



Upper Columbia Basin Network Integrated Water Quality Annual Report 2013

John Day Fossil Beds National Monument (JODA)

Natural Resource Report NPS/UCBN/NRR—2015/983



ON THE COVER

John Day River, 28 August 2013 John Day Fossil Beds National Monument
NPS Photo

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Natural Resource Report NPS/UCBN/NRR—2015/983

Eric N. Starkey

National Park Service

Upper Columbia Basin Network Inventory and Monitoring Program

105 E. 2nd St.

Suite #7

Moscow, ID 83843

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Executive Summary

The mission of the National Park Service is “to conserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment of this and future generations” (NPS 1999). To uphold this goal, the Director of the NPS approved the Natural Resource Challenge to encourage national parks to focus on the preservation of the nation’s natural heritage through science, natural resource inventories, and expanded resource monitoring (NPS 1999). Through the Challenge, 270 parks in the national park system were organized into 32 inventory and monitoring networks. The Upper Columbia Basin Network (UCBN) is comprised of 8 national park sites located in Idaho, Montana, Oregon, and Washington.

The UCBN has identified 14 priority park vital signs, indicators of ecosystem health, which represent a broad suite of ecological phenomena operating across multiple temporal and spatial scales. The intent of the network is to monitor a balanced and integrated “package” of vital signs that meets the needs of current park management, but will also be able to accommodate unanticipated environmental conditions in the future. Water quality is a particularly high priority vital sign for six of the nine UCBN parks. The UCBN contains more than 34 rivers, streams, ponds, and reservoirs. Unlike many National Parks that are large and often encompass entire watersheds, most UCBN parks and water bodies are small and embedded in large watersheds with diverse land use.

This annual report details the status of key indicators of water quality obtained from monitoring in John Day Fossil Beds National Monument (JODA), June-November, 2013. Bridge Creek and the John Day River were previously sampled by the UCBN in 2010 (see Starkey 2013). Data from the 2013 field sampling effort was collected following methods detailed in the UCBN integrated water quality monitoring protocol (Starkey et al. 2008, Starkey et al. 2013). The UCBN Integrated Water Quality Monitoring Protocol was formally peer-reviewed and approved for implementation in August 2009. This protocol can be found on the UCBN website at: <http://science.nature.nps.gov/im/units/ucbn/publications.cfm?tab=3>. Benthic macroinvertebrates were collected according to protocol established by the United States Forest Service- PACFISH/INFISH Biological Opinion (PIBO). These methods are also outlined in the UCBN monitoring protocol for stream channel characteristics (Starkey et al. 2011). This protocol can also be found on the UCBN’s website listed above.

Water chemistry and macroinvertebrate results indicate that the Bridge Creek and the John Day River are in fair condition, with the primary concern being elevated water temperatures. The status of water quality for Bridge Creek and the John Day River relative to state regulatory thresholds is given in the summary tables on the following page. UCBN water quality monitoring is conducted on a 3 year rotating panel. As a result, conditions in both streams will be re-evaluated in 2016.

Note that several of the appendices in this report are primarily intended for UCBN internal reference. In addition, some appendices serve as hard copies of quality assurance/quality control procedures performed during data processing.

Bridge Creek Water Chemistry Summary 2013

Measure	Current Condition (June-November, 2013)	State DEQ Thresholds	% Exceedance ^a
Temperature (*MDMT, **MDAT)	* MDMT= 27.49 °C ** MDAT= 23.53 °C	7 day average of the daily max.< 18 °C (salmon/trout rearing/migration)	57.1 %
Total dissolved solids /TDS (mean)	254.56 mg/L	TDS < 500 mg/L	0 %
Dissolved oxygen (mean daily min)	8.30 mg/L	> 6.5 mg/L instantaneous (cool water, non-spawning)	0 %
pH (mean daily max)	8.32 pH Units	9.0 pH Units	0 %
pH (mean daily min)	8.03 pH Units	6.5 pH Units	0 %
Turbidity (mean daily max)	--	< 10% cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity	Insufficient data

John Day River Water Chemistry Summary 2013

Measure	Current Condition (June-November, 2010)	State DEQ Thresholds	% Exceedance ^a
Temperature (*MDMT, **MDAT)	* MDMT= 28.87 °C ** MDAT= 26.21 °C	7 day average of the daily max.< 18 °C (salmon/trout rearing/migration)	60 %
Total dissolved solids /TDS (mean)	233.5 mg/L	TDS < 500 mg/L	0 %
Dissolved oxygen (mean daily min)	7.43 mg/L	> 6.5 mg/L instantaneous (cool water, non-spawning)	16.2 %
pH (mean daily max)	8.56 pH Units	9.0 pH Units	0 %
pH (mean daily min)	8.22 pH Units	6.5 pH Units	0 %
Turbidity (mean daily max)	17.47 NTU	< 10% cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity	Insufficient data

*MDMT – Maximum Daily Maximum Temperature, **MDAT – Maximum Daily Average Temperature, ^a Proportion of samples above water quality standard

0-5% exceedance	
5-25% exceedance	
>25% exceedance	

Acknowledgments

Funding for this project was provided through the National Park Service Natural Resource Challenge and the Servicewide Inventory and Monitoring Program. The UCBN would also like to thank JODA staff for their assistance in the field, accommodations during field work, and for the review of this report.

Introduction and Background

Water resources have been identified as a high priority vital sign for the Upper Columbia Basin Network (UCBN). These resources are used by many riparian, migratory, and terrestrial organisms in the Network, and have intrinsic value as places of natural beauty and recreation (Garrett et al. 2007). Reflecting this priority, the Water Resources Division (WRD) of the NPS provides a separate source of funding each fiscal year to the UCBN to accomplish water quality monitoring. In June 2013 the UCBN began its second year of integrated water quality monitoring at John Day Fossil Beds National Monument (JODA).

Water resources in the semi-arid West have been strongly affected by human activity, and many UCBN streams and rivers are listed by states as impaired for one or more parameters. Most UCBN water bodies and many aquatic resources such as migratory fish are strongly influenced by activities in the larger watersheds outside park boundaries. Understanding the current status of freshwater ecosystems will help guide management and restoration efforts, and provide insight into ecosystem change in a landscape with a shifting climate and dynamic human influences.

