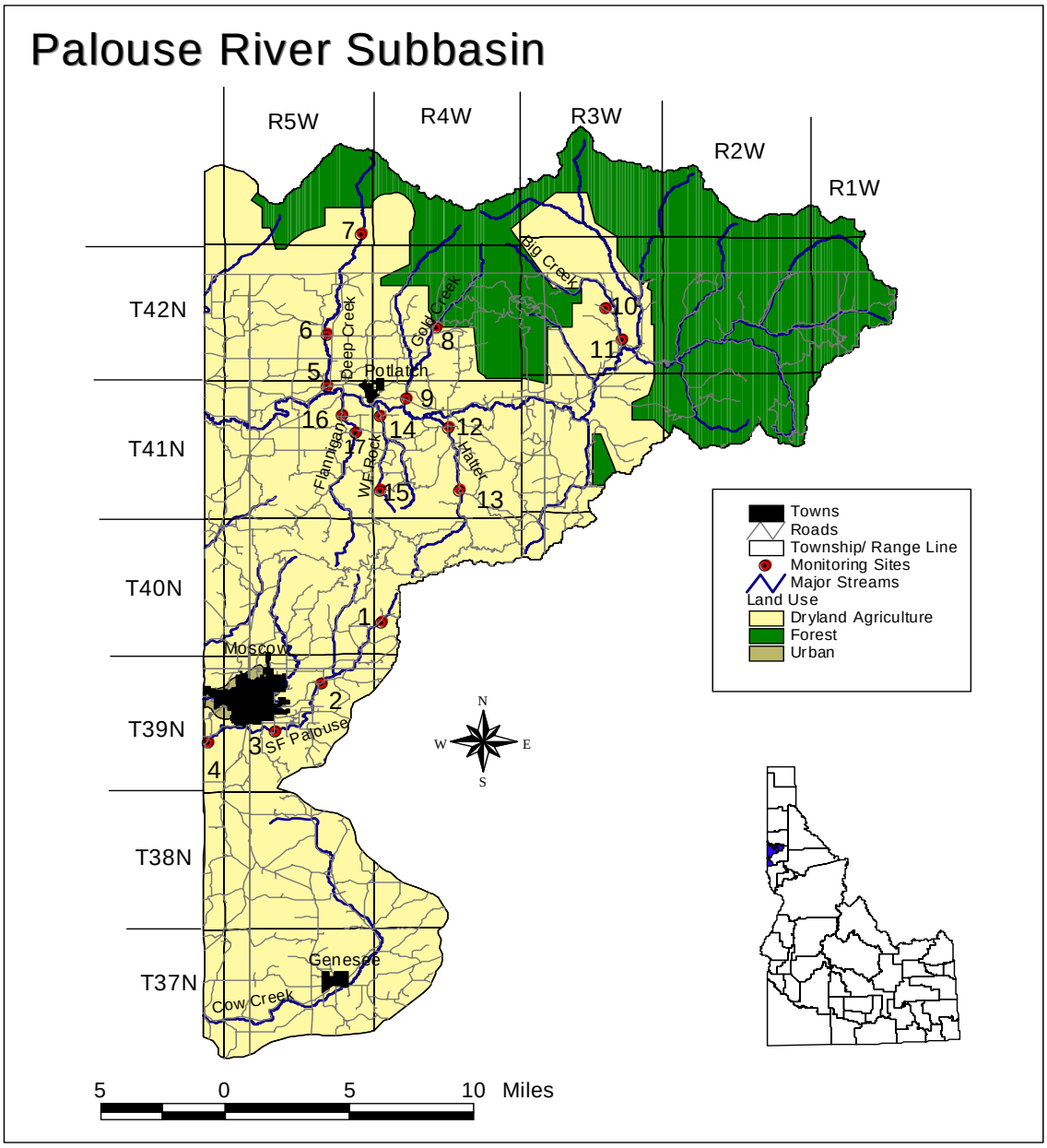


Figure 1. Palouse River Watershed HUC 170601088 with IASCD monitoring sites

Methods and Materials

Water Quality

Water Quality Limited Segments

The Federal Clean Water Act (CWA) requires restoration and maintenance of the chemical physical, and biological integrity of the nation's water (Public Law 92-500 Federal Water Pollution Control Act Amendments of 1972). Section §303 (d) of the CWA establishes requirements for states to identify and prioritize waterbodies that are water quality limited (do not meet water quality standards). North Fork of the Palouse River tributaries: Deep, Flannigan, West Fork Rock, Hatter, and Big Creek are all listed as water quality limited on Idaho's §303 (d) list, from their headwaters to the Palouse River. The South Fork of the Palouse River is listed from its headwaters to the Washington border. Gold Creek is listed as water quality limited from Waterhole Creek to the Palouse River.

The same pollutants of concern were identified for all of the streams being sampled. These pollutants consist of sediment, nutrients, temperature, and pathogens. The streams were also identified as impaired from habitat alteration and flow alteration.

Sampling Protocols

Approximately 4 liters of stream water was collected at each site, using a DH-81 depth-integrating suspended-sediment sampler. The samples were collected and transferred into a 2.5-gallon polyethylene churn sample splitter. The polyethylene churn splitter was thoroughly rinsed with ambient water at each location prior to sample collection. The resultant composite sample was thoroughly homogenized before filling the appropriate sample containers. Water samples requiring preservation (NO_2+NO_3, NH_3, and TP) were transferred into preserved (H_2SO_4 pH <2) 500 mL sample containers. Water quality samples (TSS, NO_2+NO_3, NH_3, and TP) were then analyzed at the UIASL in Moscow, Idaho.

Bacteriological samples (total coliform and *E. coli*) were collected directly from the thalweg into sterile sample containers. The samples were shipped to the State of Idaho Health and Welfare Laboratory in Coeur d' Alene for analysis. Most probable number (MPN) multiple tube fermentation was used to determine fecal coliform and *E. coli* levels in the water sample.

A list of parameters, sample sizes, preservation, holding times, and analytical methods are displayed in Table 2. All sample containers were labeled with waterproof markers with the following information: station location, sample identification, date of collection, and time of collection. Samples were placed on ice and transported to the laboratory the same day as collection. Chain-of-custody forms accompanied each sample shipment.

Table 2. Water Quality Parameters

Parameters	Sample Size	Preservation	Holding Time	Method
Non Filterable Residue (TSS)	1L	Cool 4°C	7 Days	EPA 160.2
Nitrogen Components: (NO_3+NO_2) Ammonia	60 mL 60 mL	Cool 4°C, H_2SO_4 pH < 2	28 Days	EPA 353.2 EPA 350.1
Total Phosphorus	100 mL	Cool 4°C, H_2SO_4 pH < 2	28 Days	EPA 365.4
Escherichia coli	100 mL	Cool 4°C	30 Hours	MPN

Field Measurements

At each location, field parameters for dissolved oxygen, specific conductance, pH, temperature, turbidity, and total dissolved solids were measured. Calibration of all field equipment was in accordance with the manufacturer specifications. Field measurement parameters, equipment and calibration techniques are shown in Table 3.

Table 3. Field Measurements

Parameters	Instrument	Calibration
Dissolved Oxygen	YSI Model 55	Ambient air calibration
Temperature	YSI Model 55 StowAway temperature logger Model XTI 02	Centigrade thermometer Centigrade thermometer
Conductance & TDS	Orion Model 115	Specific Conductance (25^oC standard)
pH	Orion Model 210A	Standard buffer (7,10) bracketing for linearity
Turbidity	Hach Model 2100P	Formazin Primary Standard

All field measurements were recorded in a field notebook along with any pertinent observations about the site, including weather conditions, flow rates, personnel on site, and any problems observed that might affect water quality.

Flow Measurements

Flow measurements were collected at each site using a Marsh McBirney Flow Mate Model 2000 flow meter. The six-tenths depth method (0.6 of the total depth from the surface of the water surface) was used. A transect line was established at each monitoring station, across the width of the stream at an angle perpendicular to the flow, for the calculation of cross-sectional area. The discharge was computed by summing the products of the partial areas (partial sections) of the flow cross-sections and the average velocities for each of those sections. Stream discharge was reported as cubic feet per second (cfs).

Quality Assurance and Quality Control (QA/QC)

The UIASL utilizes methods approved and validated by the Environmental Protection Agency (EPA). A method validation process, including precision and accuracy performance evaluations and method detection limit studies, are required of UIASL Standard Methods. Method performance evaluations include quality control samples, analyzed with a batch to ensure sample data integrity. Internal laboratory spikes and duplicates are part of UIASL's quality assurance program. Laboratory QA/QC results generated from this project can be provided upon request.

QA/QC procedures from the field-sampling portion of this project included a split sample and a blank sample (one set per sampling day). The field blanks consisted of laboratory-grade deionized water, transported to the field and poured off into the appropriate sample containers. The blank sample was used to determine the integrity of the field teams handling of samples, the condition of the sample containers and deionized water supplied by the laboratory and the accuracy of the laboratory methods. Split samples were obtained by filling two sets of sample containers with homogenized composite water from the same sampling site. The split and blank samples were not identified as such to laboratory personnel to ensure laboratory precision.

Data Handling

All of the field data and analytical data generated from each survey was reviewed and submitted to ISDA for review. Each batch of data was reviewed to insure that all necessary observations, measurements, and analytical results have been properly recorded. The analytical results were evaluated for completeness and accuracy. Any suspected errors were investigated and resolved, if possible. The data was then stored electronically and made available to any interested entity upon request.

Results and Discussion

Analysis was done of the data, and maximum, minimum, median, and average values for each parameter measured was determined. The number of exceedances per year was calculated, based on the number sampling events whose respective values exceeded EPA or State of Idaho water quality standards and criteria. Percent exceedance represents the percentage of sampling events when each respective value exceeded EPA or State of Idaho water quality standards and criteria.

Descriptive data is presented in Table 4.

Table 4. Maximum, minimum, median, and average values for each measured parameter at IASCD Palouse River Tributaries Monitoring locations. # exceedance per year equals the number of sampling events when each respective value exceeded EPA or State of Idaho water quality standards and critera. % exceedance equals the percentage of sampling events when each respective value exceeded EPA or State of Idaho water quality standards and critera.

PR-1	**D.O. (mg/L)**	**% Sat (%)**	**Temp (^oC)**	**Cond ($\mu S/cm^2@25^oC$)**	**TDS (mg/L)**	**pH (H^+)**	**Turbidity (NTU)**	**TSS (mg/L)**	**TP (mg/L)**	**Flow (cfs)**	***Total-coli* (coli/100mL)**	***E-coli* (coli/100mL)**
Maximum	13.01	91.40%	14.90	188.00	59.00	9.04	83.10	30.00	0.20	10.55	2400.00	1700.00
Minimum	7.80	71.30%	0.10	38.20	20.00	6.90	5.69	0.00	0.06	0.03	330.00	9.00
Average	10.75	83.43%	5.19	76.15	36.44	7.84	20.25	6.40	0.11	1.67	1764.78	302.91
Median	10.75	85.70%	4.60	72.00	38.00	7.80	13.10	4.00	0.10	0.46	2400.00	83.00
# exceedance	0.0		1.0			0.0			9.0		19.00	4.00
% exceedance	0.0%		4.0%			0.0%			36.0%		82.6%	17.4%

PR-2	**D.O. (mg/L)**	**% Sat (%)**	**Temp (^oC)**	**Cond ($\mu S/cm^2@25^oC$)**	**TDS (mg/L)**	**pH (H^+)**	**Turbidity (NTU)**	**TSS (mg/L)**	**TP (mg/L)**	**Flow (cfs)**	***Total-coli* (coli/100mL)**	***E-coli* (coli/100mL)**
Maximum	13.17	91.40%	18.90	162.60	96.00	8.82	167.00	330.00	0.52	35.24	2400.00	2400.00
Minimum	5.25	44.50%	0.00	36.00	18.00	6.90	6.01	0.00	0.08	0.19	610.00	2.00
Average	10.18	79.84%	5.95	80.56	40.63	7.55	24.36	25.70	0.15	5.28	2199.60	239.96
Median	10.19	81.80%	5.00	71.00	35.00	7.60	11.70	8.00	0.13	1.04	2400.00	88.00
# exceedance	1.0		4.0			0.0			19.0		24.00	2.00
% exceedance	3.7%		14.8%			0.0%			70.4%		96.0%	8.0%

PR-3	**D.O. (mg/L)**	**% Sat (%)**	**Temp (^oC)**	**Cond ($\mu S/cm^2@25^oC$)**	**TDS (mg/L)**	**pH (H^+)**	**Turbidity (NTU)**	**TSS (mg/L)**	**TP (mg/L)**	**Flow (cfs)**	***Total-coli* (coli/100mL)**	***E-coli* (coli/100mL)**
Maximum	13.32	173.40%	29.40	342.00	163.00	9.30	328.00	530.00	0.81	84.52	3500.00	2400.00
Minimum	7.42	71.80%	0.20	11.70	37.00	5.03	2.66	0.00	0.02	0.13	120.00	1.00
Average	10.96	91.15%	8.07	167.02	85.76	7.99	33.85	34.59	0.14	10.13	1973.60	144.20
Median	11.12	85.10%	5.80	175.60	90.00	7.95	14.10	9.00	0.10	1.52	2400.00	39.00
# exceedance	0.0		8.0			1.0			13.0		23.00	1.00
% exceedance	0.0%		29.6%			3.8%			48.1%		92.0%	4.0%

PR-4	**D.O. (mg/L)**	**% Sat (%)**	**Temp (^oC)**	**Cond ($\mu S/cm^2@25^oC$)**	**TDS (mg/L)**	**pH (H^+)**	**Turbidity (NTU)**	**TSS (mg/L)**	**TP (mg/L)**	**Flow (cfs)**	***Total-coli* (coli/100mL)**	***E-coli* (coli/100mL)**
Maximum	13.25	99.70%	22.10	460.00	219.00	8.90	474.00	560.00	1.00	24.36	2400.00	920.00
Minimum	4.69	37.40%	0.10	90.30	45.00	6.67	2.20	0.00	0.04	0.31	410.00	2.00
Average	8.81	70.40%	7.42	267.53	136.11	7.77	37.02	34.41	0.17	7.62	2188.40	101.68
Median	9.64	74.10%	5.40	272.00	135.00	7.80	11.30	7.00	0.12	3.95	2400.00	59.00
# exceedance	8.0		8.0			0.0			16.0		24.00	1.00
% exceedance	29.6%		29.6%			0.0%			59.3%		96.0%	4.0%

PR-5	**D.O. (mg/L)**	**% Sat (%)**	**Temp (^oC)**	**Cond ($\mu S/cm^2@25^oC$)**	**TDS (mg/L)**	**pH (H^+)**	**Turbidity (NTU)**	**TSS (mg/L)**	**TP (mg/L)**	**Flow (cfs)**	***Total-coli* (coli/100mL)**	***E-coli* (coli/100mL)**
Maximum	15.00	102.80%	22.30	342.00	162.00	9.32	1000.00	1100.00	1.20	28.39	2400.00	1700.00
Minimum	4.45	50.50%	0.00	37.60	19.00	6.92	4.65	0.00	0.06	0.04	410.00	2.00
Average	10.45	81.84%	6.72	153.39	75.32	7.82	76.01	75.32	0.19	7.48	2174.40	243.60
Median	11.58	85.20%	3.60	125.00	66.00	7.60	26.10	14.00	0.12	5.01	2400.00	84.00
# exceedance	1.00		1.00			0.00			10.00		24.00	4.00
% exceedance	5.3%		5.3%			0.0%			52.6%		96.0%	16.0%

PR-6	D.O. (mg/L)	%Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	15.07	103.40%	25.60	332.00	154.00	8.62	1000.00	1400.00	1.50	60.01	2400.00	3500.00
Minimum	4.38	53.80%	0.10	36.90	19.00	6.93	4.38	0.00	0.05	0.14	70.00	9.00
Average	10.59	84.44%	7.31	139.59	68.72	7.69	80.44	88.79	0.18	15.98	4381.67	397.53
Median	11.45	86.50%	3.60	123.30	62.50	7.60	23.55	11.00	0.10	4.85	2400.00	100.00
# exceedance	1.0		2.0			0.0			9.0		17.00	3.00
% exceedance	5.3%		10.5%			0.0%			47.4%		94.4%	17.6%

PR-7	D.O. (mg/L)	%Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	12.60	89.80%	16.70	92.80	44.00	9.49	1000.00	140.00	0.20	43.31	2400.00	1200.00
Minimum	5.22	51.10%	1.30	26.90	13.00	7.10	6.17	0.00	0.02	0.42	110.00	3.00
Average	9.47	74.49%	5.96	53.77	26.21	7.83	71.03	12.89	0.06	9.48	1166.67	129.78
Median	9.70	75.00%	4.00	48.30	25.00	7.60	16.70	0.00	0.06	3.03	610.00	27.00
# exceedance	2.0		0.0			0.0			1.0		8.00	1.00
% exceedance	10.5%		0.0%			0.0%			5.3%		44.0%	5.6%

PR-8	D.O. (mg/L)	%Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	14.72	102.90	17.90	121.40	58.00	9.27	158.00	130.00	0.28	46.54	2400.00	1100.00
Minimum	7.16	70.60	0.10	36.00	18.00	6.90	4.86	0.00	0.04	0.10	55.00	4.00
Average	10.66	85.01	6.28	70.73	35.21	7.74	20.46	8.38	0.09	6.87	1047.80	153.84
Median	10.37	84.45	5.05	69.15	36.00	7.76	10.20	0.00	0.06	1.29	460.00	35.00
# exceedance	0.0		4.0			0.0			7.0		10.00	2.00
% exceedance	0.0%		15.4%			0.0%			26.9%		40.0%	8.0%

PR-9	D.O. (mg/L)	%Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	14.68	109.60%	20.20	217.00	108.00	8.55	1000.00	260.00	1.90	35.96	2400.00	2400.00
Minimum	5.55	58.50%	0.00	41.00	21.00	6.54	3.52	0.00	0.04	0.03	280.00	1.00
Average	10.75	87.17%	7.58	128.45	65.89	7.68	55.62	18.44	0.16	7.91	1998.48	274.88
Median	11.06	88.70%	4.30	130.10	69.00	7.60	14.60	6.00	0.08	2.82	2400.00	39.00
# exceedance	1.0		0.0			0.0			9.0		25.00	3.00
% exceedance	3.7%		0.0%			0.0%			33.3%		96.2%	11.5%

PR-10	D.O. (mg/L)	%Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	15.14	102.90%	14.30	78.80	39.00	8.99	46.80	16.00	0.10	25.90	2400.00	2400.00
Minimum	5.93	57.80%	0.10	40.90	16.00	7.00	2.36	0.00	0.04	0.21	150.00	3.00
Average	10.57	81.52%	5.14	58.96	28.69	7.92	13.14	2.77	0.05	3.84	989.41	246.00
Median	9.91	82.20%	2.40	56.90	29.00	7.87	10.40	0.00	0.04	1.00	490.00	35.00
# exceedance	1.0		0.0			0.0			0.0		8.00	2.00
% exceedance	7.7%		0.0%			0.0%			0.0%		47.1%	12.5%

PR-11	D.O. (mg/L)	%Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	15.25	102.40%	17.90	338.00	164.00	9.48	25.80	320.00	0.11	84.44	2400.00	370.00
Minimum	4.30	44.80%	0.00	31.50	15.00	6.70	4.35	0.00	0.02	0.12	230.00	5.00
Average	9.71	75.65%	6.27	80.38	39.04	7.56	10.57	15.11	0.06	16.30	1162.69	100.54
Median	10.12	78.80%	3.60	67.90	32.00	7.40	10.10	0.00	0.06	4.02	845.00	69.00
# exceedance	2.0		0.0			0.0			1.0		20.00	0.00
% exceedance	7.4%		0.0%			0.0%			3.7%		76.9%	0.0%

PR-12	D.O. (mg/L)	%Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	15.19	104.60%	19.00	173.10	89.00	9.07	178.00	270.00	0.80	105.87	2400.00	2400.00
Minimum	4.70	46.00%	0.10	10.63	14.00	7.10	3.32	0.00	0.05	0.01	190.00	12.00
Average	10.67	84.96%	6.60	83.14	43.26	7.83	23.85	26.22	0.15	20.13	1920.00	382.64
Median	11.14	86.90%	4.10	80.00	43.00	7.65	11.50	7.00	0.10	3.84	2400.00	120.00
# exceedance	2.0		0.0			0.0			11.0		23.00	8.00
% exceedance	7.4%		0.0%			0.0%			40.7%		95.8%	32.0%

PR-13	D.O. (mg/L)	% Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	14.66	102.60%	17.00	473.00	222.00	8.91	359.00	600.00	0.66	63.05	2400.00	2400.00
Minimum	6.87	68.60%	0.10	26.10	13.00	6.20	3.89	0.00	0.02	0.41	35.00	10.00
Average	10.39	82.58%	6.42	67.65	38.56	7.56	28.68	33.00	0.10	16.83	1459.79	246.83
Median	10.50	82.60%	4.00	48.30	25.00	7.57	9.79	4.00	0.07	4.02	1500.00	43.00
# exceedance	0.0		0.0			1.0			8.0		20.00	4.00
% exceedance	0.0%		0.0%			3.8%			29.6%		83.3%	16.7%

PR-14	D.O. (mg/L)	% Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	15.42	106.10%	18.60	426.00	205.00	8.60	759.00	1000.00	1.20	79.48	2400.00	980.00
Minimum	8.22	70.90%	0.00	76.20	42.00	7.10	1.64	0.00	0.05	0.05	370.00	3.00
Average	12.00	92.92%	5.00	230.08	116.55	7.84	59.61	58.40	0.20	8.76	1972.50	177.95
Median	12.29	91.90%	2.90	231.00	113.50	7.80	19.50	6.00	0.15	0.87	2400.00	85.00
# exceedance	0.0		0.0			0.0			14.0		19.00	3.00
% exceedance	0.0%		0.0%			0.0%			70.0%		95.0%	15.0%

PR-15	D.O. (mg/L)	% Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	14.57	99.50%	17.40	385.00	187.00	8.25	450.00	610.00	0.82	12.79	2400.00	770.00
Minimum	5.95	58.20%	0.10	64.00	31.00	7.23	7.37	0.00	0.12	0.06	580.00	9.00
Average	10.45	79.57%	5.49	170.84	83.89	7.69	48.20	48.33	0.22	1.89	1975.79	179.95
Median	10.80	80.10%	2.70	151.25	76.00	7.74	25.45	10.50	0.17	0.66	2400.00	100.00
# exceedance	1.0		0.0			0.0			18.0		19.00	2.00
% exceedance	5.6%		0.0%			0.0%			100.0%		100.00	10.5%

PR-16	D.O. (mg/L)	% Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	15.25	102.50%	22.20	286.00	136.00	8.81	541.00	650.00	0.95	34.05	2400.00	2400.00
Minimum	5.70	55.50%	0.00	0.91	24.00	7.20	4.95	4.00	0.06	0.08	550.00	1.00
Average	10.22	82.33%	7.62	127.55	65.22	7.85	39.54	45.77	0.15	6.91	2027.69	254.19
Median	10.63	83.20%	4.80	133.60	64.00	7.80	18.00	13.50	0.12	2.08	2400.00	65.00
# exceedance	1.0		1.0			0.0			16.0		26.00	3.00
% exceedance	3.7%		3.7%			0.0%			59.3%		100.0%	11.5%

PR-17	D.O. (mg/L)	% Sat (%)	Temp (°C)	Cond (µS/cm²@25°C)	TDS (mg/L)	pH (H⁺)	Turbidity (NTU)	TSS (mg/L)	TP (mg/L)	Flow (cfs)	*Total-coli* (coli/100mL)	*E-coli* (coli/100mL)
Maximum	15.70	112.40%	23.30	194.00	102.00	9.16	368.00	620.00	0.65	39.89	9800.00	2400.00
Minimum	6.74	70.20%	0.00	43.20	22.00	7.40	3.36	4.00	0.05	0.17	290.00	13.00
Average	10.69	88.47%	8.74	110.73	55.67	7.80	30.43	53.29	0.14	5.92	2411.15	582.46
Median	10.98	88.50%	5.60	117.60	55.00	7.75	11.70	15.00	0.10	1.58	2400.00	290.00
# exceedance	0.0		2.0			0.0			13.0		24.00	9.00
% exceedance	0.0%		7.4%			0.0%			48.1%		92.30	0.35

Parameters

Dissolved Oxygen

Dissolved Oxygen (DO) is found in microscopic bubbles of oxygen that are mixed in the water and occur between water molecules. DO is a very important indicator of a water body's ability to support aquatic life. Fish "breathe" by absorbing dissolved oxygen through their gills. Oxygen enters the water by absorption directly from the atmosphere or by aquatic plant and algae photosynthesis. Oxygen is removed from the water by respiration and decomposition of organic matter.