During the process of prioritizing vital signs to monitor in UCBN parks in 2005, water quality was identified as a high priority vital sign (Garrett et al. 2007). When asked what aspects of water quality were important to monitor, resource managers identified the sampling of macroinvertebrate assemblages within UCBN water bodies as the top water quality monitoring priority. Secondary priorities included baseline sampling of water chemistry parameters, characterization of channel morphology, and information on water quantity. Channel morphology and riparian vegetation are addressed in separate monitoring protocols which were also implemented at JODA in 2013.

The objectives of the UCBN Integrated Water Quality Monitoring Protocol are documenting the aquatic macroinvertebrate assemblage composition and baseline water chemistry parameters. Aquatic macroinvertebrate assemblages have strong effects on freshwater ecosystem processes and represent an important trophic linkage between primary producers and fishes. Measures of macroinvertebrate assemblage composition and structure have been frequently used as water quality indicators because these assemblages integrate the effects of point and non-point source pollutants over spatial-temporal scales and can be used to answer many management questions. Also, macroinvertebrates are more cost-effective to sample than other biota or many water chemistry parameters.

Water chemistry and temperature have strong effects on aquatic biota. Consequently, direct and indirect human alteration of stream water quality is associated with altered biotic communities and ecosystem processes. Because of the direct relationship between water chemistry and biota, water chemistry is typically a central component of any water quality monitoring program. More recently, monitoring of stream water temperatures has increased in the Pacific Northwest, because of concerns over cold-water fish habitat (primarily salmonid fishes), the recognized influence of land- and water-use on stream temperature regime, and the need for baseline temperature information to monitor the effects of climate change. National Park Service (NPS) Water Resource Division (WRD) has identified a suite of four “core water quality parameters”: temperature, specific conductance, pH, and dissolved oxygen, which are critical to understanding baseline conditions in aquatic habitats. The

UCBN added turbidity as a parameter to measure because turbidity is listed as a source of impairment in several UCBN park streams.

Well-articulated desired future condition statements have not yet been developed for water quality in UCBN parks. However, the mission statements for the NPS as a whole and for the individual parks clearly state the intent “to conserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment of this and future generations” (NPS 1999). Water quality is a particularly important resource with nationally recognized merit. It is assumed that desired future conditions for all UCBN parks will include clean streams, rivers, and lakes free of human health concerns that provide visitors with recreational and scenic experiences. Monitoring macroinvertebrate assemblage composition and structure, and core water quality parameters will directly measure the water characteristics most important to park mission, visitor experience, and desired future conditions.

Objectives

The overarching programmatic goal of the UCBN integrated water quality monitoring program is to obtain information that will aid in informed management decisions pertaining to improved water quality within UCBN parks. Park managers have committed to improving the water quality of impaired waters by adopting the NPS Government Performance Results Act (GPRA) goal (Ia4) that streams and rivers managed by NPS will meet State and Federal water quality standards (NPS 2000).

Given the lack of available data on water quality in UCBN parks, the following fundamental questions drive much of the UCBN’s inquiry into water quality:

- Are the core water quality parameters of streams in the UCBN with established Total Maximum Daily Loads (TMDLs) selected for sampling improving over time?
- What is the status and long-term trend of core water quality parameters (temperature, pH, conductivity, dissolved oxygen, and turbidity) in UCBN streams selected for sampling?
- What is the status and long term trend in aquatic macroinvertebrate abundance and assemblage composition in selected UCBN streams?
- Do aquatic macroinvertebrate assemblages sampled within UCBN streams indicate polluted or otherwise impaired water quality?
- Do aquatic macroinvertebrate assemblages sampled within UCBN streams indicate “pristine” or “reference” conditions according to regional criteria established by the Environmental Protection Agency (EPA) and the states of Idaho, Oregon, Montana, and Washington?

Determine status and long term trend in key water quality parameters for selected streams within UCBN park units.

- Determine status and trend in aquatic macroinvertebrate abundance, assemblage composition, and functional feeding group composition in wadeable streams within the UCBN.

Study Area

Bridge Creek- John Day Fossil Beds National Monument (JODA) Painted Hills Unit

The Painted Hills unit of JODA is in the Lower John Day Watershed, Hydrologic Unit 17070204 (United States Geologic Survey [USGS]), in Wheeler County, Oregon (Figures 1-3, Appendix A and B). The drainage area for Bridge Creek above the USGS gage (#14046778) is approximately 692 square km (267 square miles) and consists of several land cover types (NPS 1997). According to Bell and Hinson 2010, the Painted Hills watersheds are dominated by the following land cover types: big sagebrush-bluebunch wheatgrass (40.34%), Wyoming big sagebrush (33.06%), and less than 2% of the watersheds in agriculture or developed lands.

Threats to water resources in JODA have been listed as: irrigation withdrawals, confined animal feeding upstream and untreated sewage effluent from upstream (Garrett et al. 2007). In addition, Bridge Creek is listed as impaired for biological criteria (category 5a TMDL needed), sedimentation (category 5a TMDL needed), and temperature (category 4a- has an approved TMDL in place and being implemented) (OR DEQ 2010, OR DEQ 2012).

Designated beneficial uses for the Bridge Creek include: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, and aesthetic quality (OR DEQ 2010). Designated fish use is for salmon and trout rearing and migration (note: includes all salmon species, steelhead, rainbow and cutthroat trout. The designated salmon and steelhead spawning use is from January 1 – May 15 (OR DEQ 2010, Admin. Rules of OR 2013, 340-041-001 [through 12/15/2013]).