The State of Idaho standard for DO states that dissolved oxygen must exceed 6.0 mg/L for cold water biota at all times.

Sites PR-1, PR-3, PR-8, PR-13, PR-14 and PR-17 did not drop below the 6.0 mg/L criteria during the sampling period. Sites PR-2, PR-5, PR-6, PR-9, PR-10, PR-15, and PR-16 all dropped below the 6.0 mg/L criteria once during the sampling period. PR-7, PR-11, and PR-12 fell below the criteria twice during the sampling period. PR-4 violated the DO criteria eight times during this period, making it in violation of the state standard 24.2% of the time. PR-4 was the site located closest to the Washington border on the South Fork Palouse River. When flows began to decrease in late spring/ early summer the water level began to rise and form a pool approximately an eighth of a mile upstream and downstream of site PR-4. It was assumed that beaver activity or human alterations to the stream channel in Washington had produced the change, although limited investigation did not lead to any direct observations. This pooling effect is most likely responsible for the low DO numbers observed at PR-4. Figure 2 graphically illustrates the DO levels for all sites. The dashed red line represents the 6.0 mg/ L standard for DO.

It should also be noted that most of the sites in violation of the 6.0 mg/L standard were only observed to be in violation when stream flow was less that 1.0 cubic foot per second (cfs). Low flow, or stagnant conditions often cause oxygen sags to occur.

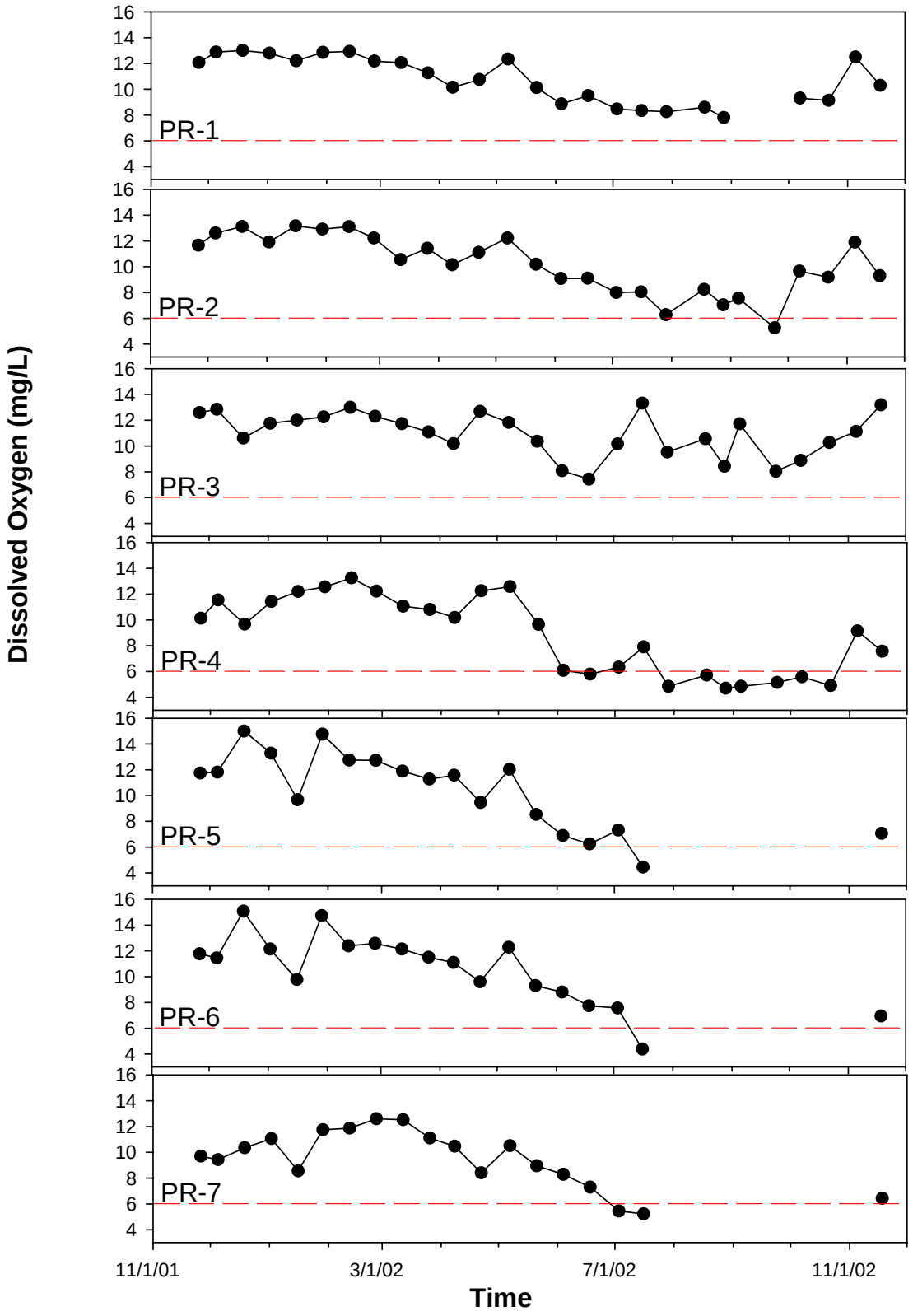


Figure 2. Dissolved oxygen concentrations collected at Palouse River Tributaries monitoring sites.

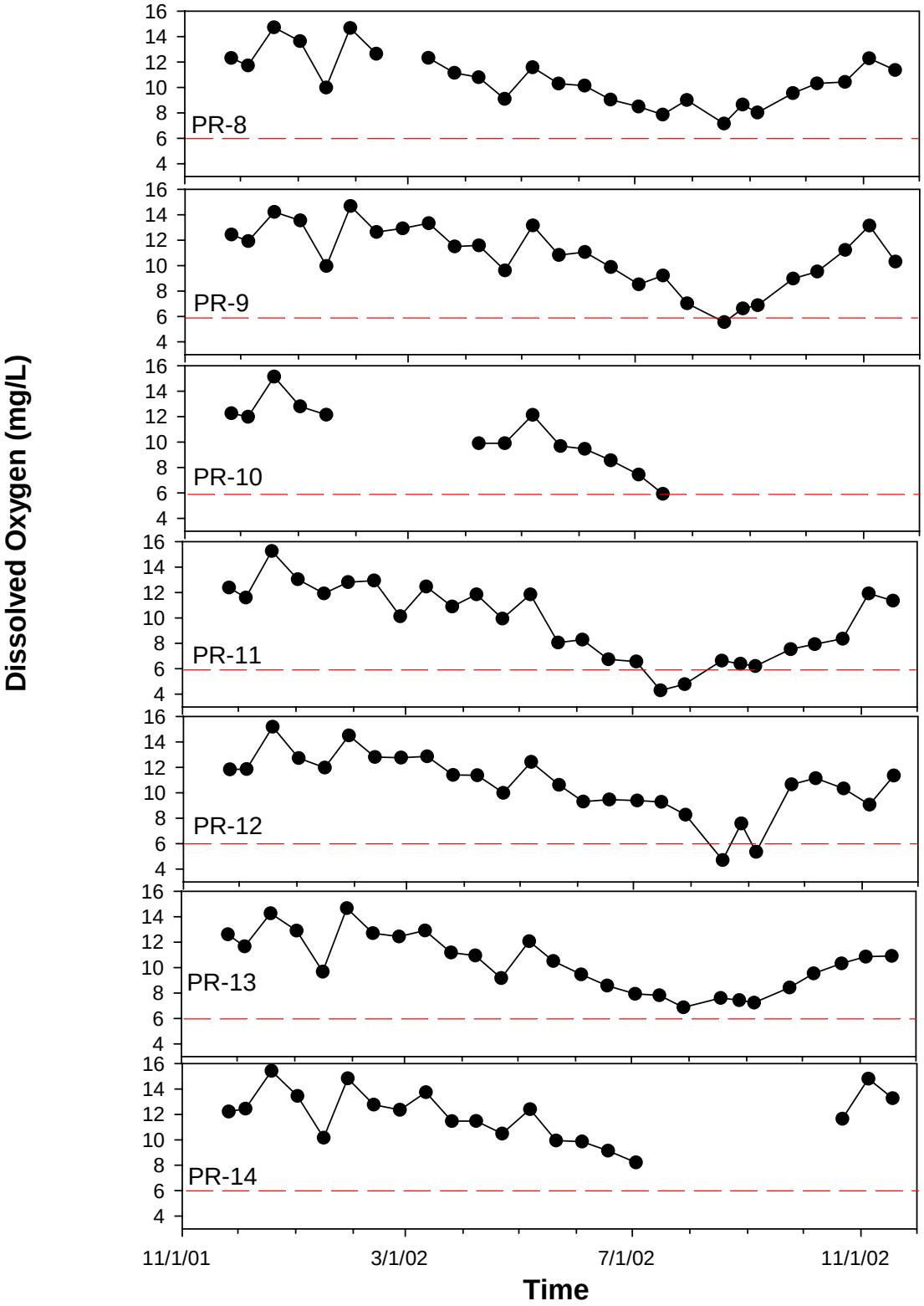


Figure 2. Dissolved oxygen concentrations collected at Palouse Tribs. monitoring sites.

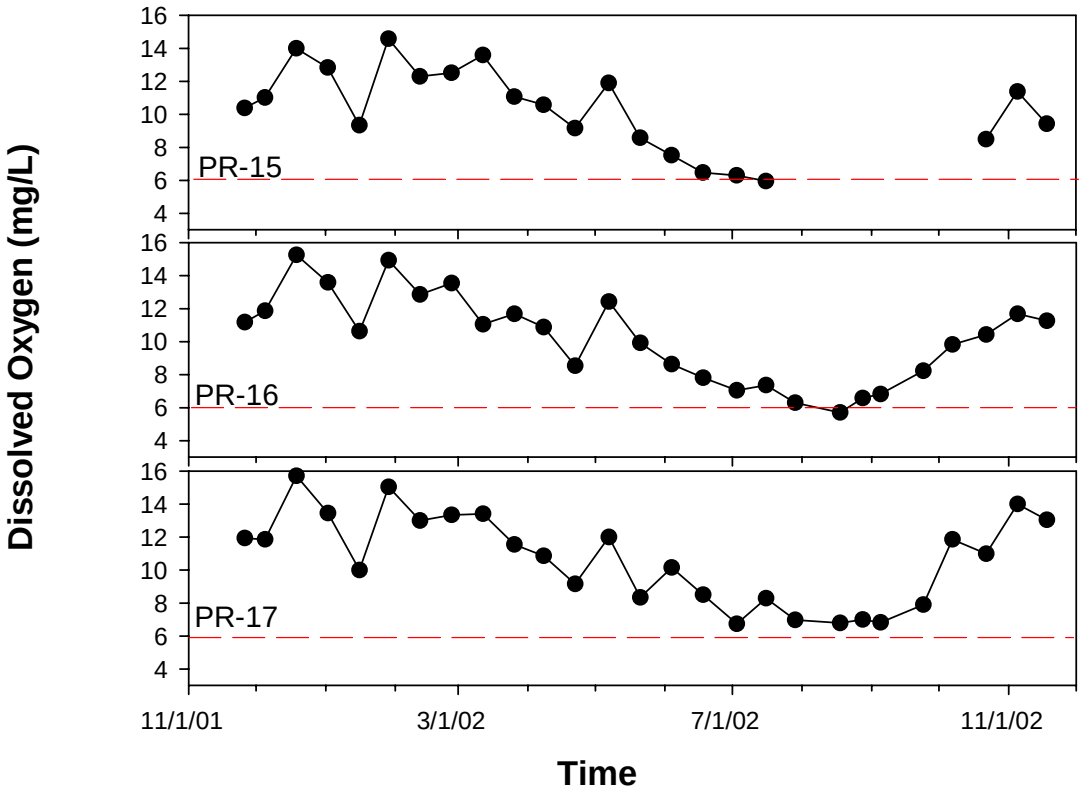


Figure 2. Dissolved oxygen concentrations collected at Palouse Tribs. monitoring sites.

Water Temperature

Water temperature is a very important indicator for overall water quality. Many of the physical, biological and chemical characteristics of a river are directly affected by temperature. For example, temperature influences the:

-amount of oxygen that can be dissolved in water.
-photosynthetic rate of algae and larger aquatic plants.
-metabolic rates of aquatic organisms.
-sensitivity of organisms to toxic wastes, parasites and diseases.

Cool water can hold more oxygen than warm water, because gases are more easily dissolved in cool water. The reduction of oxygen solubility at high water temperatures can compound the stress on fish caused by marginal dissolved oxygen concentrations.

The State of Idaho water quality standard for temperature support of cold-water biota is a water temperature of 22^{o} C or less with a daily average no greater than 19 ^{o} C.

The State of Idaho water quality standard for temperature support of salmonid spawning states that the temperature must be equal to or less than 13^{o}C with a maximum daily average of no greater than 9^{o}C. The entire South Fork Palouse River and the upper Gold Creek site are listed for salmonid spawning and must therefore meet the more stringent criteria. The upper portion of Big Creek is also listed for salmonid spawning, but both monitoring sites on Big Creek were physically located downstream of the listed segment. Therefore, the 22^{o} C criteria was used to analyze temperature data collected from monitoring sites on Big Creek.

Sites PR-5, PR-6, PR-16 and PR-17 all exceeded the cold-water biota criteria of 22^{o} C, and sites PR 1-4 and PR-8 exceeded the 13^{o} C threshold associated with being listed for salmonid spawning; the remaining sites did not exceed the criteria. Figure 3 graphically illustrates the instantaneous water temperature measurements for all sites. The dotted red line represents the cold-water biota temperature criteria of 22^{o} C or the 13^{o} C salmonid spawning temperature criteria, where applicable.

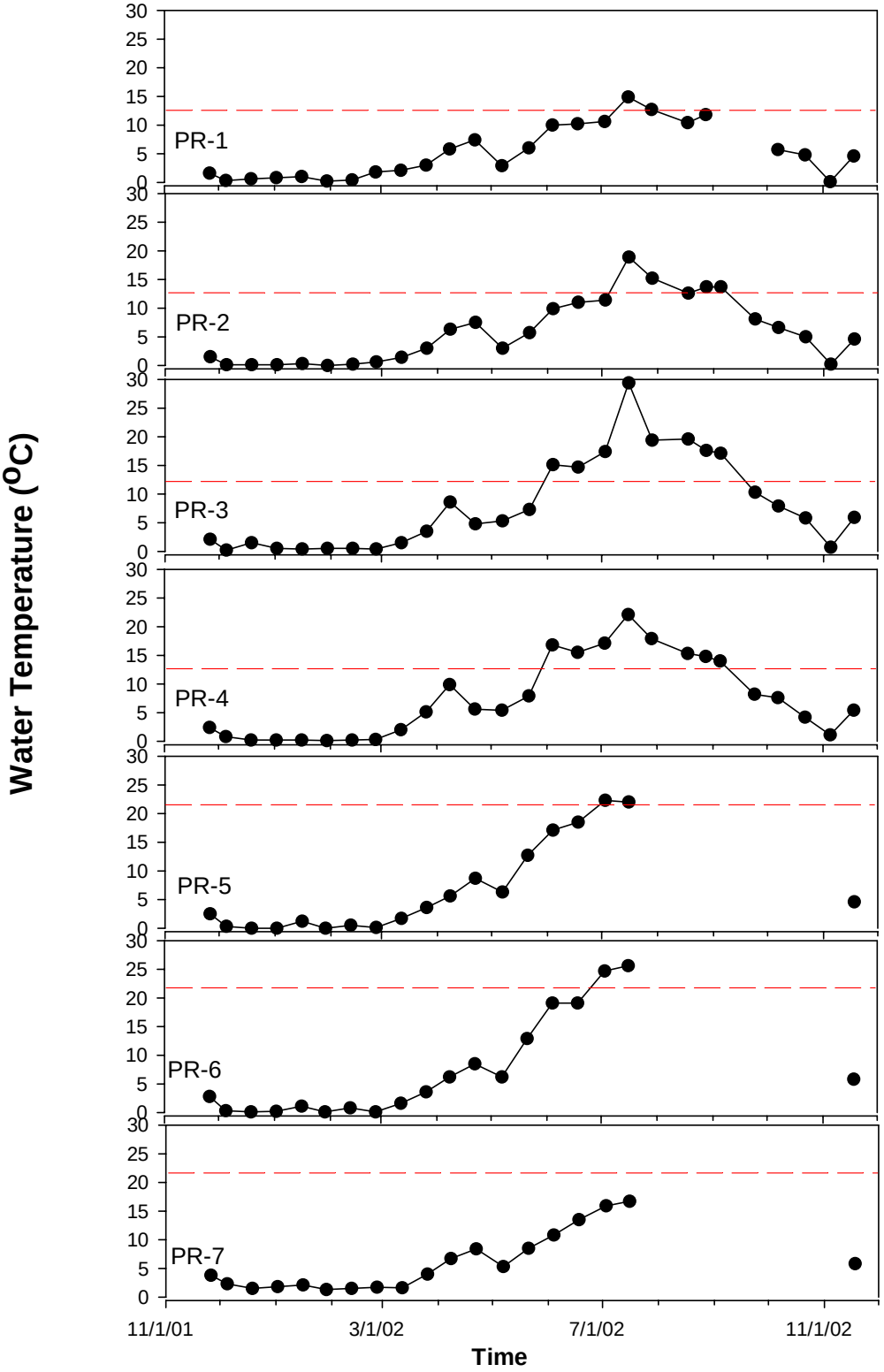
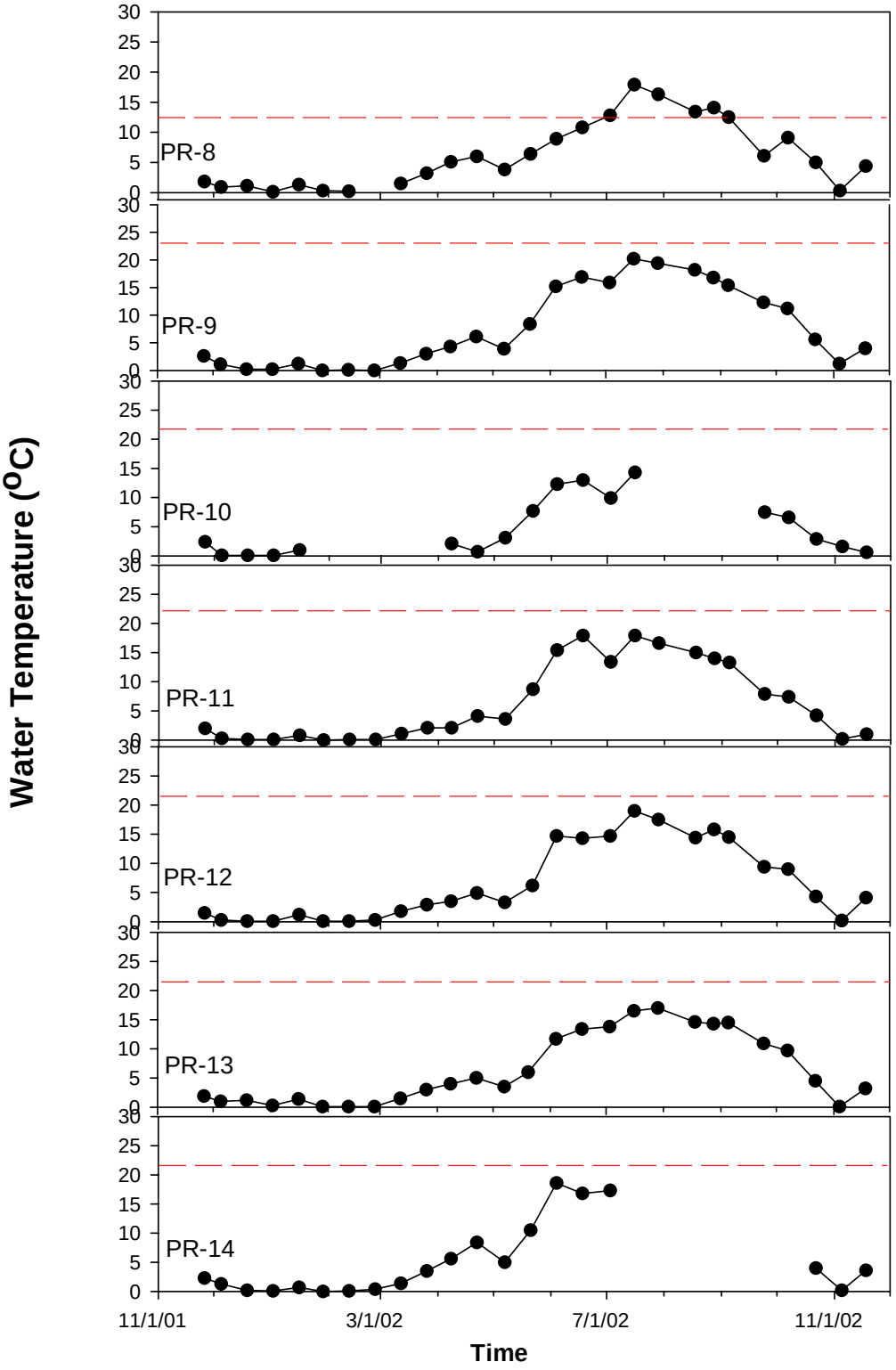


Figure 3. Instantaneous water temperature (solid black circles) for Palouse River Tributary sites. The state instantaneous temperature standard is 22°C for support of cold-water biota and 13°C for support of salmonid spawning.



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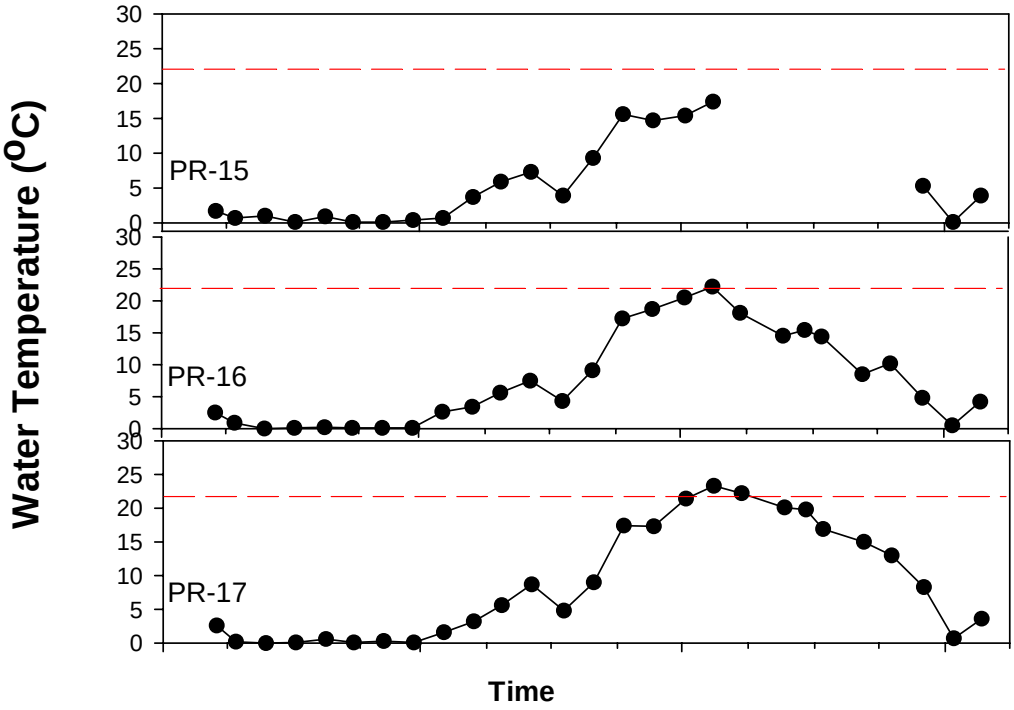

Figure 3. Instantaneous water temperature (solid black circles) for Palouse River Tributary sites. The state instantaneous temperature standard is 22°C for support of cold-water biota and 13°C for support of salmonid spawning.

Specific Conductance and Total Dissolved Solids

Total Dissolved Solids (TDS) is a measure of the total amount of minerals, salts, organic matter, and nutrients dissolved in water. Specific Conductance (SC) is a measure of how well water can conduct an electrical current. Conductivity increases with increasing amount and mobility of ions. These ions, which come from the breakdown of compounds, conduct electricity because they are negatively or positively charged when dissolved in water. Therefore, SC is an indirect measure of the presence of dissolved solids such as chloride, nitrate, sulfate, phosphate, sodium, magnesium, calcium, and iron, and can be used as an indicator of water pollution.

No standards or criteria exist that set limits on SC or TDS.

Figure 4 shows the levels of SC and TDS found at all sites throughout the sampling period.

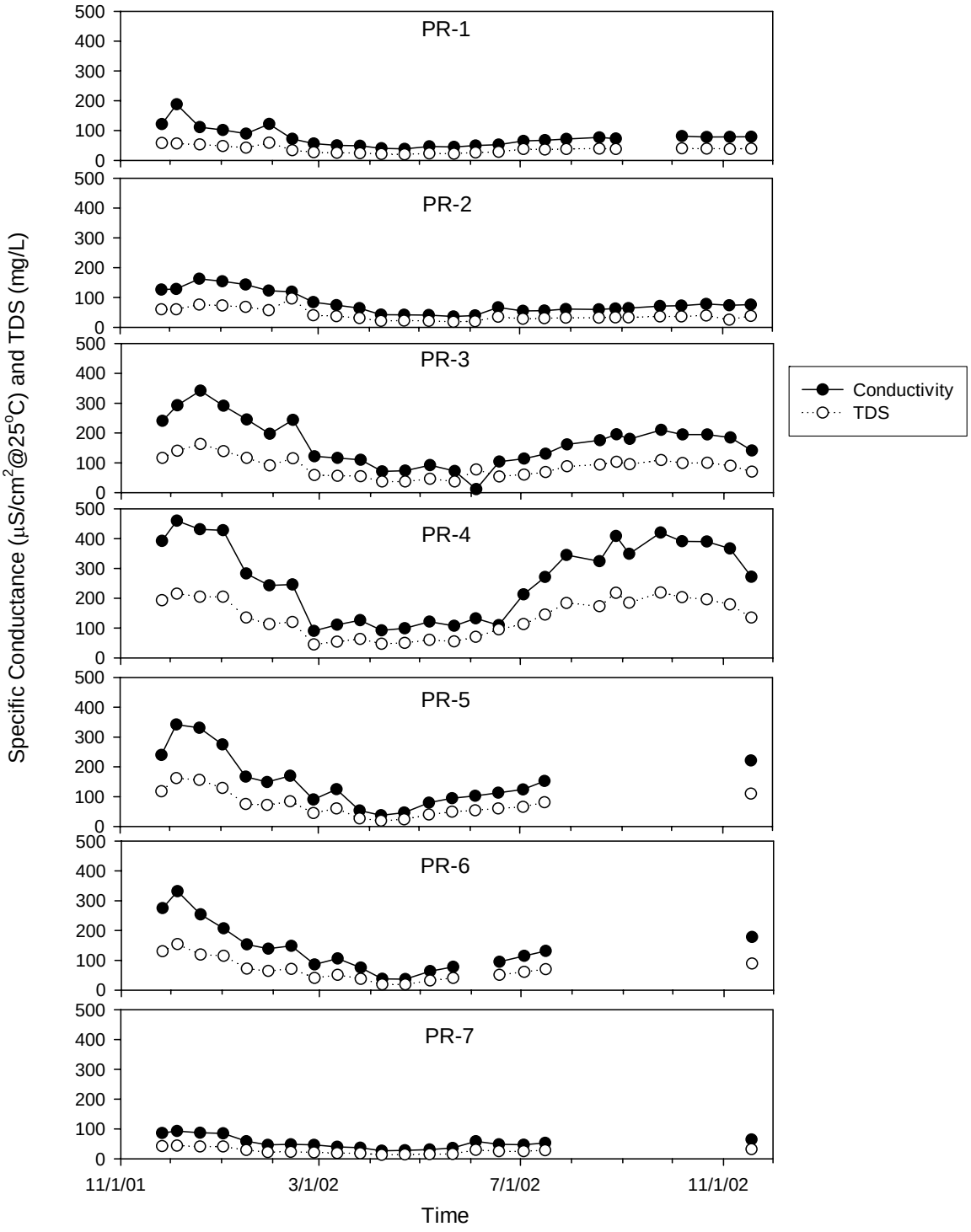

Figure 4. Specific conductance and total dissolved solids data collected at Palouse River Tribs. monitoring sites from November 26, 2001 to November 18, 2002.

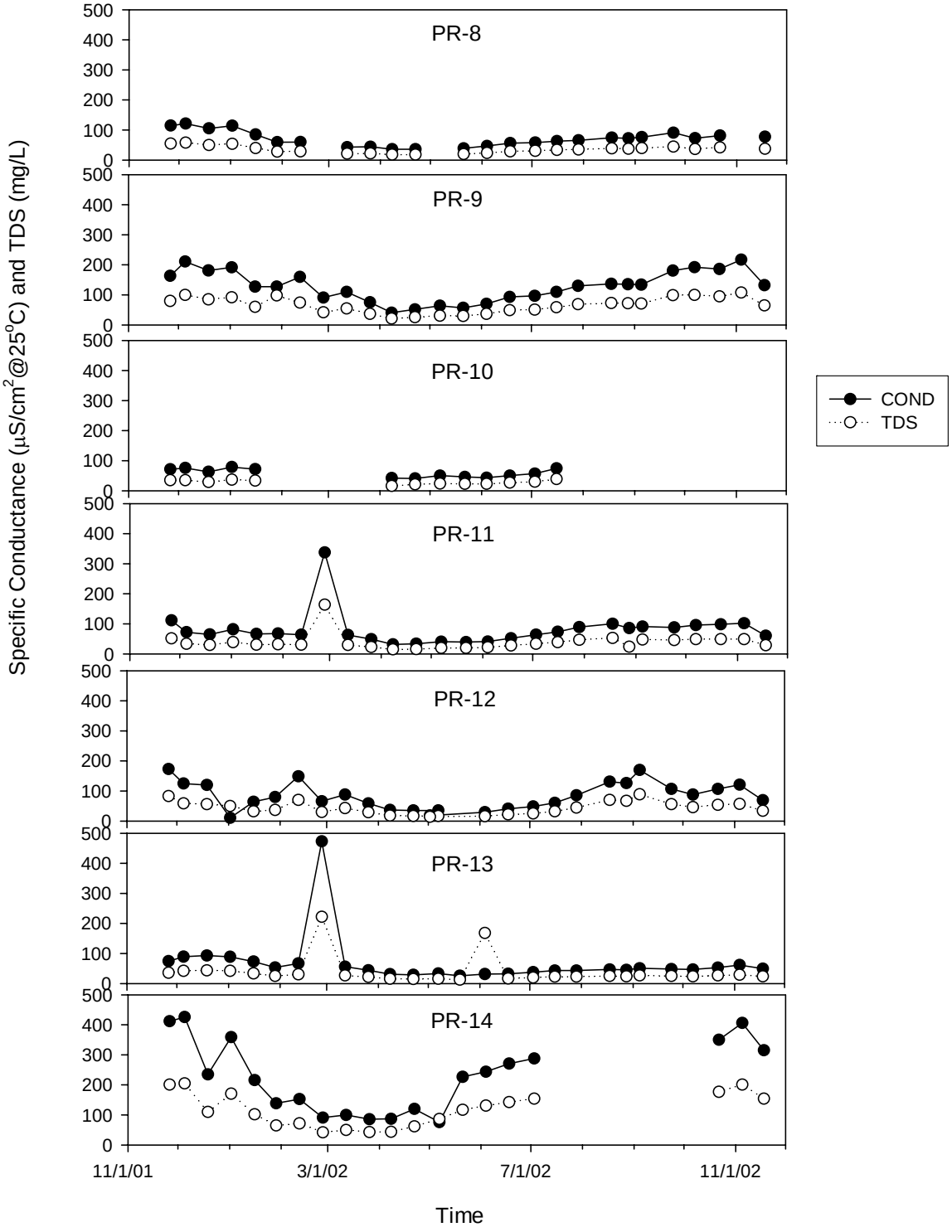

Figure 4. Specific conductance and total dissolved solids data collected at Palouse River Tribs. monitoring sites from November 26, 2001 to November 18, 2002.

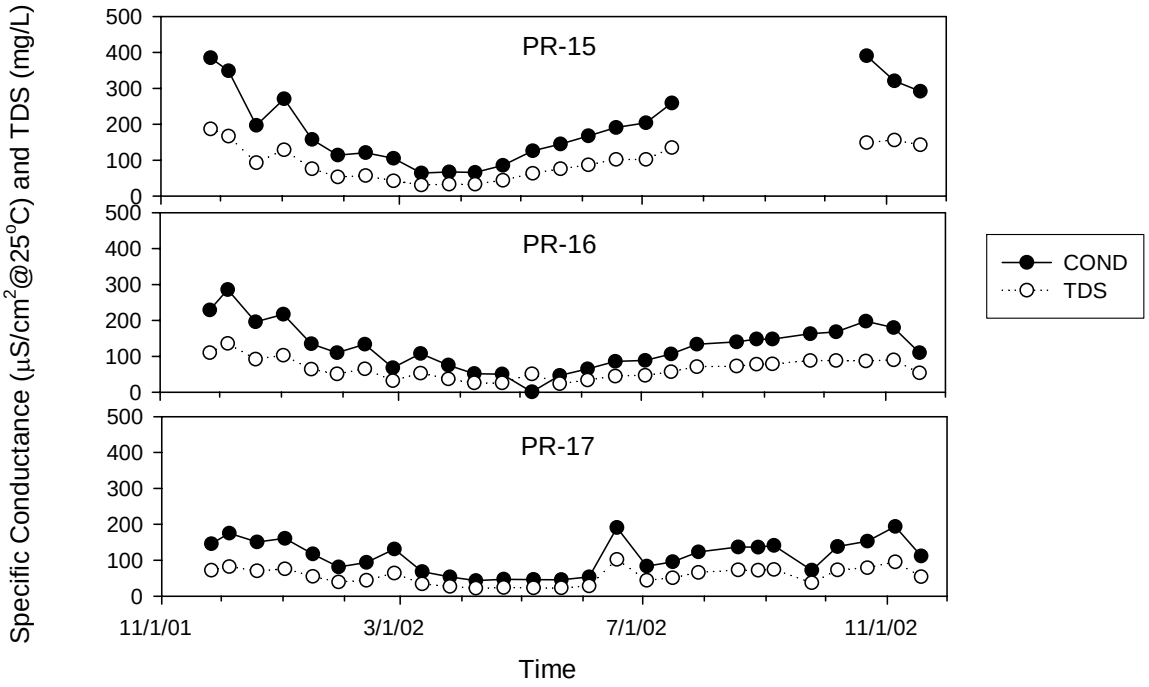

Figure 4. Specific conductance and total dissolved solids data collected at Palouse River Tribs. monitoring sites from November 26, 2001 to November 18, 2002.

pH

pH represents the effective concentration (activity) of hydrogen ions (H^+) in water. The activity of hydrogen ions can be expressed most conveniently in logarithmic units. pH is defined as the negative logarithm of the activity of H^+ ions:

- $pH = -\log [H^+]$,
- where $[H^+]$ is the concentration of H^+ ions in moles per liter.

The State of Idaho surface water quality criteria for Aquatic Life Use designations states that the Hydrogen Ion Concentration (pH) values must fall within the range of 6.5 and 9.5 (Sec. 250-WQS).

PR-3 and PR-13 both exceeded the State of Idaho criteria once during the sampling period.

Turbidity and Total Suspended Solids

Total suspended solids (TSS) include both sediment and organic material suspended in water. TSS can cause problems for fish by clogging gills and for aquatic plants by limiting growth because of reduced light penetration. In addition, TSS provides a medium for the

accumulation and transport of other constituents such as phosphorus and bacteria. The sediment standard in Idaho is a narrative standard that states sediment shall not exceed, "…in the absence of specific sediment criteria, quantities which impair designated beneficial uses." The State of Idaho water quality standard for Turbidity states that measurements shall not exceed background turbidity by more than fifty NTU instantaneously or more than twenty-five NTU for more than ten consecutive days.

A comparison between turbidity (lack of water clarity due to particulate matter in the water column), TSS concentration, and discharge is presented in Figure 5. In addition, simple regression analysis was done to compare TSS and Turbidity values. In most cases, the R^2 values were greater than 90, indicating a strong correlation between TSS and Turbidity. In the future, turbidity may be used as a surrogate for TSS in order to save both time and money.

As one might expect, increases in turbidity and TSS are strongly correlated with increases in stream flow. As flow increases, sediment from surrounding fields, as well as from within the stream channel, is carried downstream and into the Palouse River. While this is a normal phenomenon in any environment, and especially the highly erosive Palouse subbasin, rates of sediment transport may be elevated in many of these systems due to the prior channelization of stream corridors, as well as the lack of sufficient riparian vegetation to stabilize stream banks. Reintroducing meanders and riparian vegetation in these systems may be an effective strategy to reduce flow velocity and stabilize stream banks, thereby reducing overall sediment transport.

Turbidity levels appeared to be highest during spring flows, and the water often appeared visibly murky. However, using the upstream monitoring sites as a proxy for background turbidity, none of the sites near the mouth of these streams surpassed the instantaneous exceedance of 50 NTUs, except during the highest peak of spring runoff. This may indicate that high turbidity and erosivity are a natural part of these stream systems, although further turbidity measurements might be warranted in order to better define natural background levels.

Stream name and number below give the number of turbidity exceedances over estimated background levels:

- South Fork Palouse (PR1-PR4) = 1
- Deep Creek (PR5-PR7) = 0
- Gold Creek (PR8-PR9) = 2
- Big Creek (PR10-PR11) = 0
- Hatter Creek (PR12-PR13) = 1
- Rock Creek (PR14-PR15) = 0
- Flannigan Creek (PR16-PR17) = 1

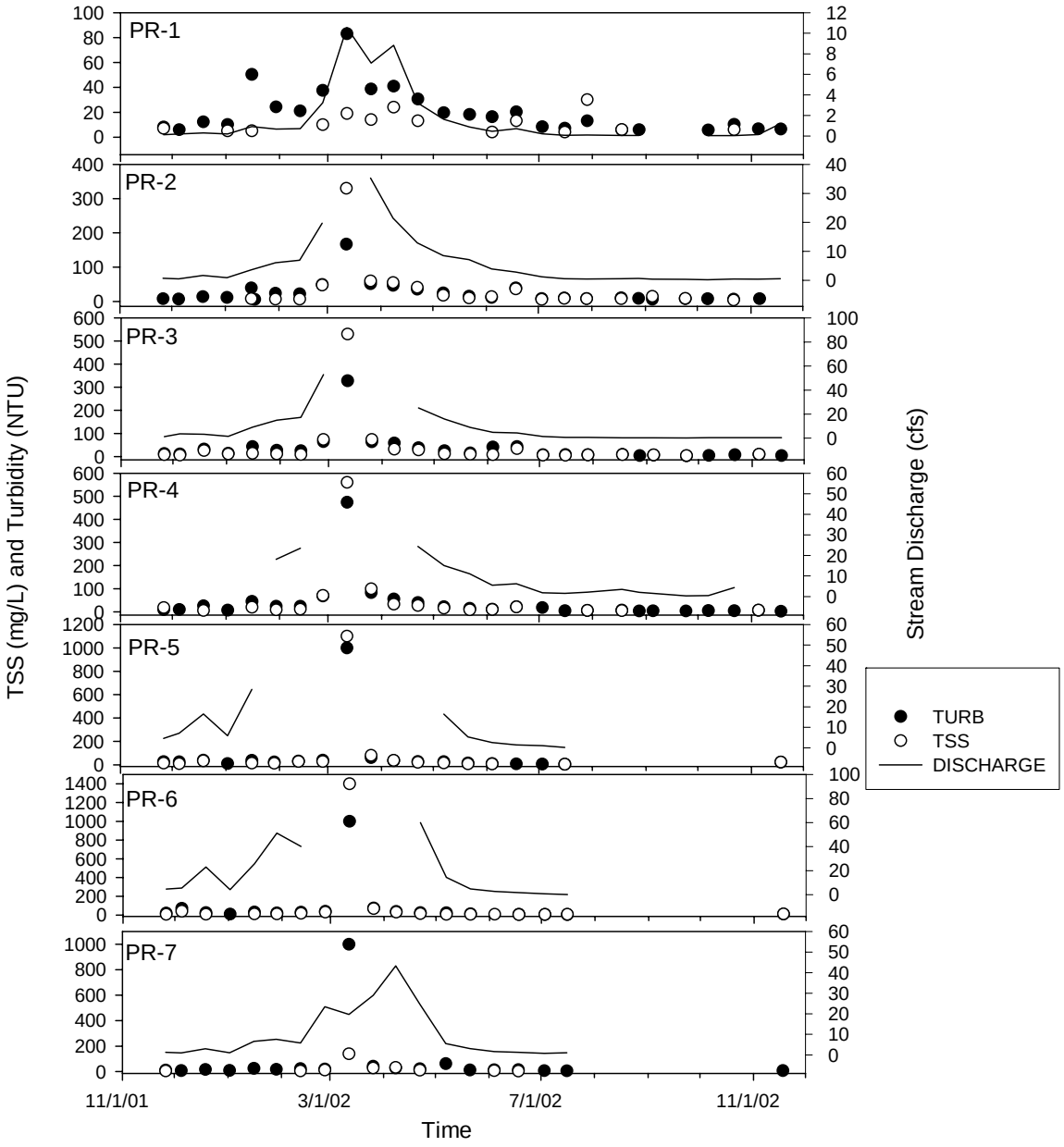

Figure 5. TSS, turbidity, and stream discharge for Palouse River Tributaries monitoring sites.

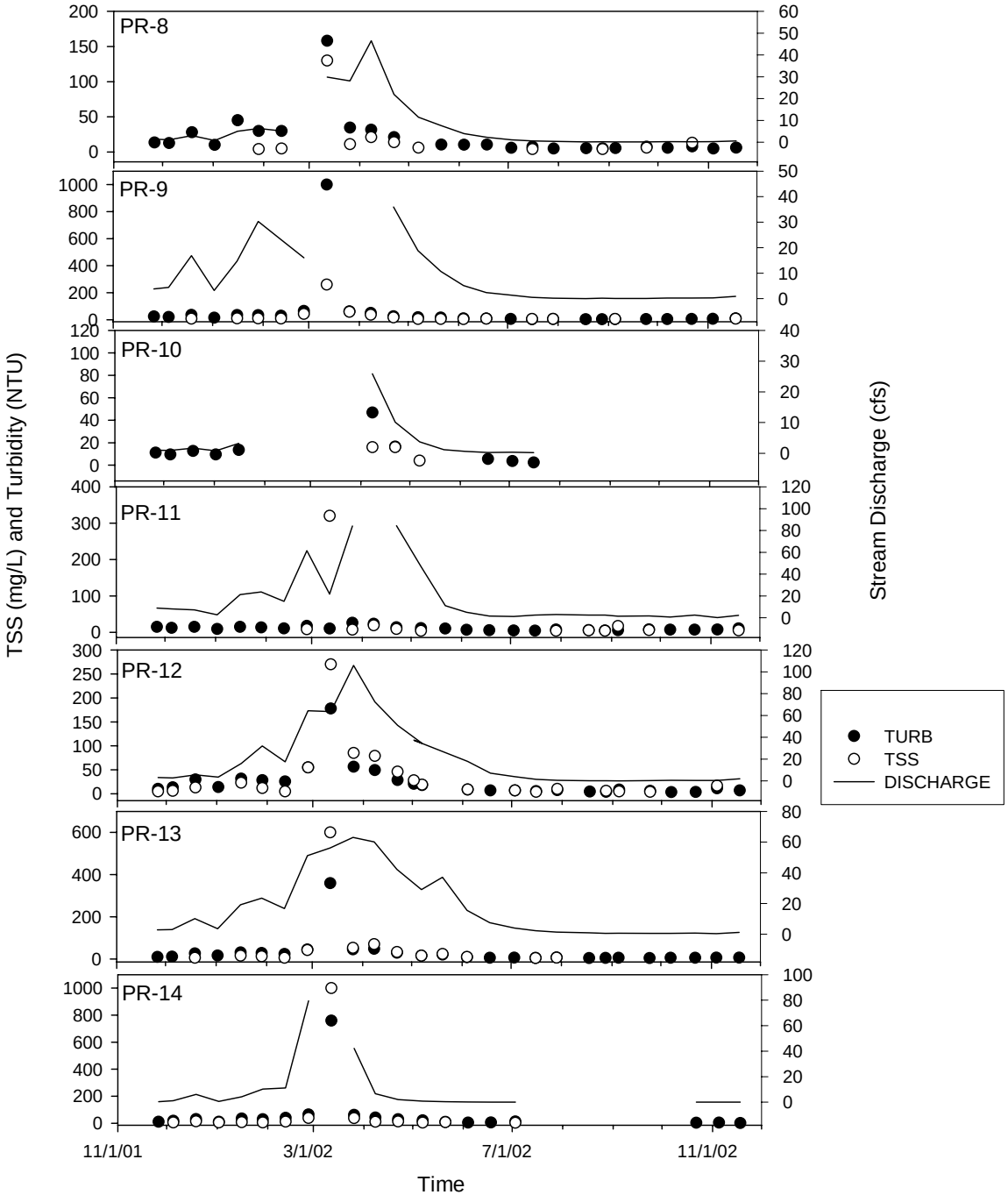

Figure 5. TSS, turbidity, and stream discharge for Palouse River Tributaries monitoring sites.