The Hydrolab was deployed approximately 75 m downstream of the picnic area /visitor information kiosk (Figures 1 and 3, Appendix A). This location was chosen due to logistical considerations, adequate water depth, and to avoid placement of equipment near creek access points

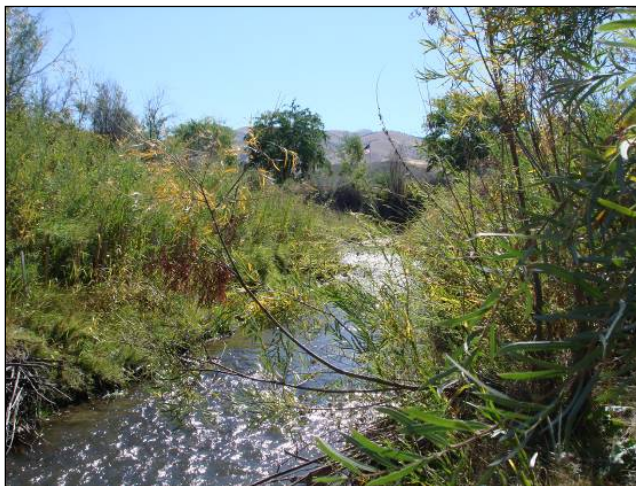


Figure 1. Bridge Creek looking upstream towards the picnic area.

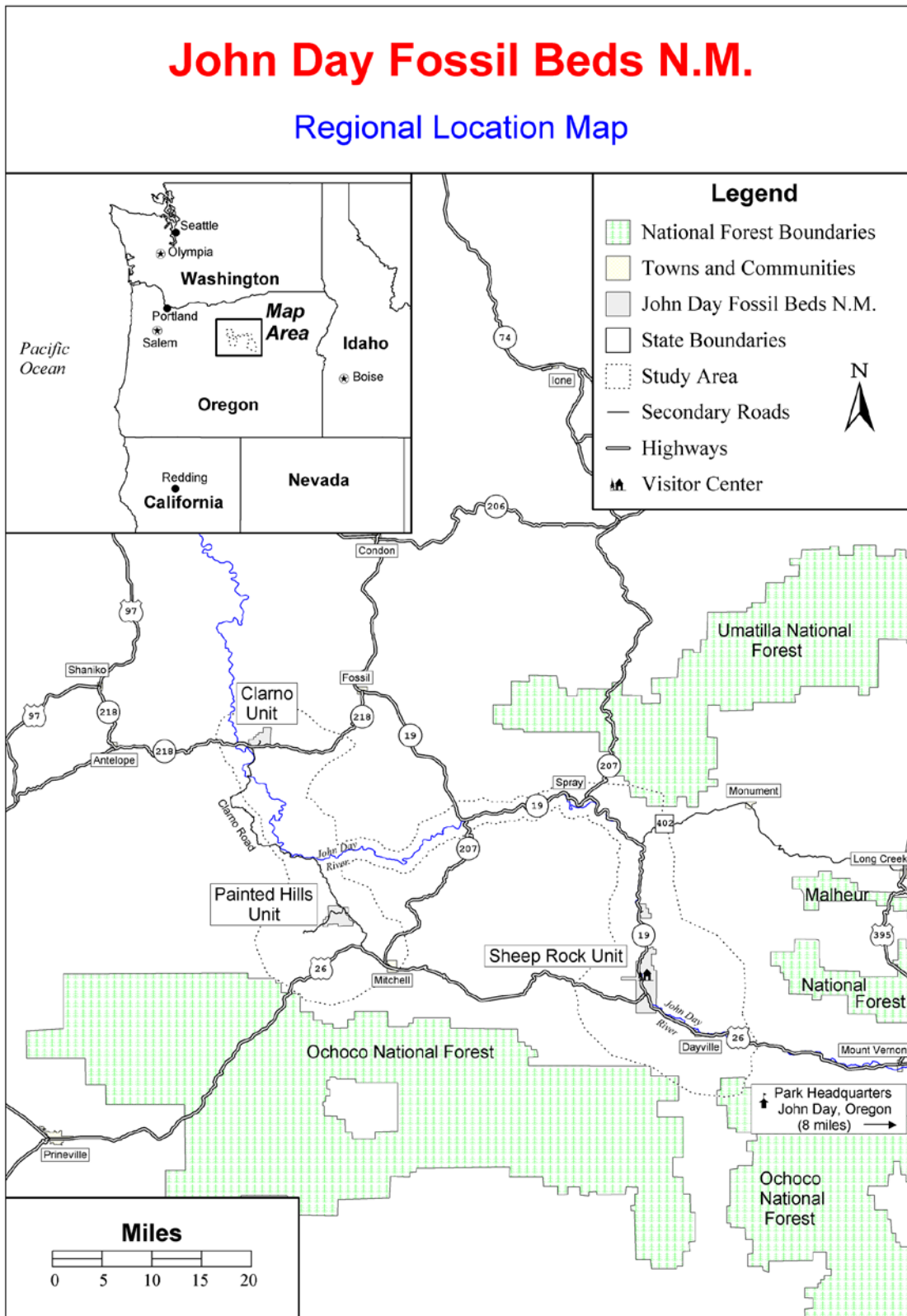


Figure 2. John Day Fossil Beds National Monument regional map (NPS 1997).



JODA Water Quality Monitoring 2013



Figure 3. Water quality monitoring location in Bridge Creek 2013.



Figure 4. Water quality monitoring location in the John Day River 2013.

John Day River- John Day Fossil Beds National Monument (JODA), Sheep Rock Unit

The Sheep Rock unit of JODA is in the Upper John Day Watershed, Hydrologic Unit 17070201 (United States Geologic Survey [USGS]), in Grant County, Oregon (Figures 2 and 4, Appendix B). The drainage area for the John Day River above the park is approximately 4,351 square km (1,680 square miles) and consists of several land cover types (NPS 1997). According to Bell and Hinson 2010, Sheep Rock's watersheds are dominated by the following land cover types: big sagebrush-bluebunch wheatgrass (*Aretemisia tridentata*, *Pseudoroegneria spicata*) (36.59%), Wyoming big sagebrush (*Aretemisia tridentata* spp. *wyomingensis*) (13.63%), and has less than 3% of the watersheds in agriculture or developed lands. In addition, over 25% of the Sheep Rock watersheds are tree dominated vegetation, primarily ponderosa pine (*Pinus ponderosa*) and Douglas fir (*Pseudotsuga menziesii*) [Bell and Hinson 2010].