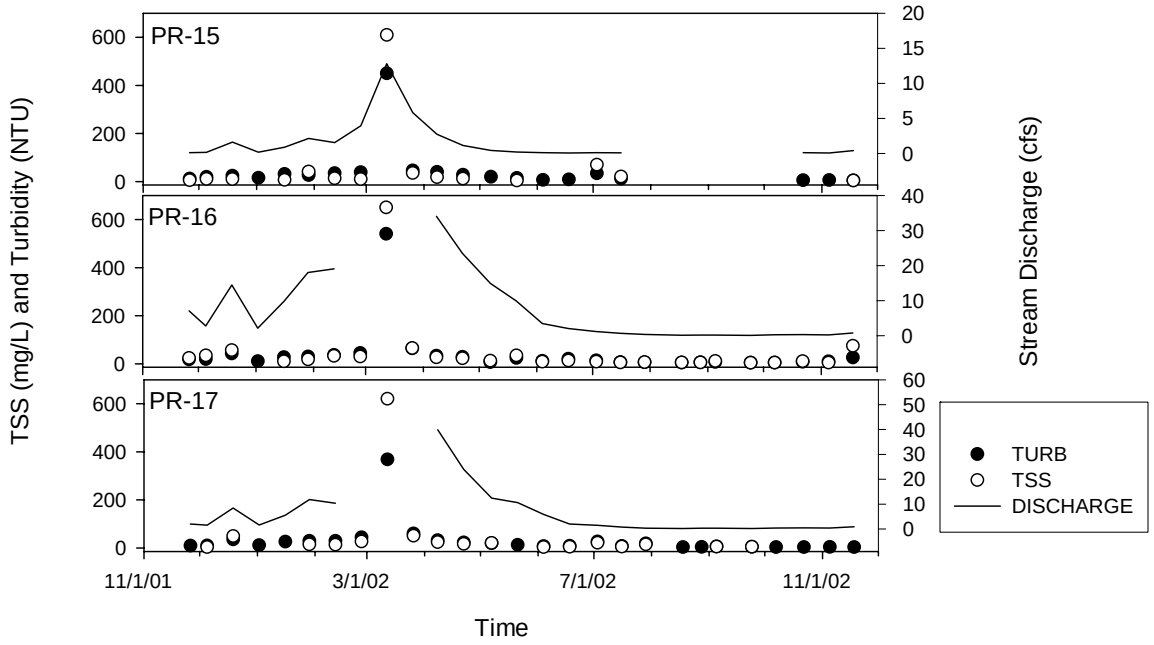

Figure 5. TSS, turbidity, and stream discharge for Palouse River Tributaries monitoring sites.

Nitrate+Nitrite (NO_3+NO_2) and Ammonia (NH_3)

Excessive concentrations of nitrate and/or nitrite can be harmful to humans and wildlife. Although there is no numeric standard in place, some literature claims that numbers above 0.30 mg/L could cause excessive plant growth and possible eutrophication (Cline, 1973 & Golterman, 1975).

Idaho administrative code employs a narrative standard for nutrients, which states that "surface waters of the state shall be free from excess nutrients that can cause visible slime growths or other nuisance aquatic growths impairing designated beneficial uses" (DEQ IDAPA 58.01.02).

High concentrations of nitrate and/or nitrite can also produce "brown blood disease" in fish. Nitrite enters the bloodstream through the gills and turns the blood a chocolate-brown color. As in humans, nitrite reacts with hemoglobin to form methemoglobin. Brown blood cannot carry sufficient amounts of oxygen, and affected fish can suffocate despite adequate oxygen concentration in the water. This accounts for the gasping behavior often observed in fish with brown blood disease, even when oxygen levels are relatively high (Mississippi State University, 1998).

Ammonia is the least stable form of nitrogen in water. Ammonia is easily transformed to nitrate in waters that contain oxygen and can be transformed to nitrogen gas in waters that are

low in oxygen. Ammonia concentrations can affect hatching and growth rates of fish; changes in tissues of gills, liver, and kidneys may occur during structural development.

Ammonia levels were very low throughout the system, although nitrate/nitrite levels were often elevated beyond the 0.30 mg/L threshold suggested as an acceptable limit in the literature. The dashed red lines on the graphs in Figure 5 represent the suggested 0.30 target.

Precipitation, septic tank leakage, organic materials, and poor management of nitrogen fertilizers are the likely sources of nitrogen in these streams. The presence of high nitrogen compound concentrations in surface waters usually indicates organic enrichment via one or more of the aforementioned sources.

Nitrogen levels were highest during spring runoff and decreased substantially in latter months. However, visible slime and other nuisance aquatic growth was visible at a number of monitoring stations throughout the summer months, most notably at the South Fork Palouse River, Gold Creek, Deep Creek, and Flannigan Creek. Flannigan, Deep, and Gold Creek have a substantial number of cattle accessing the creek near the monitoring sites that were established, and are likely the primary cause of the observed vegetative growth.

The South Fork Palouse River has a more suburban aspect to the drainage and septic tank leakage is apt to play a larger role in nutrient contribution than in the other watersheds. There are also a number of horses in the area that have direct access to the stream and certainly contribute nutrients to it as well.

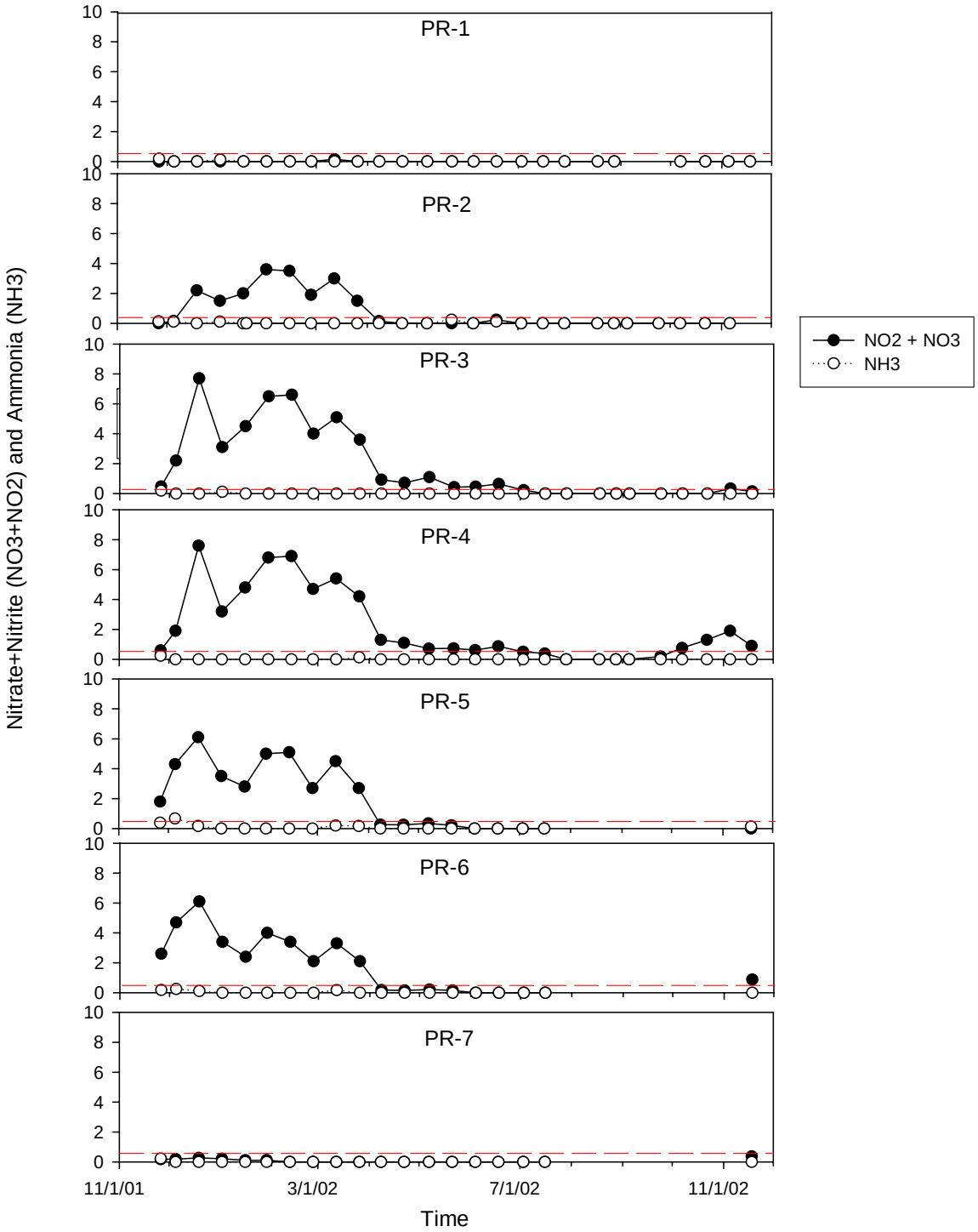

Figure 6. NO2+NO3 and NH3 data collected at Palouse River Tribs. monitoring sites.

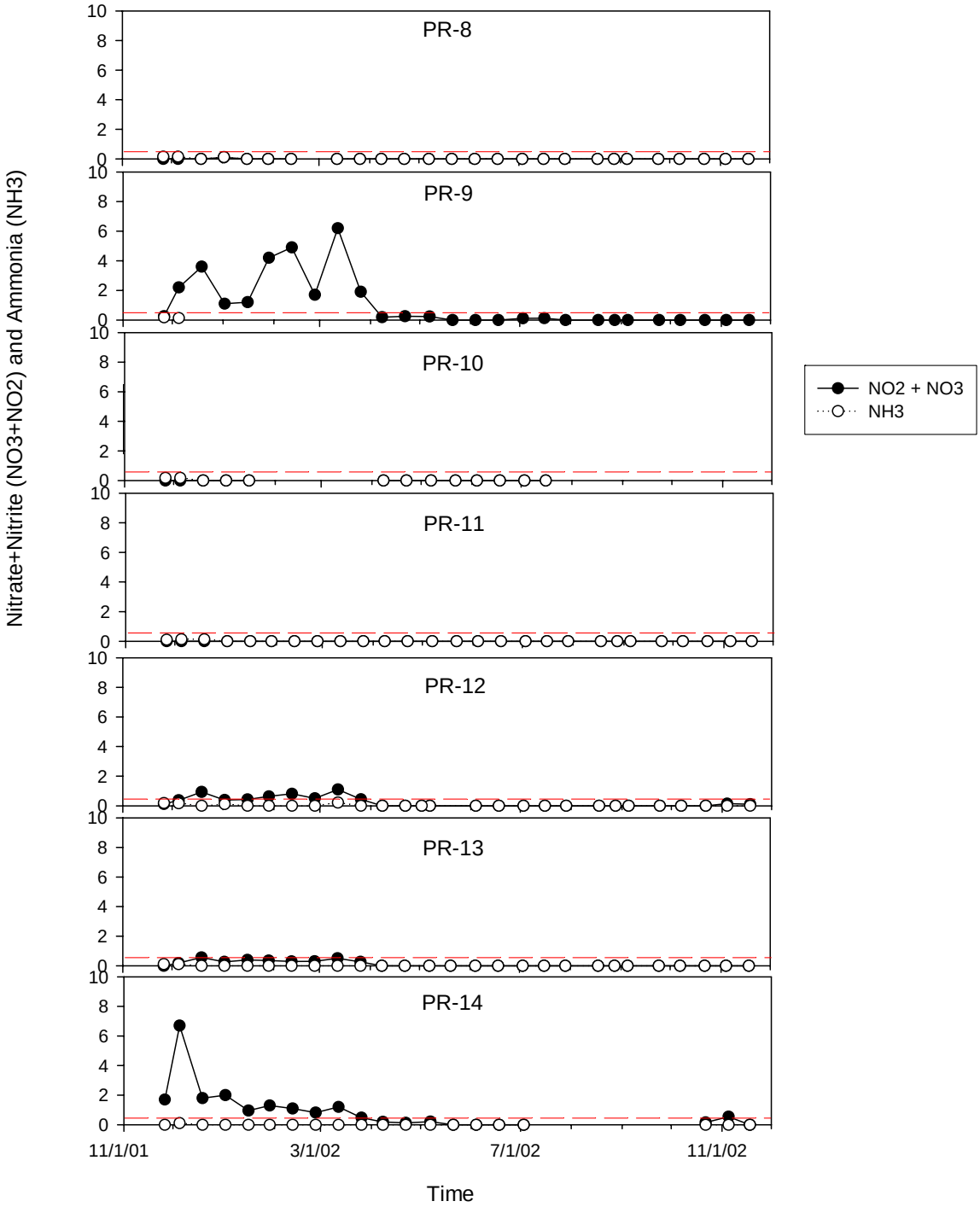

Figure 6. NO2+NO3 and NH3 data collected at Palouse River Tribs. monitoring sites.

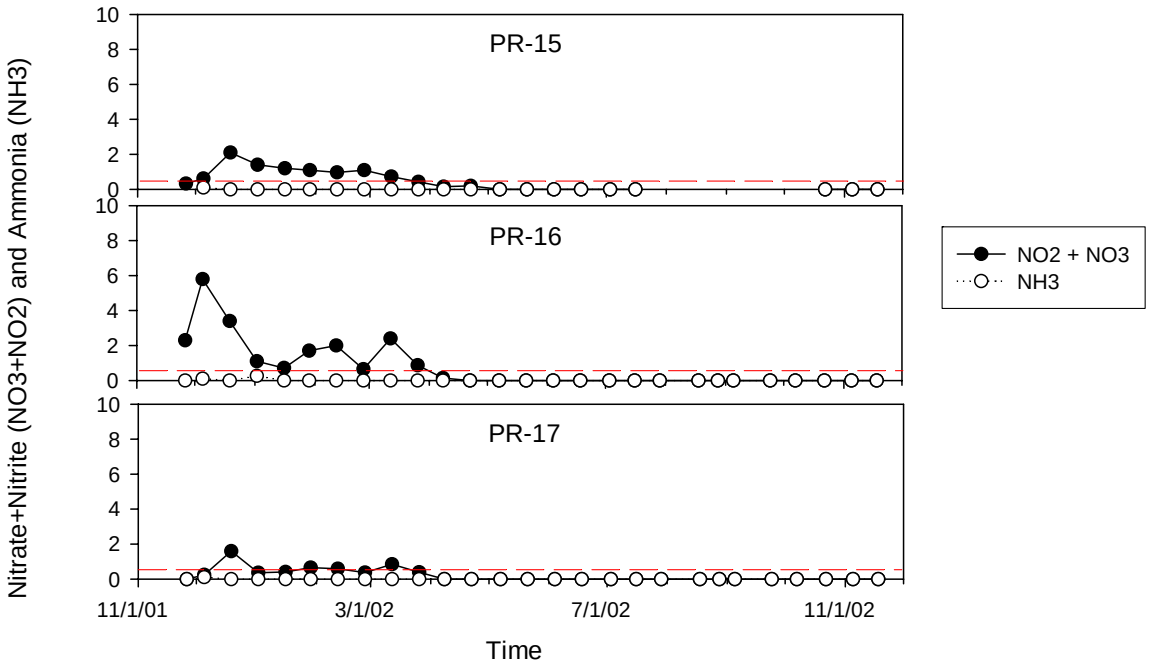

Figure 6. NO2+NO3 and NH3 data collected at Palouse River Tribs. monitoring sites.

Total Phosphorus

Total phosphorus (TP) is a measure of all the forms of phosphorus, dissolved or particulate, that are found in a sample. In freshwater lakes and rivers, phosphorus is often found to be the growth-limiting nutrient, because it occurs in the least amount relative to the needs of plants. If excessive amounts of phosphorus and nitrogen are added to the water, algae and aquatic plants can be produced in large quantities. When these algae die, bacteria decompose them, and use up oxygen. As a result, dissolved oxygen concentrations can drop too low for fish to breathe; leading to fish kills. The loss of oxygen in the bottom waters can free phosphorus previously trapped in the sediments, further increasing the available phosphorus.

The EPA Gold Book criterion for total phosphorus concentrations is 0.10 mg/L for streams or rivers not discharging directly into lakes or reservoirs. With the exception of site PR-10, all sites exceeded the Gold Book criterion.

Phosphorus is not particularly mobile in soil; instead it tends to adhere to soil. Highest phosphorus rates were observed during spring runoff, when soil becomes highly mobile within stream systems and carries the phosphorus load with it. As one would expect, there was a strong correlation between TSS and phosphorus levels. The dashed red line in Figure 7 represents the 0.10 mg/L threshold for total phosphorus.

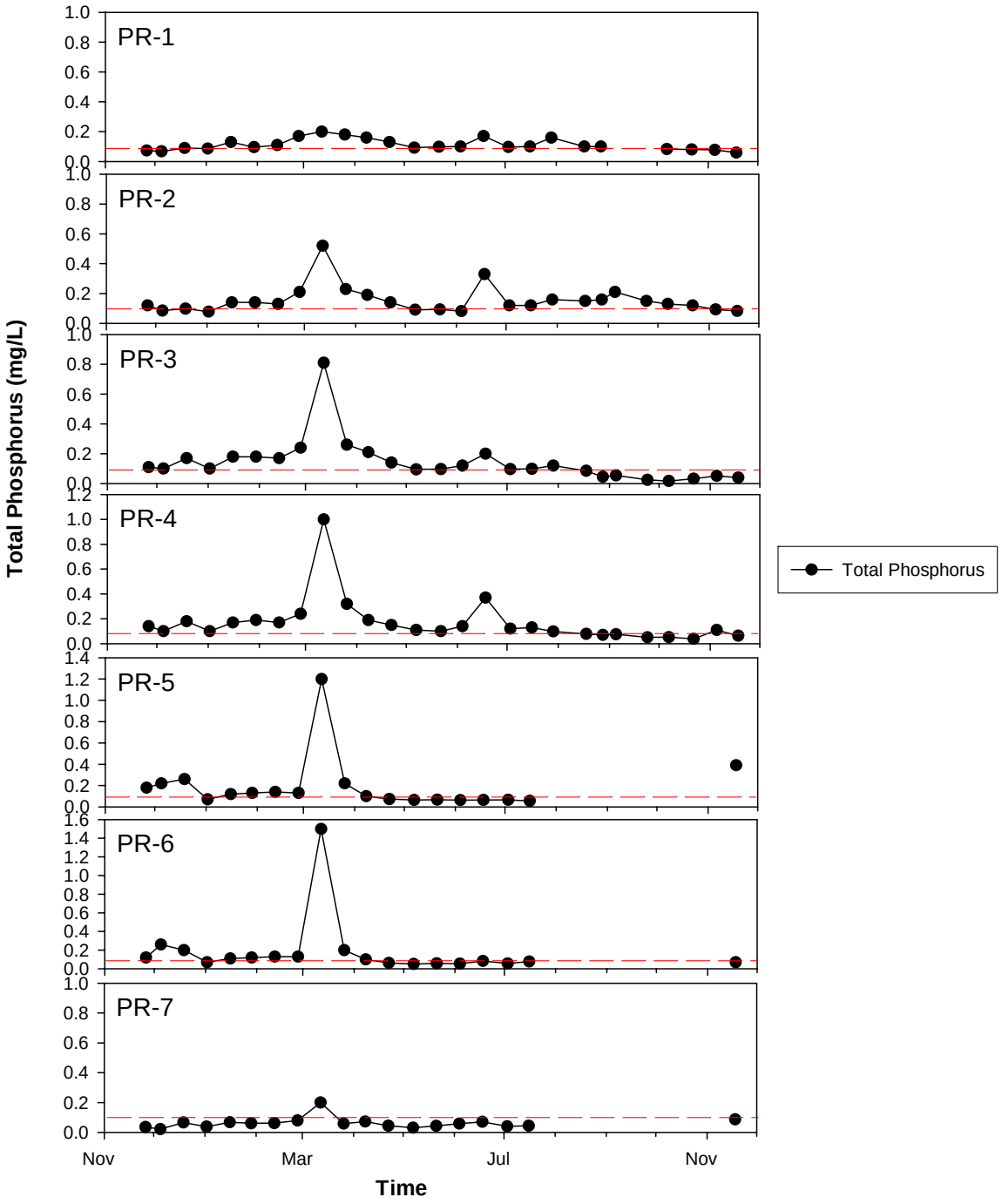

Figure 7. Total Phosphorus (TP) readings for Palouse River Tributaries monitoring sites. The red dashed line shows the TP criteria of 0.1 mg/L.

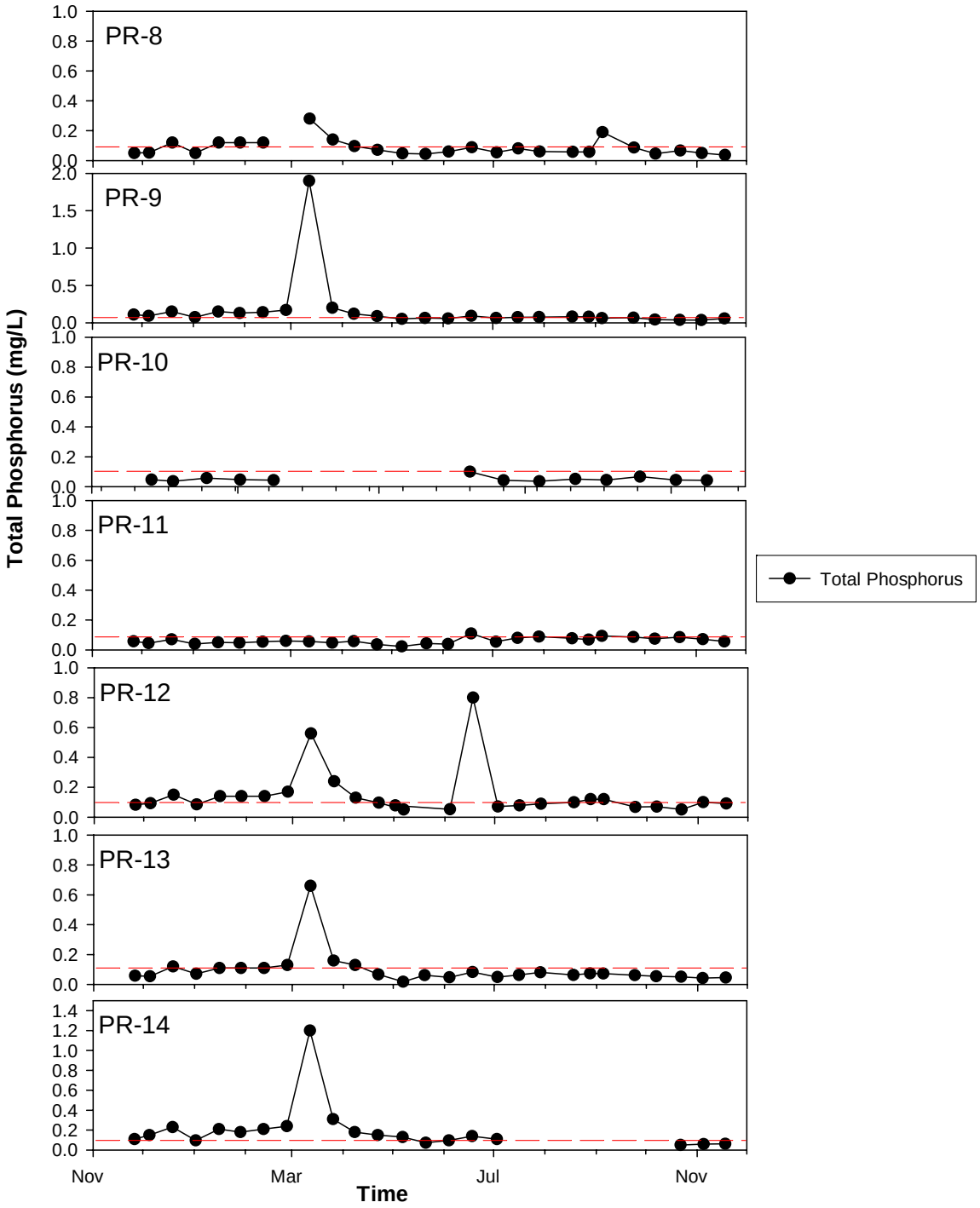

Figure 7. Total Phosphorus (TP) readings for Palouse River Tributaries monitoring sites. The red dashed line shows the TP criteria of 0.1 mg/L.

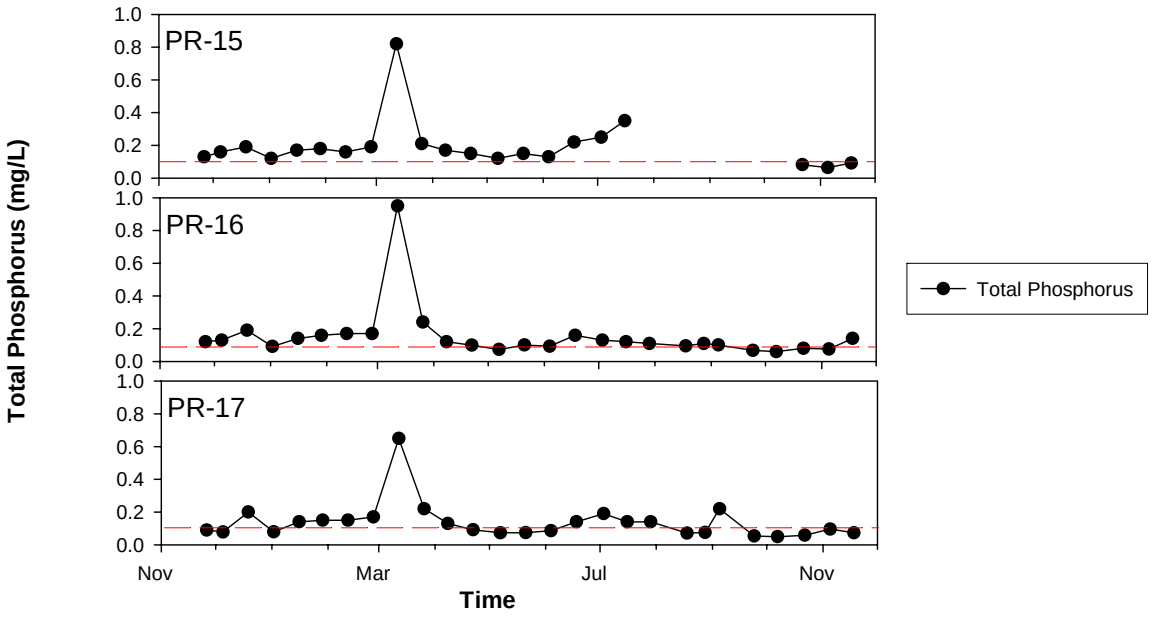

Figure 7. Total Phosphorus (TP) readings for Palouse River Tributaries monitoring sites. The red dashed line shows the TP criteria of 0.1 mg/L.

Bacteria (*Escherichia coli*)

The coliform bacteria group consists of several genera of bacteria belonging to the family *enterobacteriaceae*. These mostly harmless bacteria live in soil, water, and the digestive system of animals. *Escherichia coli* (*E. coli)* is a type of fecal coliform bacteria commonly found in the intestines of animals and humans. The presence of *E. coli* in water is a strong indication of recent sewage or animal waste contamination.

The standard for *E. coli* is that concentrations should not exceed 126 organisms/100 mL, which should be based on the geometric mean (5 samples collected over a 30 day period). The *E. coli* standard for primary contact is not to exceed 406 organisms/100 mL at any time and not to exceed 576 organisms/100 mL at any time for secondary contact. The dashed red line indicates the 576 organism/100mL instantaneous recommendation.

All of the streams monitored are listed for secondary contact, although it should be noted that the Palouse River, into which they all flow, is listed for primary contact from its source to Hatter Creek and for secondary contact from Hatter Creek to Deep Creek.

With the exception of PR-11 (Big Creek), all of the sites sampled exceeded the secondary contact criteria. Many of the sites had the most elevated levels of bacteria during periods of extremely low flow, usually during July and August. There were a few sites, however, that showed elevated bacteria levels even during spring flows, when one might expect low bacteria levels due to dilution. These creeks were the South Fork Palouse (PR1-4), Deep Creek (PR-5-7), Gold Creek (PR-9), Hatter Creek (PR-12-13), and Flannigan Creek (PR-16). All of these streams had cattle, horses, sheep, or goats directly accessing them in areas adjacent to or directly at the monitoring sites. In addition to these obvious sources of bacteria contamination, there are farmhouses and suburban residences near these streams and possible contamination from faulty septic systems must not be overlooked.

E. coli bacteria levels are illustrated in Figure 8. The dashed red line represents the 576-organism/100mL threshold for secondary contact.

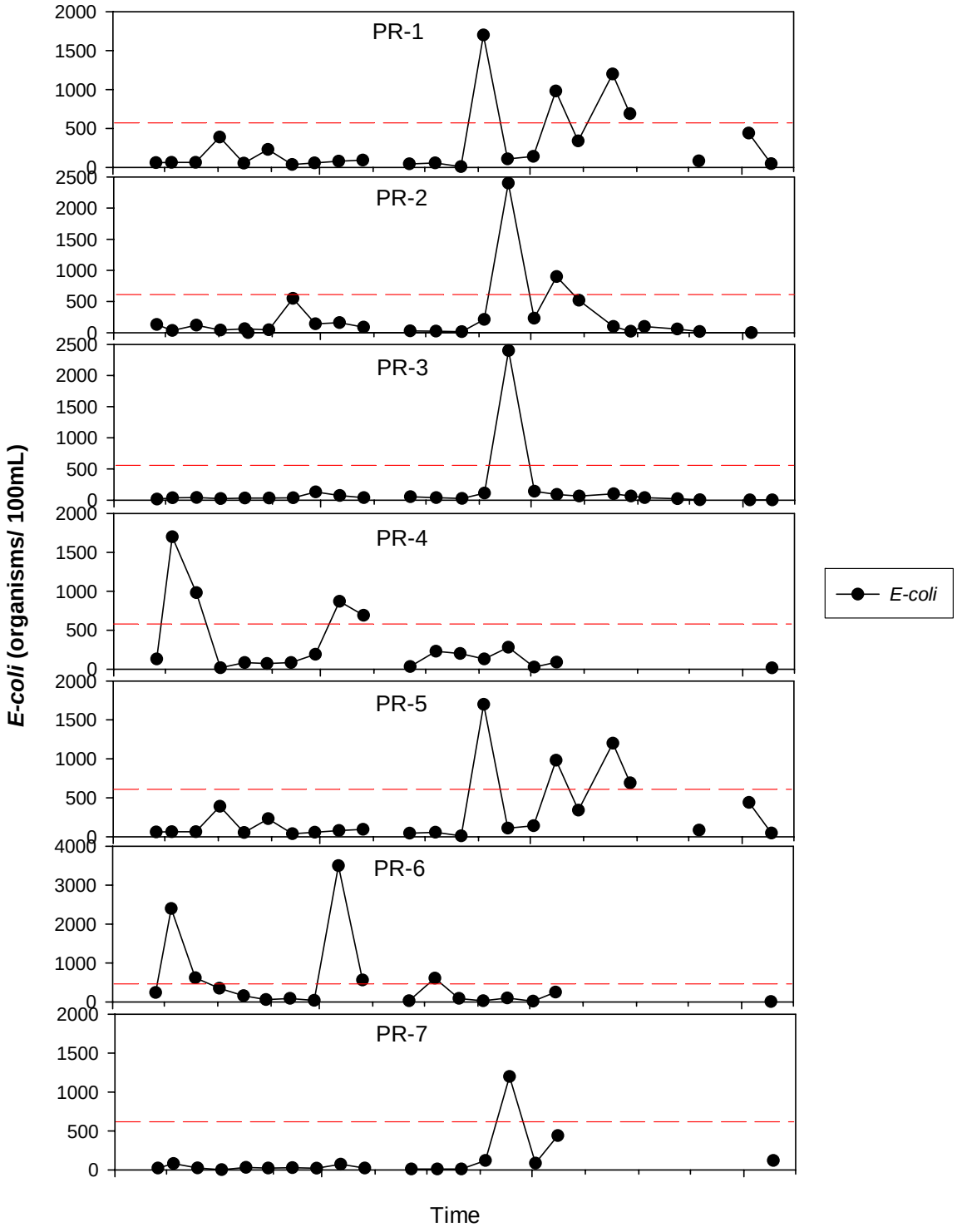

Figure 8. *E. Coli* data collected at Palouse River Tribs. monitoring sites from November 26, 2001 to November 18, 2002.

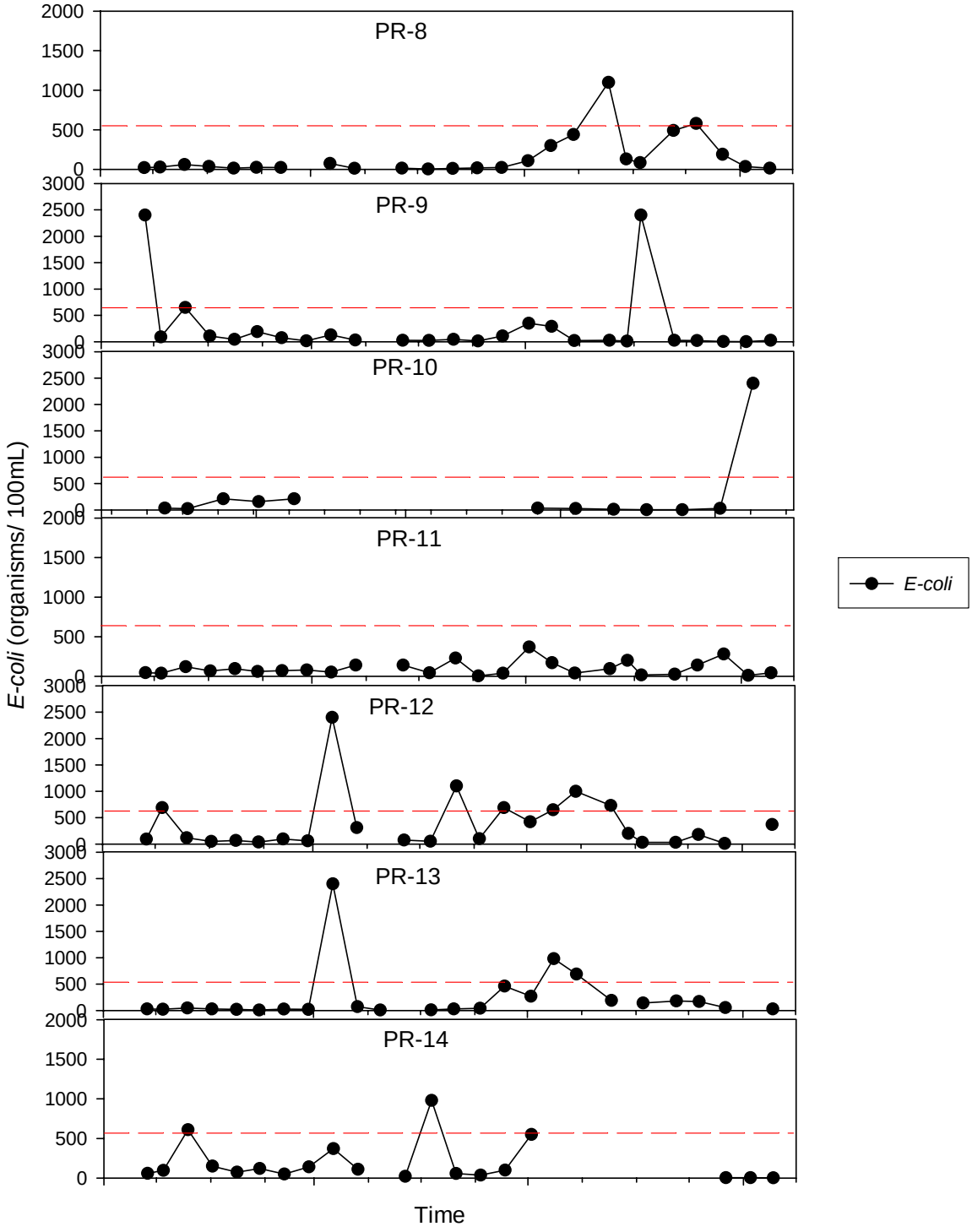

Figure 8. *E. Coli* data collected at Palouse River Tribs. monitoring sites from November 26, 2001 to November 18, 2002.

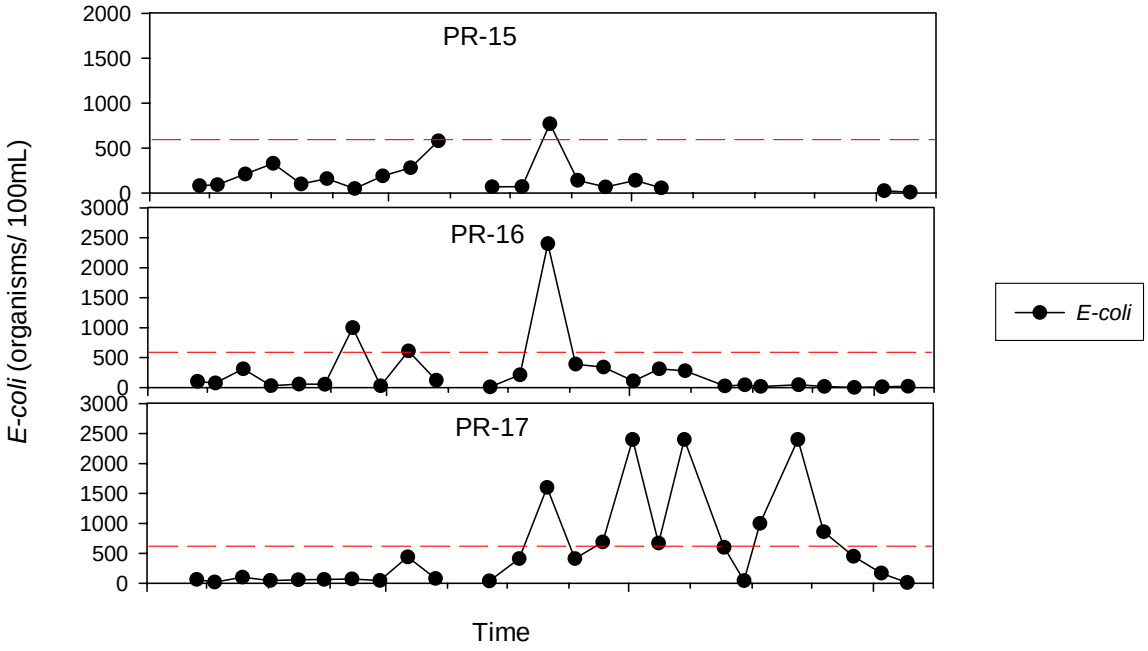

Figure 8. *E. Coli* data collected at Palouse River Tribs. monitoring sites from November 26, 2001 to November 18, 2002.

Water Quality Exceedances Summary

The most significant problem facing the Palouse River watershed appears to be soil erosion (both in-channel and runoff) and the resultant increase in phosphorus levels, as illustrated in Table 5. In order to better visualize individual sites as part as a system, as well as for the sake of simplification, waterbody exceedances are listed by stream, rather than site. It should be noted, however, that monitoring sites near the headwater of streams often had a lower number of exceedances than did sites near the mouth of streams.

Table 5. Mean percent exceedances over target levels.

Waterbody	**ID #**	**Parameters of Concern-Mean % Exceedance**			
		Dissolved Oxygen	Temperature	Total Phosphorus	E. coli
South Fork Palouse River	PR 1-4	8.49%	19.81%	53.77%	8.16%
Deep Creek	PR 5-7	7.02%	5.26%	35.09%	13.33%
Gold Creek	PR 8-9	1.89%	7.55%	30.19%	9.80%
Big Creek	PR11	7.4%	0%	3.70%	0%
Hatter Creek	PR 12-13	3.7%	0%	35.19%	24.49%
Rock Creek	PR 14-15	2.63%	0%	84.21%	12.82%
Flannigan Creek	PR 16-17	1.85%	5.56%	53.70%	23.08%

Conclusions

The monitoring program for Palouse River Tributaries was successfully carried out as planned. Protocols were followed, QA/QC standards were met, and specific information per TMDL parameter for each subwatershed was collected. The data collected during this reconnaissance-monitoring project will be used in TMDL development as well as to help define critical areas within the watershed for placement of agricultural BMPs.

Sediment, phosphorus, and pathogens are the primary pollutants within the Palouse River subbasin. Water temperature, dissolved oxygen levels, and nitrate/nitrite levels are also a concern in a number of creeks, most notably on the South Fork Palouse River.

Unlike nitrogen, phosphorus is not particularly mobile in soils. Instead, erosion transports phosphorous attached to soil particles. Excess fertilization and manure production often cause a phosphorus surplus, which accumulates in soil. Some of this surplus is transported in soil runoff to aquatic ecosystems. Stream bank erosion and re-suspension of phosphorus in stream sediments can contribute significant portions of the overall phosphorus load of streams that drain both agricultural and non-agricultural areas.

Recommendations

Surface water pollution by phosphorus is controllable, through the reduction of soil erosion rates and by keeping soil out of creeks, rivers, and lakes. A number of BMPs exist for fertilizer and manure management, as well as soil erosion control. Water quality protection BMPs to be considered include: nutrient management, buffer (filter) strips, conservation tillage and residue management, barnyard/ feedlot runoff control, crop rotation, cover crops, and mulching. Fertilizer recommendations and soil sampling should be based on a nutrient management plan (NRCS Standard 590), and University of Idaho Extension soil testing and fertilizer guides. Implementation of targeted stream improvements to reduce phosphorus loads will be important. Based on stream inventory and prioritization efforts, stakeholders must fund, devise, and construct high priority stream improvements designed to include water quality enhancement.

Significant erosion is currently evident in a considerable number of streams, and treatment should be prioritized to streams that are already undergoing severe erosion. Based on visual assessments, TSS rates, and turbidity levels, the South Fork Palouse River, Hatter Creek, Flannigan Creek, Gold Creek, and Deep Creek seem to have the highest rates of bank erosion. Hatter and Flannigan also appear to have more cattle accessing the stream than any other stream in the subbasin, although cattle, horses, and goats were noticed in lesser concentrations on Deep, Gold, and Rock creeks, respectively. The South Fork Palouse River has horses accessing the stream in a number of areas, as well as agricultural fields directly abutting the stream. Fencing out the horses and creating riparian buffers on the agricultural land would go a long way in reducing the sediment load in this stream.

Bacteria were also found to be a significant pollutant in the watershed. As indicated before, livestock are found in varying concentrations throughout region and have noticeably impacted many of the sampling sites. There were many instances, however, when cattle were not present yet bacteria levels exceeded criteria. This is most likely due to faulty septic systems in the area, although wildlife may also be a contributing factor. Fencing cattle away from creeks and developing off-stream watering facilities would likely be the most cost-effective method to reduce bacteria levels in many areas. *E. coli* DNA testing may be an option one could pursue if there is some debate regarding the source of the excess bacteria in these systems. This method would entail developing a library of DNA fingerprints of *E. coli* strains isolated from various potential sources and comparing these fingerprints with the fingerprints of samples collected in streams. A relative percentage of source species could then be developed, and proper management strategies could be devised.

The data found herein is being used in TMDL development, and should be looked at closely when a conservation/ implementation plan is created for the subbasin. This water quality monitoring was conducted in order to give adequate definition to water quality problems in the area. Now that the pollutants of concern have been identified and quantified, BMPs can be put in place to help mitigate them. It is recommended that further monitoring be conducted in order to evaluate the overall effectiveness of BMPs put on the ground.