Threats to water resources in JODA have been listed as: irrigation withdrawals, confined animal feeding upstream and untreated sewage effluent from upstream (Garrett et al. 2007). In addition, the John Day River is listed as impaired (category 4a- has an approved TMDL in place and being implemented) in the following areas: temperature, dissolved oxygen and bacteria (OR DEQ 2010, OR DEQ 2012).

Designated beneficial uses for the John Day River and all its tributaries include: public and private domestic water supply, industrial water supply, irrigation, livestock watering, fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, and aesthetic quality (OR DEQ 2010). Designated fish use is for salmon and trout rearing and migration (note: includes all salmon species, steelhead, rainbow and cutthroat trout. The designated salmon and steelhead spawning use is from January 1 – May 15 (OR DEQ 2010, Admin. Rules of OR 2013, 340-041-001 [through 12/15/2013]).

The Hydrolab was deployed approximately 1.6 km downstream of the Cant ranch house and approximately 200 m downstream of the first parking area north of the Cant ranch (Figures 4 and 5, Appendix A). This location was chosen due to logistical considerations, adequate water depth, and to avoid placement of equipment near river access points. The macroinvertebrate sample reaches along the John Day River coincide with the stream channel characteristics and riparian condition monitoring reaches (see Appendix C for GPS waypoint).



Figure 5. John Day River looking upstream towards picture gorge.

Methods

Water Chemistry

Continuous water quality monitors (HACH, MS5 Hydrolabs) were deployed from June 19th to November 6th in the John Day River, and from June 18th to November 7th in Bridge Creek at index sites to estimate the status, variability, and long-term trends in core parameters. The core parameters measured were water temperature, dissolved oxygen, pH, specific conductance, and turbidity. These core parameters were measured hourly and the instrument serviced monthly throughout the deployment period. Each monitor was deployed in a location that was representative of conditions in the park, logistically feasible to access, and relatively secure from vandalism and high flows. A cross-section survey was conducted to aid in the determination of Hydrolab site selection. For more information on the UCBN water chemistry sampling design see Starkey et al. (2008 and 2013).

Quality Assurance/Quality Control (QA/QC):

Quality assurance and quality control for continuous water quality monitor data collection are covered in detail in SOP #12 (Starkey et al. 2008). Basic procedures adhere to the guidelines established in Part B lite (Irwin 2008); the National Coastal Assessment Quality Assurance Project Plan 2001-2004 (U.S. EPA 2001); the Laboratory Methods Manual-Estuaries, Volume 1: Biological and Physical Analyses (U.S. EPA 1995); and Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers (Barbour et al. 1999).

General quality assurance and quality control methods for UCBN water quality multiprobe calibration and data downloads include the following:

- Representative multiprobe sample locations are determined by using a cross-section and stream segment survey. Each site is re-assessed for representativeness at the start and end each sample year.
- The UCBN follows pre-established maximum acceptable differences for field instrument calibration and QC checks. If the multiprobe readings are outside of the maximum acceptable differences, the multiprobe is removed for non-routine maintenance.
- When calibrating the multiprobe, values of known standard solutions are measured pre and post calibration, to help determine if the instrument's measurements have "drifted." In addition, repeated measures of these solutions are used to determine the repeatability of multiprobe measures.
- All multiprobe data is visually checked for outliers and QC issues immediately following the download of data. QC issues indicated by the data may include: wiper parking, defective sensors, power supply problems, and other anomalies affecting data quality.
- Quantitative and qualitative terms that describe how accurate data need to be in order to meet project objectives are discussed in detail in SOP #12 Starkey et al. 2008 and Appendix D in this report. NPS WRD lists the following data quality objectives as necessary for water chemistry data: target population, representativeness, completeness, data comparability,

measurement sensitivity and detection limits, measurement precision as repeatability, and measurement systematic error/bias.

More detailed QA/QC for water quality multiprobes is contained in SOP #6 and 12, Starkey et al. 2008 and 2013.

Discharge

Gaging stations on the John Day River are located far enough from the park to make them marginally useful for determination of discharge within the park. The closest active gages on the John Day River are USGS #14038530 near John Day, OR (≈ 60 km upstream of water quality monitoring station) and USGS #14046500 at Service Creek, OR (≈ 70 km downstream). The closest historic gaging station on the John Day River is USGS #14040500 at Picture Gorge, near Dayville, OR (≈ 5 km upstream of water quality monitoring station). This gage was active from 1926 to 1991.

The only gage on Bridge Creek is USGS # 14046778 Bridge Creek above Coyote Canyon near Mitchell, OR (≈ 12 km downstream of water quality monitoring station). This gage is useful for the determination of general flow conditions within the Painted Hills Unit.

Macroinvertebrates

Macroinvertebrates were collected at 6 sample reaches on the John Day River (August and September 2013) and 2 sample reaches on Bridge Creek (July 2014) by the United States Forest Service- PACFISH/INFISH Biological Opinion (PIBO) Effectiveness Monitoring Program during the assessment of stream channel characteristics. This assessment was completed as part of the UCBNs stream channel characteristics monitoring protocol. Macroinvertebrates were collected from 8 fast water habitats (riffles, runs) in each sample reach. These 8 samples were combined for a single composite sample per reach. For more information on the PIBO macroinvertebrate sampling design see Heitke et al. (2009).

Results and Discussion

Bridge Creek- Painted Hills Unit

Water Chemistry

Cross Section Survey

A cross section survey was conducted at the proposed multiprobe deployment location to evaluate if the site was reasonably representative of stream conditions throughout the park. As suggested by the water resource division the UCBN judges overall representativeness primarily on the basis of specific conductance (Starkey et al. 2008).

The 2013 deployment location provided adequate water depth throughout the field season, was easily accessible, and was away from heavily trafficked access points.

A one way analysis of variance (ANOVA) test was conducted to evaluate representativeness (R v3.0.2). Results of the ANOVA showed that there was a significant difference for specific conductance among the transects and the deployment location in July $F(4,43) = 5.659$, $p < 0.001$ and a significant difference in September $F(4,37) = 3.249$, $p < 0.05$ (Figures 6 and 7).