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Appendix A

Palouse River Tributaries Raw Data
(November 2001- November 2002)

Appendix A Tributaries of the Palouse River raw data

PR1-date	PR1-time	PR1-do	PR1-%sat	PR1-temp	PR1-cond	PR1-tds	PR1-ph	PR1-turb	PR1-tss	PR1-nn	PR1-NH3	PR1-tp	PR1-tcol	PR1-ecoli	PR1-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(°C)	(µS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	8:09	12.07	86.40%	1.6	121.5	58	9.04	8.07	7	BDL	0.18	0.073	>2400	61	0.13655	clear
12/5/2001	8:35	12.88	89.10%	0.3	188	56	8.93	5.94	BDL	BDL	BDL	0.068	820	64	0.20475	clear
12/19/2001	8:52	13.01	90.50%	0.6	111.3	53	8.31	12.3	BDL	BDL	BDL	0.09	>2400	63	0.30545	clear
1/2/2002	8:40	12.79	89.30%	0.8	101.8	48	8.22	10.1	5	BDL	0.12	0.086	2200	390	0.20045	clear
1/16/2002	8:45	12.2	85.70%	1	89.5	42	8.38	50.3	5	BDL	BDL	0.13	870	53	0.93335	milky
1/30/2002	9:00	12.85	88.30%	0.2	121.9	59	8.42	24.2	BDL	BDL	BDL	0.096	1100	230	0.68205	cloudy
2/13/2002	8:40	12.93	89.50%	0.4	72	34	7.76	21.1	BDL	BDL	BDL	0.11	690	37	0.718	clear
2/26/2002	14:20	12.18	87.80%	1.8	56	27	7.3	37.5	10	BDL	BDL	0.17	980	57	3.2407	cloudy
3/12/2002	8:30	12.06	87.50%	2.1	50	25	7.2	83.1	19	0.14	BDL	0.2	>2400	79	10.5521	cloudy
3/26/2002	8:30	11.26	83.80%	3	48.8	24	7.3	38.6	14	BDL	BDL	0.18	2000	93	7.08725	cloudy
4/8/2002	16:00	10.15	81.20%	5.8	40.5	21	7.4	40.9	24	BDL	BDL	0.16			8.82175	cloudy
4/22/2002	16:00	10.75	89.50%	7.4	38.2	20	7.4	30.6	13	BDL	BDL	0.13	610	45	3.219225	clear
5/7/2002	8:30	12.34	91.40%	2.9	46.7	23	7.1	19.6	BDL	BDL	BDL	0.092	>2400	56	1.63955	clear
5/22/2002	8:30	10.12	81.40%	6	44.7	22	7.7	18.2	BDL	BDL	BDL	0.098	490	9	0.8829	clear
6/4/2002	8:30	8.87	78.40%	10	49.5	26	7.8	16.3	4	BDL	BDL	0.1	330	1700	0.46025	clear
6/18/2002	8:30	9.5	84.5	10.2	52.8	28	7.8	20.3	13	BDL	BDL	0.17	>2400	110	0.722	clear
7/3/2002	9:00	8.47	76.4	10.6	65	38	8	8.33	BDL	BDL	BDL	0.097	1700	140	0.2117	clear
7/16/2002	14:00	8.34	86.1	14.9	67.5	36	7.1	7.12	4	BDL	BDL	0.1	2400	980	0.08085	clear
7/29/2002	8:30	8.25	77.7	12.7	71.6	38	8.2	13.1	30	BDL	BDL	0.16	>2400	340	0.09945	clear
8/18/2002	9:00	8.6	76.8	10.4	76.9	39	7.1	5.8	6	BDL	BDL	0.1	>2400	1200	0.0513	clear
8/28/2002	8:30	7.8	71.9	11.8	72.8	38	6.9	5.86	BDL	BDL	BDL	0.1	>2400	690	0.04665	clear
9/5/2002																dry
9/24/2002																
10/7/2002	9:00	9.31	74.2	5.7	81	40	8.2	5.69	BDL	BDL	BDL	0.083	>2400	83	0.033525	clear
10/22/2002	9:00	9.13	71.3	4.8	78.1	39	8.3	10.2	6	BDL	BDL	0.08			0.043775	clear
11/5/2002	8:00	12.5	85.7	0.1	78.6	38	8.5	6.65	BDL	BDL	BDL	0.077	>2400	440	0.1448	clear
11/18/2002	13:50	10.3	81.4	4.6	79.1	39	7.7	6.42	BDL	BDL	BDL	0.059	>2400	47	1.2162	clear

PR2-date	PR2-time	PR2-do	PR2-%sat	PR2-temp	PR2-cond	PR2-tds	PR2-ph	PR2-turb	PR2-tss	PR2-nn	PR2-NH3	PR2-tp	PR2-tcol	PR2-ecoli	PR2-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^{0}C)	(µS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100mL	Coli/100mL	(cfs)	
11/26/2001	8:42	11.66	83.10%	1.5	126.2	60	8.82	8.3	BDL	BDL	0.13	0.12	>2400	130	0.67125	dingy
12/5/2001	9:17	12.61	86.90%	0.1	128.5	60	7.17	6.96	BDL	0.15	0.11	0.085	610	34	0.4565	clear
12/19/2001	9:15	13.11	89.90%	0.1	162.6	76	7.48	13.9	BDL	2.2	BDL	0.098	>2400	120	1.6558	cloudy
1/2/2002	9:30	11.91	81.60%	0.1	154	73	7.31	11.7	BDL	1.5	0.11	0.078	2400	41	0.8702	cloudy
1/16/2002	9:00	13.17	90.80%	0.3	143.4	68	7.32	39.7	8	2	BDL	0.14	2400	63	3.58275	cloudy
1/30/2002	9:17	12.91	88.10%	0	122.6	57	7.98	24	7	3.6	BDL	0.14	2400	45	6.074025	cloudy
2/13/2002	9:00	13.1	90.20%	0.2	119	96	7.63	21.9	7	3.5	BDL	0.13	>2400	550	6.9106	cloudy
2/26/2002	14:50	12.22	88.00%	0.6	84.1	40	7.2	49.2	48	1.9	BDL	0.21	>2400	140	19.6765	cloudy
3/12/2002	9:00	10.54	74.70%	1.4	74	37	7.1	167	330	3	BDL	0.52	>2400	160	too deep	cloudy
3/26/2002	9:00	11.42	84.90%	3	64	31	7.3	51.6	60	1.5	BDL	0.23	>2400	88	35.2425	cloudy
4/8/2002	16:30	10.14	82.10%	6.3	42	21	7.3	47	55	0.14	BDL	0.19			21.4623	muddy
4/22/2002	16:30	11.11	91.40%	7.5	41.9	22	7.3	35.7	41	BDL	BDL	0.14	2000	28	12.9174	cloudy
5/7/2002	8:45	12.22	90.70%	3	41	21	7.2	25	18	BDL	BDL	0.091	>2400	24	8.5216	cloudy
5/22/2002	9:00	10.19	81.70%	5.7	36	18	7.6	15.3	10	BDL	0.23	0.093	980	15	7.0822	clear
6/4/2002	9:00	9.08	79.80%	9.9	39.6	20	7.6	11.7	14	BDL	BDL	0.082	1700	210	3.899	clear
6/18/2002	9:00	9.1	81.8	11	66.7	35	7.7	39.4	37	0.24	0.12	0.33	>2400	>2400	2.832	cloudy
7/3/2002	9:15	8	73.2	11.4	55	28	7.7	8.46	6	BDL	BDL	0.12	6900	230	1.2077	clear
7/16/2002	14:30	8.05	86.2	18.9	55.6	30	7.2	9.99	9	BDL	BDL	0.12	>2400	900	0.53	clear
7/29/2002	9:02	6.27	62.4	15.2	61.1	32	7.6	8.57	8	BDL	BDL	0.16	>2400	520	0.396825	clear
8/18/2002	10:00	8.24	77.5	12.6	59.8	32	6.9	10.7	8	BDL	BDL	0.15	>2400	100	0.5474	cloudy
8/28/2002	9:00	7.04	68.5	13.7	62.7	33	7	8.91	BDL	BDL	BDL	0.16	>2400	21	0.6658	clear
9/5/2002	9:00	7.55	73.2	13.7	64	33	7.6	6.35	15	BDL	BDL	0.21	>2400	100	0.3802	clear
9/24/2002	9:30	5.25	44.5	8.1	71	36	8	8	9	BDL	BDL	0.15	>2400	59	0.2976	clear
10/7/2002	9:30	9.66	78.8	6.6	72.3	36	8	7.78	BDL	BDL	BDL	0.13	>2400	17	0.1926	clear
10/22/2002	9:30	9.18	71.6	5	77.9	39	8.1	6.59	4	BDL	BDL	0.12			0.4252	clear
11/6/2002	9:00	11.9	81.9	0.2	73.9	25	8.2	7.92	BDL	BDL	BDL	0.093	1700	2	0.3522	clear
1/18/2002	14:00	9.3	72.3	4.6	76.1	38	7.6	6.01	BDL	BDL	BDL	0.083	2400	2	0.49785	clear

PR3-date	PR3-time	PR3-do	PR3-%sat	PR3-temp	PR3-cond	PR3-tds	PR3-ph	PR3-turb	PR3-tss	PR3-nn	PR3-NH3	PR3-tp	PR3-tcol	PR3-ecoli	PR3-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(µS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100mL	Coli/100mL	(cfs)	
11/26/2001	9:25	12.59	91.30%	2.1	241	116	8.94	13	8	0.47	0.19	0.11	>2400	15	1.264	dingy
12/5/2001	9:48	12.84	88.10%	0.2	293	140	9.05	11	6	2.2	BDL	0.1	>2400	36	3.635	cloudy
12/19/2001	9:50	10.61	76.00%	1.5	342	163	8.94	32.6	26	7.7	BDL	0.17	>2400	40	3.3485	cloudy
1/2/2002	9:45	11.76	81.60%	0.5	291	139		14.1	11	3.1	0.11	0.1	>2400	23	1.524	cloudy
1/16/2002	9:35	12	82.40%	0.4	245	116	8.32	42.9	14	4.5	BDL	0.18	1200	31	9.144	muddy
1/30/2002	10:00	12.25	84.90%	0.5	197.2	91	7.47	27.3	11	6.5	BDL	0.18	>2400	31	14.9791	cloudy
2/13/2002	9:30	13	90.10%	0.5	244	115	8.03	25.1	9	6.6	BDL	0.17	1700	36	17.24955	muddy
2/26/2002	15:30	12.3	85.10%	0.4	122	59	7.3	64.1	74	4	BDL	0.24	>2400	130	52.8507	cloudy
3/12/2002	9:30	11.73	83.90%	1.5	116	56	7.1	328	530	5.1	BDL	0.81	>2400	74	too deep	muddy
3/26/2002	9:45	11.08	83.40%	3.5	110	55	7.4	64	74	3.6	BDL	0.26	>2400	38	84.5185	muddy
4/8/2002	16:45	10.18	86.50%	8.6	71.3	37	7.5	58.3	32	0.92	BDL	0.21			too deep	cloudy
4/22/2002	8:30	12.68	80.80%	4.8	73.8	37	7.9	37.6	28	0.71	BDL	0.14	1500	53	25.061	muddy
5/7/2002	9:30	11.82	93.60%	5.3	92.2	46.3	7.5	25.3	12	1.1	BDL	0.095	>2400	39	15.89	cloudy
5/22/2002	9:30	10.36	86.00%	7.3	72.6	37	7.8	15.5	10	0.42	BDL	0.097	730	25	8.8028	cloudy
6/4/2002	9:30	8.07	80.20%	15.1	11.7	77.3	7.6	41	8	0.46	BDL	0.12	2000	110	4.8949	clear
6/18/2002	10:00	7.42	73	14.7	103.8	54	7.6	42.9	34	0.64	BDL	0.2	>2400	>2400	4.3281	muddy
7/3/2002	9:30	10.16	103.9	17.4	114	60	8.2	7.72	6	0.22	BDL	0.097	3500	140	1.40295	clear
7/16/2002	15:00	13.32	173.4	29.4	130.2	69	9.3	7.95	5	BDL	BDL	0.098	1800	90	0.6753	cloudy
7/29/2002	10:00	9.52	103.8	19.4	161.7	88	9.2	7.57	7	BDL	BDL	0.12	>2400	65	0.71055	clear
8/18/2002	10:45	10.55	115.8	19.6	175.6	94	8.6	9.14	8	BDL	BDL	0.085	>2400	100	0.3652	clear
8/28/2002	10:00	8.43	87.3	17.6	195.4	103	8	4.16	BDL	BDL	BDL	0.045	1400	64	0.32105	clear
9/5/2002	14:30	11.72	120.6	17.1	180	95	8.8	6.43	7	BDL	BDL	0.055	920	39	0.29015	clear
9/24/2002	10:00	8.03	71.8	10.3	210	109	8.2	2.66	4	BDL	BDL	0.025	120	20	0.12915	clear
10/7/2002	10:00	8.88	74.7	7.9	195	99	7.9	4.6	BDL	BDL	BDL	0.017	870	4	0.4042	clear
10/22/2002	10:00	10.26	81.6	5.8	194.8	100	8.2	7.82	BDL	BDL	BDL	0.033			0.498	clear
11/5/2002	10:00	11.12	77.7	0.7	185	90	8	9.06	10	0.33	BDL	0.051	>2400	1	0.47425	clear
11/18/2002	14:40	13.19	103.5	5.9	141.2	70	7.8	4.13	BDL	0.14	BDL	0.04	>2400	1	0.45115	clear

PR4-date	PR4-time	PR4-do	PR4-%sat	PR4-temp	PR4-cond	PR4-tds	PR4-ph	PR4-turb	PR4-tss	PR4-nn	PR4-NH3	PR4-tp	PR4-tcol	PR4-ecoli	PR4-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(µS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	9:45	10.12	74.10%	2.4	392	193	8.18	9.15	18	0.59	0.24	0.14	>2400	15	none	still
12/5/2001	10:28	11.54	80.80%	0.8	460	215	8.2	10.2	BDL	1.9	BDL	0.1	1700	62	none	murky
12/19/2001	10:18	9.66	67.50%	0.2	431	205	8.25	25.6	6	7.6	BDL	0.18	>2400	110	none	murky
1/2/2002	10:04	11.42	79.00%	0.2	428	205		7.11	BDL	3.2	BDL	0.1	>2400	10	none	cloudy
1/16/2002	10:00	12.2	83.60%	0.2	283	135	7.83	44.8	20	4.8	BDL	0.17	2000	60	none	muddy
1/30/2002	10:20	12.55	86.40%	0.1	243	113	7.46	24.2	9	6.8	BDL	0.19	>2400	76	18.1404	muddy
2/13/2002	10:00	13.25	91.00%	0.2	246	120	6.67	23.9	11	6.9	BDL	0.17	2400	50	23.53875	muddy
2/26/2002	15:40	12.22	83.90%	0.3	90.3	45	7.5	68.7	71	4.7	BDL	0.24	>2400	66	none	muddy
3/12/2002	10:00	11.06	80.10%	2	111	54	7.3	474	560	5.4	BDL	1	>2400	200	none	muddy
3/26/2002	10:00	10.8	84.00%	5.1	126	63	7.5	83.1	100	4.2	0.13	0.32	>2400	140	none	muddy
4/8/2002	17:00	10.18	90.20%	9.9	92	47	8.9	55.2	33	1.3	BDL	0.19				muddy
4/22/2002	9:00	12.25	91.60%	5.6	99	50	7.9	40	27	1.1	BDL	0.15	1300	40	24.3635	cloudy
5/7/2002	10:00	12.57	99.70%	5.4	121.6	60	7.8	21.5	16	0.71	BDL	0.11	>2400	52	15.04895	cloudy
5/22/2002	10:00	9.64	81.30%	7.9	107.4	55	7.8	14.7	9	0.73	BDL	0.1	1300	53	11.08275	cloudy
6/4/2002	10:00	6.08	62.60%	16.8	132.3	70	7.7	11.3	10	0.62	BDL	0.14	>2400	220	5.5047	clear
6/18/2002	10:30	5.79	58.1	15.5	109.6	95	76	21.9	21	0.87	BDL	0.37	>2400	920	6.2598	muddy
7/3/2002	10:00	6.33	65.2	17.1	213	113	7.8	18	BDL	0.5	BDL	0.12	>2400	150	1.86875	clear
7/16/2002	15:30	7.9	91.9	22.1	271	145	8	4.33	BDL	0.39	BDL	0.13	>2400	31	1.5925	clear
7/29/2002	11:00	4.84	51.4	17.9	345	184	7.8	5.55	6	BDL	BDL	0.098	>2400	68	2.1448	cloudy
8/18/2002	12:00	5.72	56.9	15.3	324	173	7.6	6.94	5	BDL	BDL	0.078	2400	59	3.5136	cloudy
8/28/2002	10:30	4.69	46.5	14.8	409	218	7.5	3.31	BDL	BDL	BDL	0.07	2400	86	2.0715	clear
9/5/2002	15:00	4.84	46.5	14	349	185	7.8	4.17	BDL	BDL	BDL	0.075	2400	33	1.56935	clear
9/24/2002	10:30	5.14	46.6	8.2	420	219	8	3.65	BDL	0.19	BDL	0.051	>2400	28	0.3074	clear
10/7/2002	10:30	5.57	47.4	7.6	391	203	7.7	5.18	BDL	0.76	BDL	0.052	>2400	7	0.4928	clear
10/22/2002	10:30	4.9	37.4	4.2	390	196	7.8	4.7	BDL	1.3	BDL	0.038			4.3856	clear
11/5/2002	10:30	9.13	64.2	1.1	367	179	7.9	6.22	7	1.9	BDL	0.11	2400	4	too deep	clear
11/18/2002	14:55	7.56	52.8	5.4	272	135	7.6	2.2	BDL	0.9	BDL	0.064	410	2	too deep	clear

PR5-date	PR5-time	PR5-do	PR5-%sat	PR5-temp	PR5-cond	PR5-tds	PR5-ph	PR5-turb	PR5-tss	PR5-nn	PR5-NH3	PR5-tp	PR5-tcol	PR5-ecoli	PR5-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(µS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	11:15	11.74	86.20%	2.5	240	118	9.32	26.2	14	1.8	0.38	0.18	>2400	130	4.66925	murky
12/5/2001	8:00	11.81	81.40%	0.3	342	162	8.56	25.5	9	4.3	0.67	0.22	>2400	1700	7.174	murky
12/19/2001	8:00	15	102.80%	0	331	156	8.76	39.3	33	6.1	0.16	0.26	>2400	980	16.4832	cloudy
1/2/2002	9:08	13.29	90.60%	0	275	129	8.3	10.4	BDL	3.5	BDL	0.071	980	16	5.8915	cloudy
1/16/2002	12:38	9.67	68.40%	1.2	167	75	8.62	36.4	13	2.8	BDL	0.12	1700	84	28.3933	cloudy
1/29/2002	13:00	14.76	101.10%	0	149	72	7.9	23.9	12	5	BDL	0.13	>2400	72	too deep	cloudy
2/12/2002	12:40	12.75	88.20%	0.5	170	84	6.92	30.8	28	5.1	BDL	0.14	2400	84	too deep	muddy
2/26/2002	12:30	12.73	87.30%	0.1	90.3	45	7.3	39.6	27	2.7	BDL	0.13	>2400	190	too deep	muddy
3/12/2002	11:30	11.89	85.40%	1.7	125	60	7.3	1000	1100	4.5	0.2	1.2	>2400	870	too deep	muddy
3/26/2002	12:30	11.27	85.20%	3.6	53.5	27	7.4	60.1	80	2.7	0.16	0.22	>2400	690	too deep	muddy
4/8/2002	12:30	11.58	92.00%	5.6	37.6	19	7.5	34.4	37	0.26	BDL	0.1			too deep	muddy
4/22/2002	13:10	9.46	81.60%	8.7	46.8	24	7.6	27.3	20	0.25	BDL	0.073	870	32	too deep	cloudy
5/7/2002	13:45	12.03	97.40%	6.3	79.9	40	7.41	26.1	16	0.34	BDL	0.064	>2400	230	16.39615	cloudy
5/21/2002	13:40	8.53	80.40%	12.7	94.5	49	7.6	14.4	8	0.21	BDL	0.067	>2400	200	5.35005	cloudy
6/4/2002	9:00	6.9	71.00%	17.1	102.5	54	8	10.2	7	BDL	BDL	0.063	>2400	130	2.6073	cloudy
6/18/2002	10:30	6.24	66.7	18.5	113.1	60	7.6	7.58	BDL	BDL	BDL	0.064	>2400	280	1.453475	cloudy
7/3/2002	15:00	7.32	83.9	22.3	123.9	66	7.8	5.3	BDL	BDL	BDL	0.065	>2400	26	1.08505	clear
7/16/2002	13:30	4.45	50.5	22	152.3	81	7.5	4.65	4	BDL	BDL	0.056	>2400	89	0.17265	clear
7/29/2002																dry
8/18/2002																dry
8/28/2002																dry
9/5/2002																dry
9/24/2002																dry
10/7/2002																dry
10/22/2002																dry
11/4/2002																dry
11/18/2002	13:00	7.06	54.9	4.6	221	110	7.2	22	23	BDL	0.13	0.39	>2400	15	0.042225	cloudy

PR6-date	PR6-time	PR6-do	PR6-%sat	PR6-temp	PR6-cond	PR6-tds	PR6-ph	PR6-turb	PR6-tss	PR6-nn	PR6-NH3	PR6-TP	PR6-tcol	PR6-ecoli	PR6-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^{o}C)	(µS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	11:45	11.77	86.90%	2.8	275	130	8.62	19.6	7	2.6	0.18	0.12	>2400	240	4.8181	dingy
12/5/2001	8:29	11.45	79.00%	0.3	332	154	8.46	71.2	40	4.7	0.25	0.26	>2400	>2400	5.5722	murky
12/19/2001	8:40	15.07	103.40%	0.1	254	119	8.3	24.7	8	6.1	0.11	0.2	14000	620	23.0034	cloudy
1/2/2002	9:27	12.13	83.60%	0.2	207	115	8.1	9.52	BDL	3.4	BDL	0.069	7300	350	4.1995	clear
1/16/2002	13:00	9.77	69.00%	1.1	153.3	72	7.83	32.5	11	2.4	BDL	0.11	1200	160	25.8168	cloudy
1/29/2002	13:30	14.73	98.30%	0.1	139	64	7.67	22.2	11	4	BDL	0.12	4600	60	51.2604	cloudy
2/12/2002	13:00	12.38	86.50%	0.8	148.6	71	7.27	29.8	18	3.4	BDL	0.13	2200	90	40.2405	cloudy
2/26/2002	12:45	12.57	86.00%	0.1	86	41	7.4	39	30	2.1	BDL	0.13	1600	40	too deep	muddy
3/12/2002	11:40	12.13	86.40%	1.6	106	51	7.1	1000	1400	3.3	0.17	1.5	>24000	3500	too deep	muddy
3/26/2002	13:00	11.5	86.70%	3.6	75.4	38	7.2	74.8	68	2.1	BDL	0.2	3100	560	too deep	muddy
4/8/2002	13:00	11.09	89.70%	6.2	38	19	7.4	37.6	30	0.18	BDL	0.1			too deep	muddy
4/22/2002	13:30	9.6	81.90%	8.5	36.9	19	7.4	24.4	14	0.15	BDL	0.062	70	30	60.01485	cloudy
5/7/2002	14:10	12.27	99.80%	6.2	63.5	32	6.93	22.7	7	0.21	BDL	0.051	>2400	610	14.37088	cloudy
5/21/2002	14:00	9.3	88.20%	12.9	78.2	41	7.8	12.7	7	0.15	BDL	0.058	1600	88	4.84845	cloudy
6/4/2002	10:55	8.8	93.90%	19.1			8.6		8	BDL	BDL	0.054	>2400	31	2.68455	cloudy
6/18/2002	10:15	7.74	84	19.1	95	51	7.6	7.2	4	BDL	BDL	0.083	>2400	100	1.6491	cloudy
7/3/2002		7.56	92.1	24.7	115	61	7.8	5.13	6	BDL	BDL	0.056	>2400	20	0.8463	clear
7/16/2002	14:00	4.38	53.8	25.6	131.6	70	7.3	4.38	7	BDL	BDL	0.077	>2400	250	0.1449	clear
7/29/2002																dry
8/18/2002																dry
8/28/2002																dry
9/5/2002																dry
9/24/2002																dry
10/7/2002																dry
10/22/2002																dry
11/4/2002																dry
11/18/2002	12:30	6.94	55.1	5.8	178.1	89	7.4	10.5	11	0.88	BDL	0.069	>2400	9	0.2355	clear