To determine where the difference in representativeness occurred, a post hoc Tukey's test was conducted (R v3.0.2). Relative to specific conductance, results of the Tukey's test for the cross section conducted in July indicates that the deployment location was not significantly different from any of the transects. However, significant differences did occur amongst transects 1 and 2, 1 and 3, 2 and 4, and 3 and 4. Results of the Tukey's test for the cross section conducted in September indicates that the deployment location was not significantly different from any of the transects. In September, transect 2 was significantly different from transect 3.

In summary, the deployment location was representative of the majority of upstream transects, and results do not indicate a need to move the water quality multiprobe for future sampling.

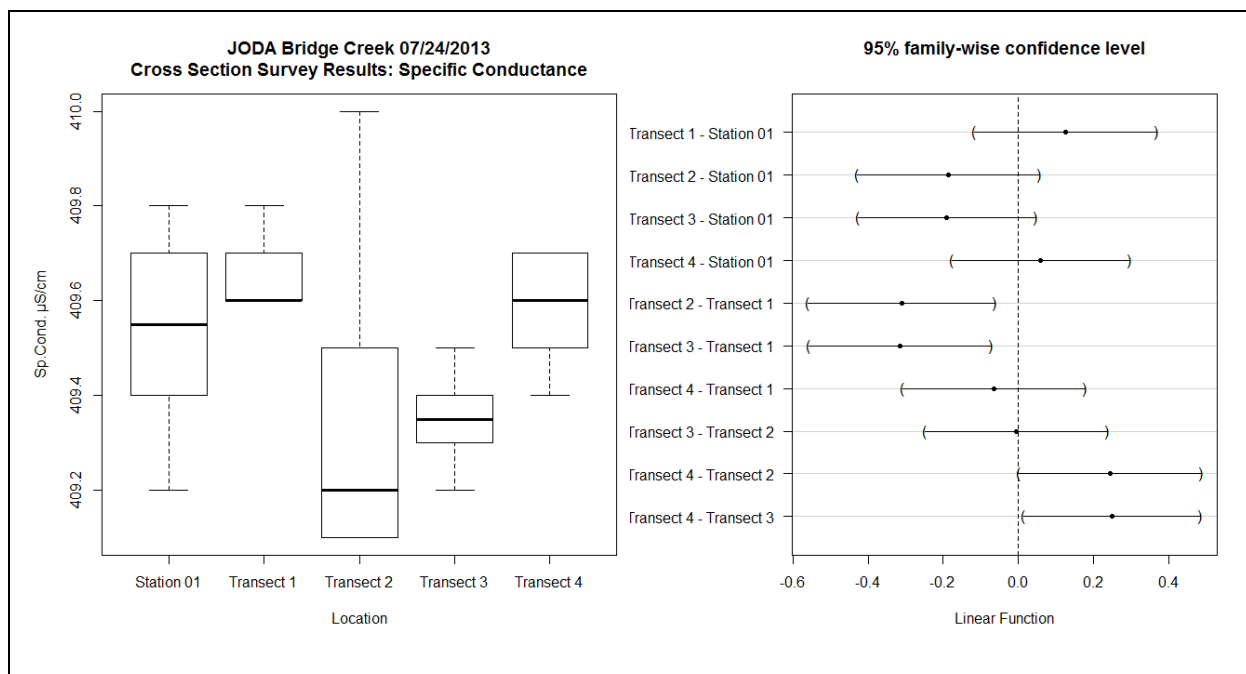


Figure 6. July 2013 cross section survey of Bridge Creek, box plot of specific conductance and plot of 95% family-wise confidence level. Note that “Station01” is the location of the multiprobe deployment and the transects progress upstream (1-4).

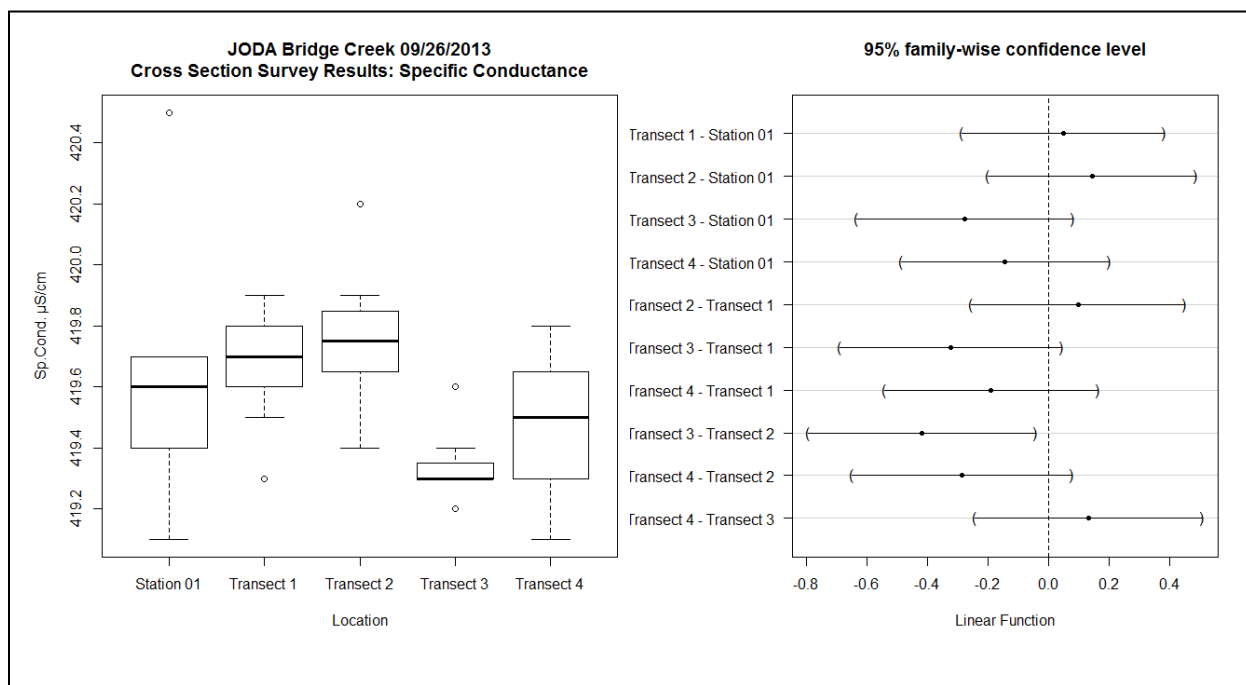


Figure 7. September 2013 cross section survey of Bridge Creek, box plot of specific conductance and plot of 95% family-wise confidence level. Note that “Station01” is the location of the multiprobe deployment and the transects progress upstream (1-4).