PR7-date Date	PR7-time Time	PR7-do D.O. (mg/L)	PR7-%sat % Sat	PR7-temp Temp (^{o}C)	PR7-cond Cond (μS)	PR7-tds TDS (mg)	PR7-ph pH	PR7-turb Turbidity (NTU)	PR7-tss TSS (mg/L)	PR7-nn NO_2+NO_3 (mg/L)	PR7-NH3 NH_3 (mg/L)	PR7-TP TP (mg/L)	PR7-tcol F-Coli Coli/100ml	PR7-ecoli E-Coli Coli/100ml	PR7-Q Flow (cfs)	Observations:
11/26/2001	12:20	9.7	73.80%	3.8	86.4	42	9.49	10.9	5	0.18	0.22	0.035	>2400	23	1.277	dingy
12/5/2001	9:12	9.42	69.40%	2.3	92.8	44	7.72	8.35	BDL	0.19	BDL	0.021	980	82	0.97785	clear
12/19/2001	9:08	10.35	72.20%	1.5	87.2	41	8.85	16.7	BDL	0.27	BDL	0.066	730	26	3.005	cloudy
1/2/2002	10:01	11.06	79.60%	1.8	85	41	8.86	9.33	BDL	0.21	BDL	0.038	110	3	1.07725	cloudy
1/16/2002	13:25	8.55	64.70%	2.1	58.8	29	7.58	25.5	BDL	0.11	BDL	0.068	310	33	6.5475	cloudy
1/29/2002	14:00	11.75	82.70%	1.3	46.7	22	7.99	17.9	BDL	0.12	BDL	0.061	490	23	7.575	muddy
2/12/2002	13:40	11.87	84.60%	1.5	48.3	23	7.28	23.4	5	BDL	BDL	0.062	250	28	5.8065	cloudy
2/26/2002	13:30	12.6	89.80%	1.7	46.4	21	7.6	19.7	12	BDL	BDL	0.079	390	22	23.4226	cloudy
3/12/2002	12:20	12.52	88.70%	1.6	40	19	7.4	1000	140	BDL	BDL	0.2	>2400	73	19.7544	muddy
3/26/2002	13:30	11.1	85.70%	4	37	18	7.1	41.8	28	BDL	BDL	0.058	130	24	28.92425	muddy
4/8/2002	13:20	10.47	85.00%	6.7	26.9	13	7.2	28.3	33	BDL	BDL	0.072			43.30825	cloudy
4/22/2002	13:45	8.4	72.10%	8.4	28.1	14	7.1	21.7	11	BDL	BDL	0.044	340	11	24.6155	muddy
5/7/2002	15:00	10.51	82.90%	5.3	30.8	15	7.31	63	BDL	BDL	BDL	0.031	130	11	5.53815	cloudy
5/21/2002	14:30	8.95	76.40%	8.5	36.1	16	7.6	12.5	BDL	BDL	BDL	0.043	340	11	3.0325	cloudy
6/4/2002	9:30	8.29	75.00%	10.8	58.2	30	8	14.8	7	BDL	BDL	0.058	>2400	120	1.67055	milky
6/18/2002	9:00	7.3	69.4	13.5	48.3	25	8.2	15.4	4	BDL	BDL	0.07	>2400	1200	1.2421	cloudy
7/3/2002		5.45	60.2	15.9	47	25	8	6.39	BDL	BDL	BDL	0.041	>2400	86	0.7896	cloudy
7/16/2002	14:30	5.22	52.1	16.7	53.2	28	7.8	6.17	BDL	BDL	BDL	0.044	>2400	440	1.04595	milky
7/29/2002																dry
8/18/2002																dry
8/28/2002																dry
9/5/2002																dry
9/24/2002																dry
10/7/2002																dry
10/22/2002																dry
11/4/2002																dry
11/18/2002	12:00	6.42	51.1	5.8	64.5	32	7.6	7.71	BDL	0.36	BDL	0.087	>2400	120	0.42255	clear

PR8-date	PR8-time	PR8-do	PR8-%sat	PR8-temp	PR8-cond	PR8-tds	PR8-ph	PR8-turb	PR8-tss	PR8-nn	PR8-NH3	PR8-TP	PR8-tcol	PR8-ecoli	PR8-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(μS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	13:08	12.31	88.50%	1.8	115	55	8.5	13.4	BDL	BDL	0.15	0.05	650	21	1.4334	dingy
12/5/2001	9:58	11.72	82.30%	0.9	121.4	58	9.27	12.6	BDL	BDL	0.15	0.053	290	28	1.1484	dingy
12/19/2001	9:30	14.72	102.90%	1.1	105.6	50	7.42	28	BDL	BDL	BDL	0.12	270	60	2.9879	cloudy
1/2/2002	11:00	13.64	93.50%	0.1	114.4	54	7.77	10	BDL	0.1	0.12	0.05	350	38	0.7643	clear
1/16/2002	14:00	9.99	70.80%	1.3	85.2	40	8	45	BDL	BDL	BDL	0.12	250	15	5.0205	milky
1/29/2002	14:40	14.67	102.20%	0.3	59.6	28	7.74	29.9	4	BDL	BDL	0.12	460	26	6.333	clear
2/12/2002	14:30	12.64	86.90%	0.2	60	29	7.31	29.9	5	BDL	BDL	0.12	170	24	5.1507	cloudy
2/26/2002																no access
3/12/2002	13:00	12.32	87.90%	1.5	43	21	7.2	158	130	BDL	BDL	0.28	>2400	74	29.8405	muddy
3/26/2002	14:20	11.14	83.30%	3.2	44.3	22	7.1	34.6	11	BDL	BDL	0.14	440	13	28.0686	muddy
4/8/2002	14:00	10.79	84.70%	5.1	36.1	18	7.4	31.6	21	BDL	BDL	0.097			46.538	cloudy
4/22/2002	14:00	9.1	78.00%	6	36	18	7.4	21.1	14	BDL	BDL	0.071	100	15	21.9795	cloudy
5/7/2002	15:30	11.58	91.00%	3.8					6	BDL	BDL	0.048	55	4	11.435	cloudy
5/21/2002	15:00	10.3	83.60%	6.4	39	20	7.6	10.5	BDL	BDL	BDL	0.044	110	11	7.644	cloudy
6/4/2002	10:15	10.13	87.30%	8.9	46.9	24	8	10.2	BDL	BDL	BDL	0.06	130	19	3.963	cloudy
6/18/2002	10:00	9.04	80.7	10.8	56.8	29	7.8	10.5	BDL	BDL	BDL	0.089	520	24	2.2608	clear
7/3/2002	17:00	8.49	80.3	12.8	58.2	31	7.8	5.85	BDL	BDL	BDL	0.055	1600	110	1.1094	clear
7/16/2002	15:00	7.86	82.6	17.9	63.4	34	7.7	7.51	4	BDL	BDL	0.081	>2400	300	0.617	clear
7/29/2002	13:30	9	91.6	16.3	66	35	7.9	4.9	BDL	BDL	BDL	0.061	2400	440	0.432	clear
8/18/2002	13:00	7.16	70.6	13.4	74.6	39	7.5	5.27	BDL	BDL	BDL	0.058	>2400	1100	0.09885	clear
8/28/2002	13:00	8.65	84.2	14.1	72.3	38	7.8	5.11	4	BDL	BDL	0.058	1600	130	0.1712	clear
9/5/2002	13:00	8.02	77	12.5	76.2	40	7.6	5.54	BDL	BDL	BDL	0.19	>2400	84	0.1448	clear
9/24/2002	9:00	9.55	76.9	6.1	91	45	6.9	7.49	6	BDL	BDL	0.087	1700	490	0.1422	clear
10/7/2002		10.31	89.5	9.1	73	37	7.9	5.87	BDL	BDL	BDL	0.046	>2400	580	0.22665	clear
10/22/2002	14:00	10.42	81.6	5	81.7	42	8.1	7.84	13	BDL	BDL	0.067	>2400	190	0.1899	clear
11/4/2002	14:01	12.28	84.8	0.3				4.86	BDL	BDL	BDL	0.05	370	35	0.2106	clear
11/18/2002	11:30	11.36	87.5	4.4	77.7	38	8	6	BDL	BDL	BDL	0.037	330	15	0.62	clear

PR9-date	PR9-time	PR9-do	PR9-%sat	PR9-temp	PR9-cond	PR9-tds	PR9-ph	PR9-turb	PR9-tss	PR9-nn	PR9-NH3	PR9-TP	PR9-tcol	PR9-ecoli	PR9-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(μS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	15:05	12.43	91.30%	2.6	163.2	80	7.66	24.5	BDL	0.26	0.18	0.11	>2400	>2400	3.84895	murky
12/5/2001	13:01	11.91	84.10%	1.1	211	100	7.81	19.9	BDL	2.2	0.13	0.091	>2400	91	4.40125	dingy
12/19/2001	13:15	14.21	102.40%	0.2	181.2	85	7.59	35.6	7	3.6	BDL	0.15	>2400	650	16.879	cloudy
1/2/2002	13:45	13.54	93.20%	0.2	191.9	92	8.55	14.6	BDL	1.1	BDL	0.075	1300	110	3.23565	cloudy
1/16/2002	10:15	9.96	70.40%	1.2	127.6	60	8.48	34.4	9	1.2	BDL	0.15	2000	46	14.7106	cloudy
1/29/2002	11:00	14.68	100.60%	0	127.6	98	8.28	32.8	9	4.2	BDL	0.13	>2400	190	30.2775	cloudy
2/12/2002	10:45	12.63	86.50%	0.1	160	74	7.25	29.2	8	4.9	BDL	0.14	2000	75	23.1982	muddy
2/26/2002	11:15	12.92	88.70%	0	91	42	7.4	64.8	43	1.7	BDL	0.17	2000	16	16.0124	muddy
3/12/2002	11:00	13.32	95.00%	1.3	110	55	7.1	1000	260	6.2	BDL	1.9	>2400	130	too deep	muddy
3/26/2002	10:00	11.5	85.40%	3	75.5	37	7.3	62.1	59	1.9	BDL	0.2	>2400	32	too deep	muddy
4/8/2002	10:30	11.58	89.30%	4.3	41	21	7.4	50.6	37	0.19	BDL	0.12			too deep	muddy
4/22/2002	10:30	9.62	71.60%	6.1	51.8	26	7.4	25.5	17	0.25	BDL	0.088	650	27	35.9613	cloudy
5/7/2002	11:30	13.15	100.30%	3.9	64.1	31	6.54	17.5	6	0.23	BDL	0.051	280	24	18.8592	cloudy
5/21/2002	11:40	10.83	93.70%	8.4	57	30	8	15.8	6	BDL	BDL	0.064	650	46	10.72	cloudy
6/4/2002	13:30	11.06	109.60%	15.2	70.1	37	8.4	9.39	5	BDL	BDL	0.057	980	15	5.13765	milky
6/18/2002	13:30	9.88	102.1	16.9	93.2	49	8	8.69	7	BDL	BDL	0.092	>2400	110	2.395975	clear
7/3/2002	12:00	8.52	86.3	15.9	96.9	51	7.6	5.14	BDL	0.11	BDL	0.064	>2400	350	1.42095	clear
7/16/2002	11:13	9.21	101.6	20.2	110	59	7.8	3.52	6	0.12	BDL	0.075	>2400	290	0.525675	clear
7/29/2002	11:30	7.03	76.5	19.4	130.1	69	7.6	5.57	6	BDL	BDL	0.076	1700	23	0.19155	clear
8/18/2002	10:40	5.55	58.5	18.2	136.8	73	7.5	3.66	BDL	BDL	BDL	0.081	2400	28	0.0286	clear
8/28/2002	11:00	6.62	68.4	16.8	135.6	72	7.5	3.59	BDL	BDL	BDL	0.08	>2400	13	0.207525	clear
9/5/2002	11:00	6.88	68.9	15.4	134	71	7.5	4.61	6	BDL	BDL	0.062	>2400	>2400	0.07	clear
9/24/2002	12:30	8.97	83.7	12.3	181.1	99	7.6	4.26	BDL	BDL	BDL	0.067	>2400	27	0.0906	clear
10/7/2002	13:30	9.52	86.4	11.2	192.1	100	7.8	4.42	BDL	BDL	BDL	0.042	>2400	22	0.256925	clear
10/22/2002	11:30	11.22	89.2	5.6	186	95	7.6	5.38	BDL	BDL	BDL	0.037	>2400	3	0.252	clear
11/4/2002	14:40	13.14	91.1	1.2	217	108		6.49	BDL	BDL	BDL	0.036	2000	1	0.2972	clear
11/18/2002	9:30	10.31	78.7	4	132.3	65	8	9.73	7	BDL	BDL	0.057	>2400	28	0.928725	clear

PR10-date	PR10-time	PR10-do	PR10-%sa	PR10-temp	PR10-conc	PR10-tds	PR10-ph	PR10-turb	PR10-tss	PR10-nn	PR10-NH3	PR10-TP	PR10-tcol	PR10-ecoli	PR10-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(μS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	14:05	12.26	89.50%	2.4	71.5	35	7.76	11.2	BDL	BDL	0.18	0.047	490	35	1.0038	dingy
12/5/2001	11:00	11.98	82.20%	0.1	75.8	35	8.99	9.6	BDL	BDL	0.17	0.036	410	26	0.94615	dingy
12/19/2001	10:50	15.14	102.90%	0.1	63	29		12.6	BDL	BDL	BDL	0.057	390	210	1.67	clear
1/2/2002	12:00	12.81	88.80%	0.1	78.8	37	8.55	9.57	BDL	BDL	BDL	0.047	770	160	0.79755	clear
1/16/2002	8:30	12.15	85.40%	1	71.8	34	8.68	13.6	BDL	BDL	BDL	0.043	490	210	3.21375	cloudy
1/29/2002	9:30															no access
2/12/2002																no access
2/26/2002																no access
3/12/2002																no access
3/26/2002																no access
4/8/2002	8:30	9.91	71.90%	2.1	42	16	7.3	46.8	16	BDL	BDL	0.1			25.9012	cloudy
4/22/2002	8:30	9.91	75.00%	0.7	40.9	21	7	16.5	16	BDL	BDL	0.042	170	36	10.11838	cloudy
5/7/2002	9:30	12.13	90.20%	3.1	50.6	24	7.93		4	BDL	BDL	0.036	150	27	3.7217	cloudy
5/22/2002	9:30	9.69	81.20%	7.7	46.2	23	7.1		BDL	BDL	BDL	0.051	230	12	1.1712	clear
6/4/2002	14:00	9.47	88.50%	12.3	43.7	23	8.1		BDL	BDL	BDL	0.044	410	4	0.599475	clear
6/18/2002		8.56	81.3	13	50.7	27	7.8	5.58	BDL	BDL	BDL	0.067	550	3	0.24945	clear
7/3/2002	10:15	7.44	65.1	9.9	56.9	30	7.6	3.55	BDL	BDL	BDL	0.044	>2400	29	0.334	clear
7/16/2002		5.93	57.8	14.3	74.6	39	8.2	2.36	BDL	BDL	BDL	0.042	>2400	>2400	0.2091	clear
9/24/2002	10:00	9.58	79.5	7.5	76	39	7.1	7.25	7	BDL	BDL	0.066	>2400	550	0.25425	clear
10/7/2002	9:30	10.15	82.7	6.6	81.4	41	7.1	5.49	BDL	BDL	BDL	0.058	1700	32	0.21885	clear
10/22/2002	9:30	10.6	78.3	2.9	88.4	43	6.9	5.24	BDL	BDL	BDL	0.05	160	16	0.16405	clear
11/5/2002	10:30	9.08	65	1.6	115.4	56	7.8	6.3	BDL	BDL	BDL	0.12	1300	370	0.03885	clear
11/18/2002	11:00	12.9	89.7	0.6	70.9	33	6.9	9.8	BDL	BDL	BDL	0.062	>2400	62	0.849725	clear

PR11-date	PR11-time	PR11-do	PR11-%sa	PR11-temp	PR11-conc	PR11-tds	PR11-ph	PR11-turb	PR11-tss	PR11-nn	PR11-NH3	PR11-TP	PR11-tcol	PR11-ecoli	PR11-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(μS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	14:25	12.38	89.70%	2	111.9	52	8.63	14.9	BDL	BDL	0.1	0.057	>2400	44	8.897	dingy
12/5/2001	11:30	11.59	80.10%	0.3	72.6	34	8.73	12.2	BDL	BDL	0.13	0.045	870	38	8.2045	dingy
12/19/2001	11:38	15.25	102.40%	0.1	64.9	30	6.95	14.7	BDL	BDL	0.13	0.07	730	120	7.26	muddy
1/2/2002	12:15	13.04	89.50%	0.1	82.1	39	7.52	9.01	BDL	BDL	BDL	0.04	230	68	2.707	cloudy
1/16/2002	8:45	11.92	83.40%	0.8	66.6	31	6.95	14.9	BDL	BDL	BDL	0.05	580	96	21.2786	cloudy
1/29/2002	9:30	12.8	88.00%	0	67.9	32	9.48	13.1	BDL	BDL	BDL	0.048	1200	61	23.7404	clear
2/12/2002	9:15	12.93	88.50%	0.1	64	31	7.93	10.7	BDL	BDL	BDL	0.055	410	70	15.0649	cloudy
2/26/2002	9:15	10.12	69.40%	0.1	338	164		17.2	8	BDL	BDL	0.06	240	79	61.4796	cloudy
3/12/2002	8:30	12.46	88.10%	1.1	63	30	6.7	10.1	320	BDL	BDL	0.056	550	52	21.73255	cloudy
3/26/2002	8:00	10.89	78.80%	2.1	49.2	23	7.1	25.8	7	BDL	BDL	0.048	650	140	84.021	cloudy
4/8/2002	9:00	11.85	86.00%	2.1	31.5	15	7.4	23.2	19	BDL	BDL	0.058			too deep	cloudy
4/22/2002	9:00	9.94	76.20%	4.1	33.7	16	7.2	13.7	9	BDL	BDL	0.036	520	140	84.44215	cloudy
5/7/2002	10:15	11.85	89.50%	3.6	41.1	20	7.39	11.2	4	BDL	BDL	0.023	240	43	47.0974	cloudy
5/22/2002	10:00	8.06	69.00%	8.7	39.6	20	7.4	10.2	BDL	BDL	BDL	0.043	820	230	11.0735	cloudy
6/4/2002	14:20	8.29	93.90%	15.4	41.3	22	7.6	6.6	BDL	BDL	BDL	0.039	460	5	5.135	clear
6/18/2002	15:15	6.74	74.7	17.9	52.3	28	7.7	5.57	BDL	BDL	BDL	0.11	550	37	1.5636	clear
7/3/2002	9:00	6.57	62.6	13.4	64.3	34	7.4	4.6	BDL	BDL	BDL	0.055	>2400	370	1.21795	clear
7/16/2002	9:30	4.3	44.8	17.9	73.7	39	7.9	4.35	BDL	BDL	BDL	0.08	>2400	170	2.5389	cloudy
7/29/2002	9:00	4.78	48.6	16.6	89.4	47	7	7.48	4	BDL	BDL	0.089	1600	39	2.90025	clear
8/18/2002	9:00	6.64	63.6	15	100.4	53	7.7	6	5	BDL	BDL	0.077	1600	96	2.5148	clear
8/28/2002	8:30	6.39	61.4	14	85.8	24	7.6	4.49	4	BDL	BDL	0.069	2400	200	2.50105	clear
9/5/2002	9:40	6.21	58.7	13.3	91.4	48	7.1	5.75	17	BDL	BDL	0.093	980	16	1.4331	clear
9/24/2002	11:00	7.54	63.3	7.9	88.1	46	7.3	7.64	6	BDL	BDL	0.086	2000	26	1.679	clear
10/7/2002	10:45	7.93	65.7	7.4	95.9	49	7.4	6.99	BDL	BDL	BDL	0.075	1300	140	0.60565	clear
10/22/2002	10:13	8.36	64.3	4.2	98.5	49	7	6.96	BDL	BDL	BDL	0.085	2400	280	2.4255	clear
11/5/2002	8:30	11.91	82.1	0.2	102.2	49	8.1	7.58	BDL	BDL	BDL	0.071	300	11	0.1177	clear
11/18/2002	12:00	11.35	80.2	1	60.8	29	7.4	10.5	5	BDL	BDL	0.056	>2400	43	2.248	clear

PR12-date	PR12-time	PR12-do	PR12-%sat	PR12-temp	PR12-cond	PR12-tds	PR12-ph	PR12-turb	PR12-tss	PR12-nn	PR12-NH3	PR12-TP	PR12-tcol	PR12-ecoli	PR12-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(μS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	9:04	11.84	84.40%	1.5	173.1	83	8.66	10.3	5	0.12	0.18	0.083	>2400	94	3.0986	dingy
12/5/2001	11:55	11.86	81.80%	0.3	125	59	8.66	13.3	6	0.37	0.16	0.093	>2400	690	2.6914	dingy
12/19/2001	12:15	15.19	104.60%	0.1	120	56	8.73	29.7	13	0.93	BDL	0.15	>2400	120	5.5202	cloudy
1/2/2002	12:45	12.72	87.10%	0.1	10.63	50	8.75	14.2	BDL	0.39	0.11	0.085	1700	49	3.5889	cloudy
1/16/2002	9:15	11.97	84.70%	1.2	64.1	32	8.55	31.5	23	0.42	BDL	0.14	>2400	66	15.905	cloudy
1/29/2002	10:00	14.5	99.70%	0.1	80	37	9.07	28.3	12	0.63	BDL	0.14	2400	38	32.0286	cloudy
2/12/2002	9:50	12.8	87.90%	0.1	149	70	7.89	25.5	5	0.81	BDL	0.14	1100	96	17.4595	cloudy
2/26/2002	9:45	12.76	87.90%	0.3	66	30	8.6	55	55	0.5	BDL	0.17	720	60	64.30035	cloudy
3/12/2002	9:00	12.86	92.50%	1.8	88	43	7.1	178	270	1.1	0.21	0.56	>2400	>2400	63.54815	cloudy
3/26/2002	9:15	11.4	84.40%	2.9	58.9	29	7.1	56.5	85	0.43	BDL	0.24	>2400	310	105.872	muddy
4/8/2002	9:40	11.37	85.60%	3.5	37.1	18	7.3	49.2	79	BDL	BDL	0.13			72.4205	muddy
4/22/2002	9:30	9.99	78.10%	4.9	35	17	7.1	28.6	46	BDL	BDL	0.097	190	74	50.8434	cloudy
5/7/2002	10:45	12.42	93.10%	3.3	35.1	17	8.2	18	19	BDL	BDL	0.051	1100	50	34.464	cloudy
5/2/2002	10:40	10.62	85.80%	6.2	18.6	14	7.1	20.8	28	BDL	BDL	0.078	1600	1100	37.2967	cloudy
6/4/2002	15:00	9.3	91.60%	14.7	29.5	16	7.4	8.75	9	BDL	BDL	0.053	490	100	17.9404	clear
6/18/2002	14:00	9.46	92.5	14.3	41.1	22	7.8	7.02	BDL	BDL	BDL	0.8	2000	690	7.06365	clear
7/3/2002	11:00	9.38	92.3	14.7	48.2	25	7.8	7.02	7	BDL	BDL	0.071	1700	420	3.8408	clear
7/16/2002	10:00	9.28	100	19	60.5	32	8.4	5.51	4	BDL	BDL	0.078	>2400	650	1.3881	clear
7/29/2002	10:30	8.28	86.4	17.5	85.6	45	7.4	7.57	10	BDL	BDL	0.09	>2400	1000	0.5935	clear
8/18/2002	9:45	4.7	46	14.4	131	70	7.4	4.6	BDL	BDL	BDL	0.099	>2400	730	0.0858	clear
8/28/2002	10:00	7.58	76.4	15.8	126	67	7.5	4.25	6	BDL	BDL	0.12	>2400	200	0.1755	clear
9/5/2002	10:20	5.35	52.8	14.5	170	89	7.2	8.61	5	BDL	BDL	0.12	>2400	33	0.0124	clear
9/24/2002	11:30	10.66	93.3	9.4	106.9	56	7.7	6.02	4	BDL	BDL	0.068	>2400	34	0.245175	clear
10/7/2002	12:30	11.14	96.4	9	88.1	46	7.6	3.32	BDL	BDL	BDL	0.07	>2400	180	0.42465	clear
10/22/2002	11:15	10.33	79.5	4.3	107	54	7.4	3.78	BDL	BDL	BDL	0.051	>2400	12	0.3372	clear
11/4/2002	15:33	9.06	62.2	0.2	120.8	57		11.5	17	0.14	BDL	0.1			0.4064	clear
11/18/2002	13:15	11.35	86.9	4.1	69.5	34	7.2	6.97	BDL	0.1	BDL	0.091	1400	370	2.0538	clear

PR13-date	PR13-time	PR13-do	PR13-%sa	PR13-tem	PR13-conc	PR13-tds	PR13-ph	PR13-turb	PR13-tss	PR13-nn	PR13-NH3	PR13-TP	PR13-tcol	PR13-ecoli	PR13-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(μS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	9:22	12.61	91.10%	1.9	74.7	36	8.91	9.79	BDL	BDL	0.11	0.058	1400	28	2.7976	dingy
12/5/2001	12:30	11.66	82.00%	1	89.4	42	8.76	10.5	BDL	0.19	0.11	0.055	1600	23	2.9981	dingy
12/19/2001	12:45	14.26	102.60%	1.2	93.3	44	7.55	26.3	5	0.56	BDL	0.12	2000	46	10.156	cloudy
1/2/2002	13:15	12.9	88.80%	0.3	88.9	42	7.77	15.7	BDL	0.27	BDL	0.071	1100	28	3.5733	cloudy
1/16/2002	9:50	9.67	68.60%	1.4	73.2	34	7.5	30.1	15	0.4	BDL	0.11	690	20	19.215	cloudy
1/29/2002	10:30	14.66	100.50%	0.1	53.8	25	8.72	28	12	0.35	BDL	0.11	730	10	23.4525	cloudy
2/12/2002	10:30	12.7	86.90%	0.1	67	31	7.59	22.8	5	0.29	BDL	0.11	580	24	16.7424	cloudy
2/26/2002	10:30	12.44	87.50%	0.1	473	222	6.2	44.1	42	0.3	BDL	0.13	260	19	51.1126	cloudy
3/12/2002	9:30	12.91	92.50%	1.5	56	27	7.2	359	600	0.5	BDL	0.66	>2400	>2400	56.1715	muddy
3/26/2002	9:42	11.18	82.90%	3	44.2	22	7.1	44.7	52	0.27	BDL	0.16	>2400	73	63.0497	muddy
4/8/2002	10:10	10.95	83.70%	4	31.3	16	7.2	47.9	70	BDL	BDL	0.13	35	10	60.0537	muddy
4/22/2002	10:00	9.17	76.50%	5	29	15	7.1	29.2	33	BDL	BDL	0.067			42.25325	cloudy
5/7/2002	11:00	12.06	91.20%	3.5	33.3	16	7.65	15	15	BDL	BDL	0.018	200	12	29.07615	cloudy
5/20/2002	11:00	10.5	84.20%	6	26.1	13	7.1	20.7	23	BDL	BDL	0.062	310	28	37.1462	cloudy
6/4/2002	15:15	9.45	86.80%	11.7	31.5	168	7.4	7.79	9	BDL	BDL	0.048	550	40	15.5809	clear
6/18/2002	14:15	8.58	82.6	13.4	32.5	17	7.6	5.46	BDL	BDL	BDL	0.083	1300	460	7.52475	clear
7/3/2002	11:30	7.93	77	13.8	38	20	7.6	5.93	BDL	BDL	BDL	0.049	>2400	270	4.02485	clear
7/16/2002	10:30	7.81	80.4	16.5	43.4	23	7.6	4.77	4	BDL	BDL	0.063	>2400	980	2.3304	clear
7/29/2002	11:00	6.87	70.9	17	43.6	23	7.3	6.35	6	BDL	BDL	0.081	>2400	690	1.4368	clear
8/18/2002	10:00	7.6	74.3	14.6	47.1	25	7.4	3.89	BDL	BDL	BDL	0.063	>2400	190	0.93575	clear
8/28/2002	9:15	7.43	72.8	14.3	45.9	24	7.6	4.49	BDL	BDL	BDL	0.074			0.5451	clear
9/5/2002	10:40	7.23	70.6	14.5	51	27	7.6	5.32	BDL	BDL	BDL	0.073	>2400	140	0.6269	clear
9/24/2002	12:00	8.42	75.8	10.9	48.3	25	7.5	4.29	BDL	BDL	BDL	0.062	>2400	180	0.5986	clear
10/7/2002	13:00	9.53	83.5	9.7	47.1	24	7.6	5.03	BDL	BDL	BDL	0.055	1700	170	0.562	clear
10/22/2002	10:30	10.32	79.3	4.5	53.3	27	7.4	5.43	BDL	BDL	BDL	0.051	>2400	55	0.74795	clear
11/4/2002	15:08	10.85	74.7	0.1	62	29		6.13	BDL	BDL	BDL	0.042			0.406	clear
11/18/2002	13:00	10.91	82	3.2	49.7	24	7.6	5.76	BDL	BDL	BDL	0.046	980	28	1.2122	clear

PR14-date	PR14-time	PR14-do	PR14-%sa	PR14-temp	PR14-conc	PR14-tds	PR14-ph	PR14-turb	PR14-tss	PR14-nn	PR14-NH3	PR14-TP	PR14-tcol	PR14-ecoli	PR14-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(μS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	10:02	12.22	89.30%	2.3	412	201	8.51	11.2	BDL	1.7	BDL	0.11	>2400	59	0.39775	dingy
12/5/2001	13:28	12.45	88.40%	1.3	426	205	8.02	18.1	6	6.7	0.11	0.15	>2400	96	1.1429	dingy
12/19/2001	13:39	15.42	106.10%	0.2	235	110	8.58	30.5	14	1.8	BDL	0.23	>2400	610	6.09075	cloudy
1/2/2002	14:10	13.44	92.30%	0.1	359	171	8.13	10.3	6	2	BDL	0.096	1600	150	0.6228	cloudy
1/16/2002	10:45	10.16	70.90%	0.7	216	102	7.67	34.2	7	0.96	BDL	0.21	1400	74	4.2712	cloudy
1/29/2002	11:20	14.83	101.30%	0	139	65	8.15	29.2	6	1.3	BDL	0.18	>2400	120	10.2939	cloudy- icy staff
2/12/2002	11:30	12.76	87.50%	0.1	153	72	7.44	39.7	12	1.1	BDL	0.21	980	50	11.1844	cloudy*
2/26/2002	11:00	12.36	85.50%	0.4	91	42	7.1	64.8	39	0.82	BDL	0.24	>2400	140	79.4793	muddy
3/12/2002	10:15	13.74	98.00%	1.4	100	50	7.1	759	1000	1.2	BDL	1.2	>2400	370	too deep	muddy
3/26/2002	10:30	11.47	86.50%	3.5	86.1	43	7.6	61.8	38	0.48	BDL	0.31	>2400	110	42.24	muddy
4/8/2002	11:00	11.48	91.50%	5.6	87.3	44	8.2	42.2	11	0.2	BDL	0.18			6.6384	cloudy
4/22/2002	11:00	10.48	89.50%	8.4	120	62	8.6	29.4	13	0.13	BDL	0.15	370	20	2.0422	cloudy
5/7/2002	12:00	12.4	97.20%	5	76.2	87	7.32	20.9	5	0.21	BDL	0.13	>2400	980	0.87415	cloudy
5/21/2002	12:00	9.94	89.10%	10.5	227	117	7.8	8.95	7	BDL	BDL	0.073	>2400	56	0.4686	clear
6/4/2002	13:00	9.86	106.10%	18.6	244	131	8.1	4.23	BDL	BDL	BDL	0.097	>2400	36	0.203625	clear
6/18/2002	13:00	9.14	94.4	16.8	271	143	8	5.48	BDL	BDL	BDL	0.14	>2400	99	0.068	clear
7/3/2002	12:30	8.22	84.9	17.3	288	154	7.8	13.1	4	BDL	BDL	0.11	>2400	550	0.052275	clear
7/16/2002																no water
10/22/2002	12:00	11.65	98	4	350	177	7.8	3.22	BDL	0.15	BDL	0.05	>2400	4	0.13805	clear
11/5/2002	13:00	14.8	101.7	0.2	406	201	7.4	4.31	BDL	0.55	BDL	0.06	>2400	4	0.0559	clear
11/18/2002	13:30	13.27	100.2	3.6	315	154	7.4	1.64	BDL	BDL	BDL	0.062	520	3	0.1396	clear

PR15-date	PR15-time	PR15-do	PR15-%sa	PR15-temp	PR15-conc	PR15-tds	PR15-ph	PR15-turb	PR15-tss	PR15-nn	PR15-NH3	PR15-TP	PR15-tcol	PR15-ecoli	PR15-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(μS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	10:26	10.38	75.00%	1.7	385	187	7.26	12.8	6	0.33	BDL	0.13	1700	81	0.1302	dingy
12/5/2001	13:48	11.02	76.30%	0.7	349	167	8.09	19.54	11	0.62	0.1	0.16	>2400	91	0.1662	dingy
12/19/2001	14:00	14	92.30%	1	197	93	8.25	24	10	2.1	BDL	0.19	>2400	210	1.61325	muddy
1/2/2002	14:30	12.83	88.10%	0.1	271	129	7.38	15.7	BDL	1.4	BDL	0.12	>2400	330	0.1788	cloudy
1/16/2002	11:00	9.34	65.10%	0.9	157.6	76	7.64	31.8	7	1.2	BDL	0.17	1100	100	0.8833	cloudy
1/29/2002	12:00	14.57	99.50%	0.1	114	53	8.11	26.9	41	1.1	BDL	0.18	>2400	160	2.127	cloudy
2/12/2002	11:10	12.3	84.50%	0.1	121	57	7.78	35.3	14	0.97	BDL	0.16	980	50	1.5474	cloudy
2/26/2002	11:45	12.51	86.50%	0.4	105	42	7.4	39.1	10	1.1	BDL	0.19	1700	190	3.9408	cloudy
3/12/2002	10:30	13.59	95.30%	0.7	64	31	7.4	450	610	0.73	BDL	0.82	>2400	280	12.79365	muddy
3/26/2002	11:00	11.07	83.90%	3.7	67.2	33	7.4	46.4	36	0.43	BDL	0.21	>2400	580	5.8307	muddy
4/8/2002	11:20	10.58	85.00%	5.9	66	33	7.8	40	18	0.15	BDL	0.17			2.735775	cloudy
4/22/2002	11:30	9.16	76.00%	7.3	85.4	44	7.8	28.4	12	0.2	BDL	0.15	980	69	1.1373	cloudy
5/7/2002	12:20	11.9	90.60%	3.9	126.3	63	7.23	19.7	BDL	BDL	BDL	0.12	>2400	70	0.4435	milky
5/21/2002	12:20	8.57	74.70%	9.3	144.9	76	7.9	15.1	4	BDL	BDL	0.15	>2400	770	0.2012	milky
6/4/2002	12:30	7.52	74.60%	15.6	167.8	87	7.8	7.37	BDL	BDL	BDL	0.13	2400	140	0.1197	clear
6/18/2002		6.47	63.3	14.7	191	102	7.7	9.2	BDL	BDL	BDL	0.22	>2400	68	0.058	clear
7/3/2002	13:00	6.3	63.3	15.4	204	102	7.8	34.2	70	BDL	BDL	0.25	>2400	140	0.091	cloudy
7/16/2002	11:50	5.95	58.2	17.4	259	135	7.6	12.1	21	BDL	BDL	0.35	>2400	56	0.0699	clear
10/22/2002	12:30	8.49	67.3	5.3	391	149	8	5.86	BDL	BDL	BDL	0.082			0.0966	clear
11/5/2002	13:00	11.38	78.2	0.1	321	156	7.6	6.65	BDL	BDL	BDL	0.064	1700	25	0.0523	clear
11/18/2002	14:00	9.42	71.5	3.9	292	143	7.6	5.44	4	BDL	BDL	0.092	580	9	0.4115	clear

PR16-date	PR16-time	PR16-do	PR16-%sa	PR16-temp	PR16-conc	PR16-tds	PR16-ph	PR16-turb	PR16-tss	PR16-nn	PR16-NH3	PR16-TP	PR16-tcol	PR16-ecoli	PR16-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(μS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100ml	Coli/100ml	(cfs)	
11/26/2001	11:00	11.18	82.00%	2.5	229	110	8.1	18	24	2.3	BDL	0.12	>2400	100	7.0745	murky
12/5/2001	14:20	11.87	83.20%	0.9	286	136	8.42	20.2	35	5.8	0.1	0.13	>2400	74	2.7906	murky
12/19/2001	14:40	15.25	102.40%	0	196	92	8.65	43.4	57	3.4	BDL	0.19	>2400	310	14.48365	cloudy
1/2/2002	15:00	13.59	93.10%	0.1	217	103	8.81	10.8	BDL	1.1	0.26	0.091	1100	30	2.1393	cloudy
1/16/2002	11:35	10.63	73.20%	0.2	134.9	64	8.65	27.8	10	0.71	BDL	0.14	1700	56	9.78735	cloudy
1/29/2002	12:30	14.93	102.50%	0.1	110	51	7.89	30.1	18	1.7	BDL	0.16	>2400	53	18.072	cloudy-icy staff
2/12/2002	12:30	12.85	88.20%	0.1	133.7	65	7.39	37.2	33	2	BDL	0.17	980	1000	19.11885	cloudy*
2/26/2002	12:20	13.54	92.30%	0.1	68	32	7.4	45	30	0.64	BDL	0.17	550	28	too deep	muddy
3/12/2002	11:15	11.05	81.30%	2.6	108	53	7.4	541	650	2.4	BDL	0.95	>2400	610	too deep	muddy
3/26/2002	12:00	11.68	87.80%	3.4	75.5	37	7.4	64.7	66	0.87	BDL	0.24	>2400	120	too deep	muddy
4/8/2002	12:20	10.88	87.00%	5.6	52	26	7.6	33.6	27	0.14	BDL	0.12			34.054	cloudy
4/22/2002	12:00	8.53	71.70%	7.5	50.7	26	7.8	28.9	23	BDL	BDL	0.099	770	10	23.4999	muddy
5/7/2002	13:30	12.43	95.50%	4.3	0.91	50.9	26	7.21	13	BDL	BDL	0.073	>2400	210	14.91	cloudy
5/21/2002	13:00	9.92	86.20%	9.1	46.5	24	7.6	24.4	35	BDL	BDL	0.1	>2400	>2400	9.9064	cloudy
6/4/2002	11:30	8.63	89.60%	17.2	65.1	34	7.9	12.5	9	BDL	BDL	0.093	2200	390	3.4794	cloudy
6/18/2002	11:30	7.81	83.2	18.7	86.1	45	7.8	21	14	BDL	BDL	0.16	>2400	340	2.0262	muddy
7/3/2002	14:30	7.05	77	20.5	88.7	47	8.1	14.4	9	BDL	BDL	0.13	>2400	110	1.2145	cloudy
7/16/2002	13:00	7.36	85.1	22.2	106.3	57	7.9	6.77	6	BDL	BDL	0.12	>2400	310	0.72425	clear
7/29/2002	12:30	6.3	66.4	18.1	133.6	71	7.8	6.36	7	BDL	BDL	0.11	>2400	280	0.3828	clear
8/18/2002	12:00	5.7	55.5	14.5	140.4	73	7.6	5.35	6	BDL	BDL	0.095	>2400	24	0.096	clear
8/28/2002	12:00	6.58	65.5	15.4	148	78	7.6	6.52	6	BDL	BDL	0.11	>2400	43	0.21	clear
9/5/2002	12:15	6.82	66.8	14.4	148	79	7.7	7.89	12	BDL	BDL	0.1	>2400	17	0.2194	clear
9/24/2002	14:30	8.23	71.1	8.5	163	88	7.8	4.95	4	BDL	BDL	0.068	2000	46	0.0836	clear
10/7/2002	14:30	9.82	87.5	10.2	168.3	88	7.9	5.09	5	BDL	BDL	0.06	>2400	16	0.26825	clear
10/22/2002	13:30	10.42	81.3	4.8	198	87	8.1	8.17	11	BDL	BDL	0.08	>2400	1	0.33275	clear
11/5/2002	14:30	11.68	81.1	0.5	180	90	7.8	10.3	5	BDL	BDL	0.076	920	11	0.2626	clear
11/18/2002	15:00	11.26	86.4	4.2	110.2	54	7.6	26	75	BDL	BDL	0.14	1700	20	0.7845	clear

PR17-date	PR17-time	PR17-do	PR17-%sa	PR17-temp	PR17-cond	PR17-tds	PR17-ph	PR17-turb	PR17-tss	PR17-nn	PR17-NH3	PR17-TP	PR17-tcol	PR17-ecoli	PR17-Q	
Date	Time	D.O.	% Sat	Temp	Cond	TDS	pH	Turbidity	TSS	NO_2+NO_3	NH_3	TP	F-Coli	E-Coli	Flow	Observations:
		(mg/L)		(^oC)	(μS)	(mg)		(NTU)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	Coli/100mL	Coli/100mL	(cfs)	
11/26/2001	11:50	11.93	87.60%	2.6	146	72	9.16	9.43	BDL	BDL	BDL	0.09	>2400	64	2.0055	dingy
12/5/2001	14:52	11.85	81.90%	0.2	175	82	8.2	10.4	4	0.24	0.11	0.078	1600	19	1.53325	clear
12/19/2001	15:13	15.7	108.30%	0	150.9	70	8.36	36	50	1.6	BDL	0.2	>2400	100	8.417	dingy
1/2/2002	15:40	13.45	92.30%	0.1	160.6	76	8.13	11.7	BDL	0.36	BDL	0.079	870	46	1.62105	cloudy
1/16/2002	12:10	9.99	70.20%	0.6	117.6	55	7.75	26.9	BDL	0.41	BDL	0.14	920	58	5.5755	cloudy
1/29/2002	12:15	15.04	103.00%	0.1	81.3	39	8.22	29.4	15	0.66	BDL	0.15	2400	63	11.84675	muddy
2/12/2002	12:00	12.99	89.50%	0.3	94	44	7.43	29.8	14	0.59	BDL	0.15	1000	73	10.4084	cloudy
2/26/2002	12:00	13.34	91.80%	0.1	131	64	7.4	44.6	27	0.37	BDL	0.17	490	46	too deep	muddy
3/12/2002	11:00	13.4	95.80%	1.6	68	34	7.4	368	620	0.85	BDL	0.65	>2400	440	too deep	muddy
3/26/2002	11:20	11.54	85.90%	3.2	53.5	27	7.4	60.1	51	0.39	BDL	0.22	>2400	81	too deep	muddy
4/8/2002	12:00	10.86	86.30%	5.6	43.2	22	7.6	32.3	24	BDL	BDL	0.13			39.8928	cloudy
4/22/2002	13:00	9.16	8.70%	8.7	47	24	7.6	22.7	17	BDL	BDL	0.091	820	38	23.9967	cloudy
5/7/2002	13:00	11.99	93.40%	4.8	46.1	23	7.6	20.2	21	BDL	BDL	0.073	1100	410	12.417	cloudy
5/21/2002	13:00	8.34	72.90%	9	45.9	23	8	12.9	BDL	BDL	BDL	0.074	2400	1600	10.62325	cloudy
6/4/2002	12:00	10.15	105.80%	17.4	53.8	28	8.3	7.46	4	BDL	BDL	0.086	1700	410	5.8365	cloudy
6/18/2002	12:30	8.5	88.5	17.3	191	102	7.8	9.2	5	BDL	BDL	0.14	2400	690	2.021175	clear
7/3/2002	13:30	6.74	77.3	21.4	83.5	44	7.8	27.2	22	BDL	BDL	0.19	>2400	>2400	1.5021	cloudy
7/16/2002	12:30	8.28	97	23.3	95.8	51	7.8	8.24	6	BDL	BDL	0.14	>2400	670	0.7726	clear
7/29/2002	12:00	6.97	79.8	22.2	123.2	66	7.5	19.1	15	BDL	BDL	0.14	>2400	>2400	0.3561	clear
8/18/2002	11:00	6.79	74.9	20.1	136.8	73	7.4	3.66	BDL	BDL	BDL	0.071	5800	600	0.1665	clear
8/28/2002	11:30	7	76.8	19.8	136.1	72	7.5	4.55	BDL	BDL	BDL	0.075	>2400	43	0.3385	clear
9/5/2002	12:00	6.82	70.2	16.9	141	74	7.4	6.38	6	BDL	BDL	0.22	>2400	1000	0.3341	clear
9/24/2002	13:00	7.9	78.8	15	71.9	37	7.6	5.36	5	BDL	BDL	0.054	>2400	>2400	0.178	clear
10/7/2002	14:00	11.85	112.4	13	137.8	73	7.8	3.36	BDL	BDL	BDL	0.049	9800	860	0.4233	clear
10/22/2002	13:00	10.98	93.4	8.3	153.1	79	8	4.07	BDL	BDL	BDL	0.058	4900	450	0.45615	clear
11/5/2002	14:00	13.99	97.5	0.7	194	95	7.8	4.9	BDL	BDL	BDL	0.096	2200	170	0.3954	clear
11/18/2002	14:30	13.04	98.6	3.6	111.7	54	7.7	3.67	BDL	BDL	BDL	0.073	290	13	0.9079	clear