Status

Condition of core water quality parameters along with the corresponding Oregon Department of Environmental Quality (DEQ) regulatory threshold are given in Table 1. Data indicate that the primary concern in Bridge Creek is elevated water temperatures. Individual parameters are discussed below.

Table 1. Vital sign summary table for water chemistry in Bridge Creek June-November, 2013.

Bridge Creek Water Chemistry Summary 2013			
Measure	Current Condition (June-November, 2013)	State DEQ Thresholds ^b	% Exceedance ^a
Temperature (*MDMT, **MDAT)	* MDMT= 27.49 °C ** MDAT= 23.53 °C	7 day average of the daily max.< 18 °C (salmon/trout rearing/migration)	57.1 %
Total dissolved solids /TDS (mean)	254.56 mg/L	TDS < 500 mg/L	0 %
Dissolved oxygen (mean daily min)	8.30 mg/L	> 6.5 mg/L instantaneous (cool water, non-spawning)	0 %
pH (mean daily max)	8.32 pH Units	9.0 pH Units	0 %
pH (mean daily min)	8.03 pH Units	6.5 pH Units	0 %
Turbidity (mean daily max)	--	< 10% cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity	Insufficient data

*MDMT – Maximum Daily Maximum Temperature, **MDAT – Maximum Daily Average Temperature, ^a Proportion of samples above water quality standard, ^b OR DEQ 2010, Admin. Rules of OR 2013, 340-041-001 [through 12/15/2013]

0-5% exceedance	
5-25% exceedance	
>25% exceedance	

Temperature:

June-November 2013, the 7 day average of the daily maximum temperature exceeded 18.0 °C in 57.1% of observations and the maximum daily maximum temperature (MDMT) was 27.49 °C. Temperature monitoring also occurred in Bridge Creek in 2011 and 2012 using a HOBO Pro v2.0 temperature logger. June-October 2012, the 7 day average of the daily maximum temperature exceeded 18.0 °C in 75.0% of observations and the MDMT was 27.70 °C. June-September 2011, the 7 day average of the daily maximum temperature exceeded 18.0 °C in 66.67% of observations and the MDMT was 22.87 °C.

Our data reinforces basin-wide temperature concerns as discussed in the John Day River Basin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (OR DEQ 2010). Figure 8 shows the daily maximum and mean daily temperatures in Bridge Creek from June-November 2013. Table 2 shows the data rating/grade for each deployment period (monthly interval). These standard USGS ratings are based on the degree of sensor fouling encountered during each deployment period (Wagner et al. 2006; Starkey et al. 2008; Starkey et al. 2013).

Water temperatures are of particular interest in Bridge Creek, given that its designated fish use is for salmon and trout rearing and migration (note: includes all salmon species, steelhead, rainbow and cutthroat trout). Elevated water temperatures can be caused by poor stream shading and dewatering. Implications of elevated water temperatures may include decreased salmonid recruitment, decreased salmonid health, and potential shifts in fish and benthic macroinvertebrate communities (Vannote and Sweeney 1980; McCullough 1999).

Maintaining water temperatures suitable for naturally occurring species in Bridge Creek will depend on riparian condition and reduced dewatering. For this reason cooperation with other agencies, stakeholders, and adjacent landowners will be critical for improving water temperature. One example of ongoing cooperation includes extensive riparian restoration throughout much of the Bridge Creek watershed as part of the Intensively Monitored Watershed project implemented by NOAA Fisheries, Northwest Fisheries Science Center. NOAA has worked closely with JODA and played an important role in restoration efforts within the Painted Hills Unit. More information on the intensively monitored restoration of Bridge Creek can be found in Pollock (2007 and 2011), ISEMP (2009), and Hall et al. (2010).

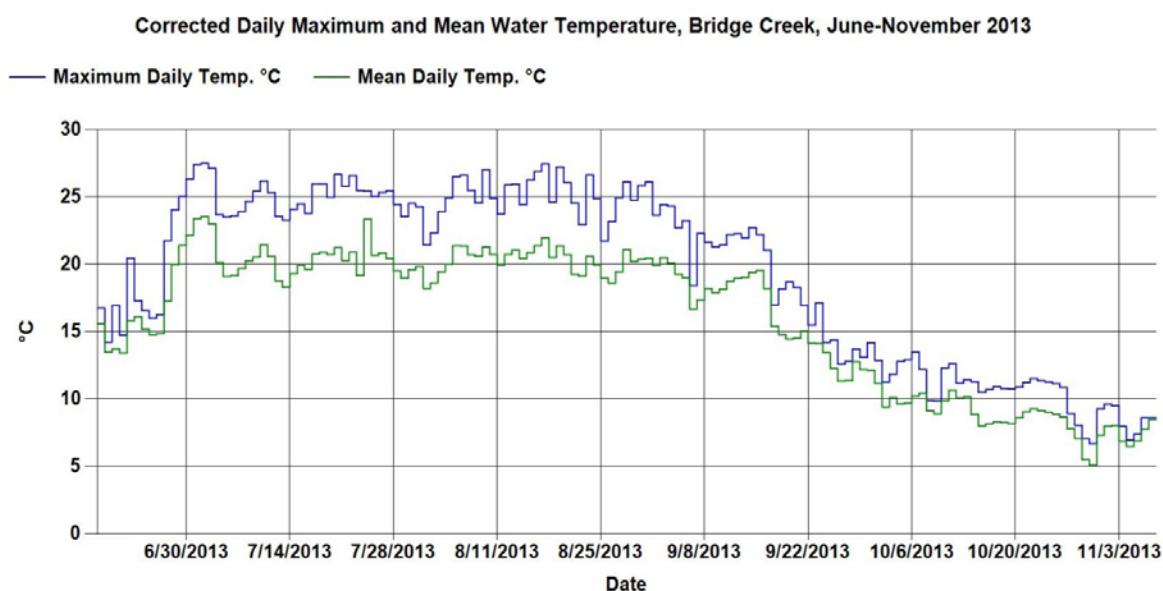


Figure 8. Daily maximum and mean water temperature in Bridge Creek, JODA June-November 2013.

Table 2. Data grade/rating for water temperature each deployment period June-November 2013 in Bridge Creek, JODA.

Temperature Data Grade/Rating	From UTC-07:00	To UTC-07:00
EXCELLENT	06/18/2013 15:00	07/23/2013 15:00
EXCELLENT	07/24/2013 11:00	08/28/2013 07:00
EXCELLENT	08/28/2013 13:00	09/26/2013 08:00
EXCELLENT	09/26/2013 15:00	11/07/2013 09:00

Specific Conductance:

Specific conductance ranged from 302.8 to 454.0 $\mu\text{S}/\text{cm}$, with an average specific conductance of 401.3 $\mu\text{S}/\text{cm}$ (Figure 9). There is no regulatory threshold for specific conductance but rather a threshold for total dissolved solids (see section below). Table 3 shows the data rating/grade for each deployment period (monthly interval). These standard USGS ratings are based on the degree of sensor fouling and drift encountered during each deployment period (Wagner et al. 2006; Starkey et al. 2008). Corrections applied to the specific conductance data are listed in Appendix E.

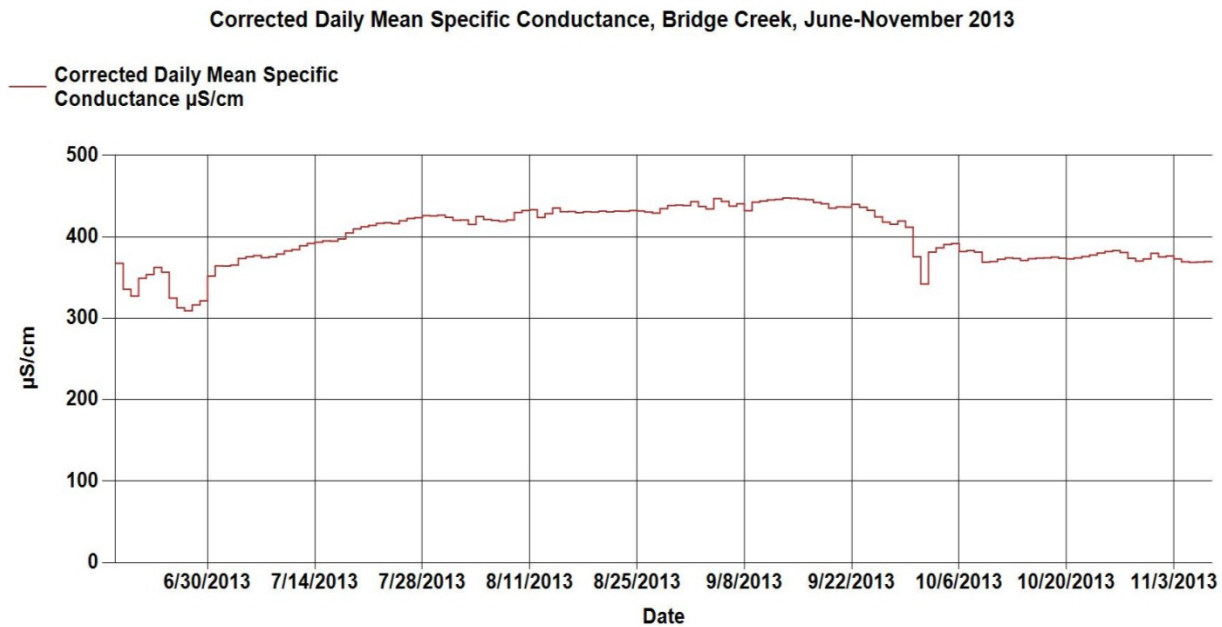


Figure 9. Corrected daily mean specific conductance in Bridge Creek, JODA, June-November 2013.

Table 3. Data grade/rating for specific conductance and TDS each deployment period June-November 2013 in Bridge Creek, JODA.

Specific Conductance Data Grade/Rating	From UTC-07:00	To UTC-07:00
EXCELLENT	06/18/2013 15:00	07/23/2013 15:00
EXCELLENT	07/24/2013 11:00	08/28/2013 07:00
EXCELLENT	08/28/2013 13:00	09/26/2013 08:00
EXCELLENT	09/26/2013 15:00	11/07/2013 09:00

Total Dissolved Solids (TDS):

Average total dissolved solids was 254.56 mg/L and never exceeded the regulatory threshold of 500 mg/L (Figure 10). Data rating/grades for each deployment period (monthly interval) are the same as for specific conductance (Table 3).

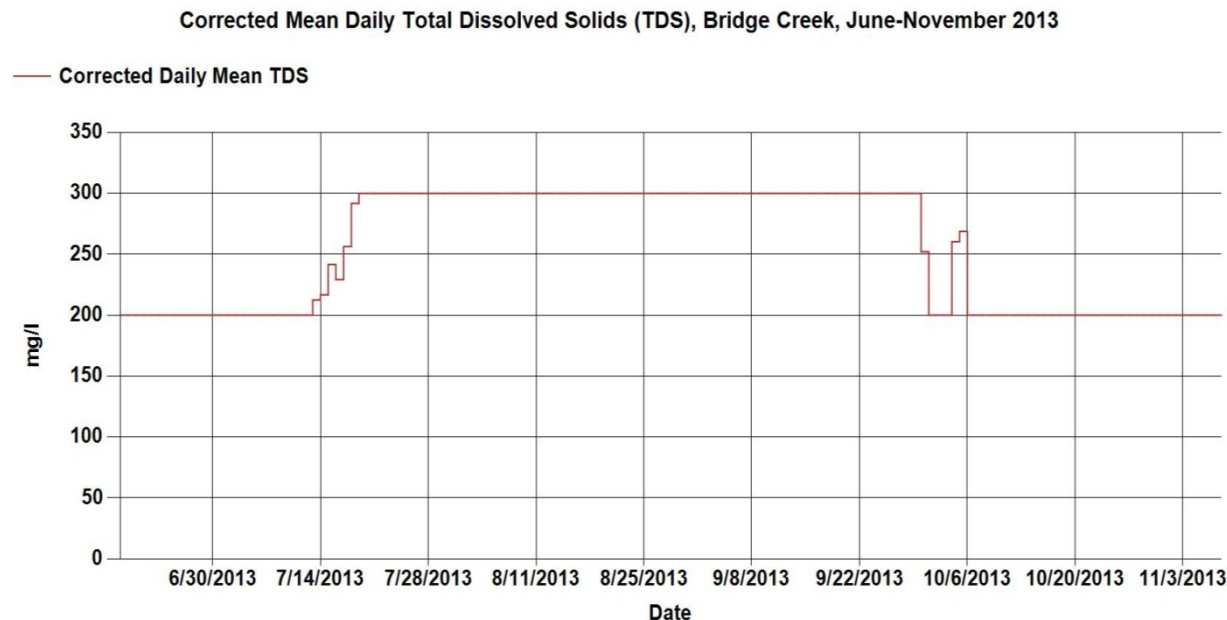


Figure 10. Corrected daily mean total dissolved solids in Bridge Creek, JODA, June-November 2013. Data grades/ratings for each deployment are the same as for specific conductance (Table 3).

Dissolved Oxygen:

Mean daily minimum dissolved oxygen was 8.3 mg/L and never dipped below the regulatory threshold (6.5 mg/L). The lowest dissolved oxygen levels generally corresponded to elevated water temperature. Figure 11 shows the daily minimum dissolved oxygen and maximum temperatures in Bridge Creek from June-November 2013. Table 4 shows the data rating/grade for each deployment period (monthly interval). These standard USGS ratings are based on the degree of sensor fouling and drift encountered during each deployment period (Wagner et al. 2006; Starkey et al. 2008). The “Good” data grades were due to a combination of sensor fouling and drift. Corrections applied to the dissolved oxygen data are listed in Appendix E.

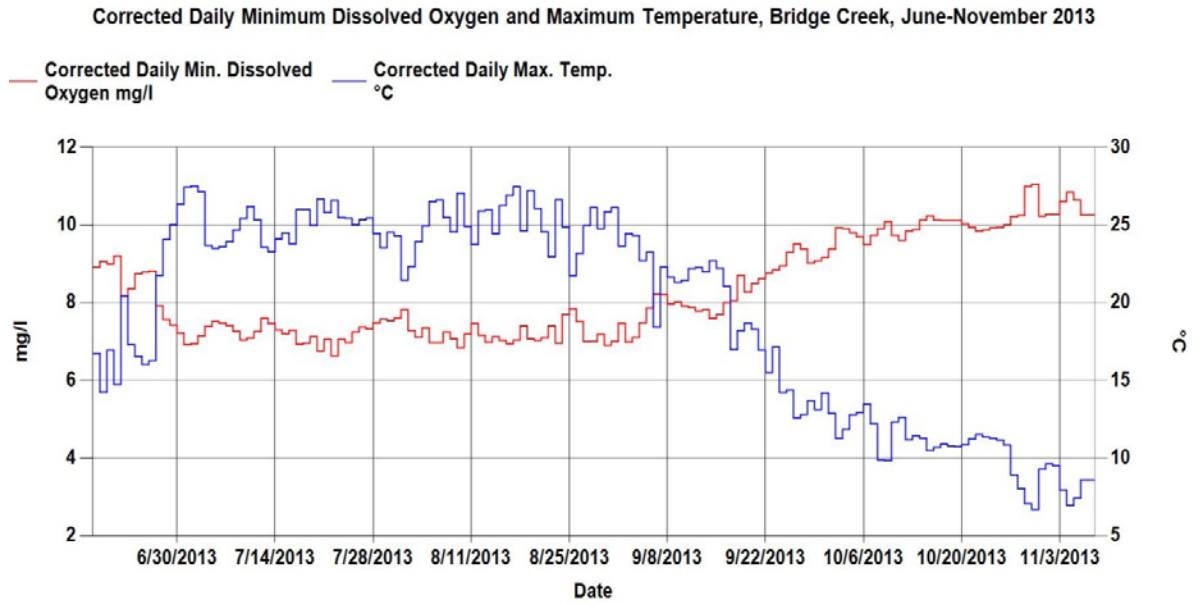


Figure 11. Corrected daily minimum dissolved oxygen and daily maximum temperature in Bridge Creek, JODA, June-November 2013.

Table 4. Data grade/rating for dissolved oxygen each deployment period June-November 2013 in Bridge Creek, JODA.

Dissolved Oxygen Data Grade/Rating	From UTC-07:00	To UTC-07:00
GOOD	06/18/2013 15:00	07/23/2013 15:00
EXCELLENT	07/24/2013 11:00	08/28/2013 07:00
GOOD	08/28/2013 13:00	09/26/2013 08:00
EXCELLENT	09/26/2013 15:00	11/07/2013 09:00

pH:

The minimum and maximum pH was 7.36 and 8.58 pH units respectively. pH never exceeded the upper or lower thresholds(9.0 and 6.5 pH units). Figure 12 shows the daily maximum, minimum, and median pH in Bridge Creek from June-November 2013. Table 5 shows the data rating/grade for each deployment period (monthly interval). These standard USGS ratings are based on the degree of sensor fouling and drift encountered during each deployment period (Wagner et al. 2006; Starkey et al. 2008). The data grade of “fair” (June-July) was due primarily to sensor drift. Corrections applied to the pH data are listed in Appendix E.

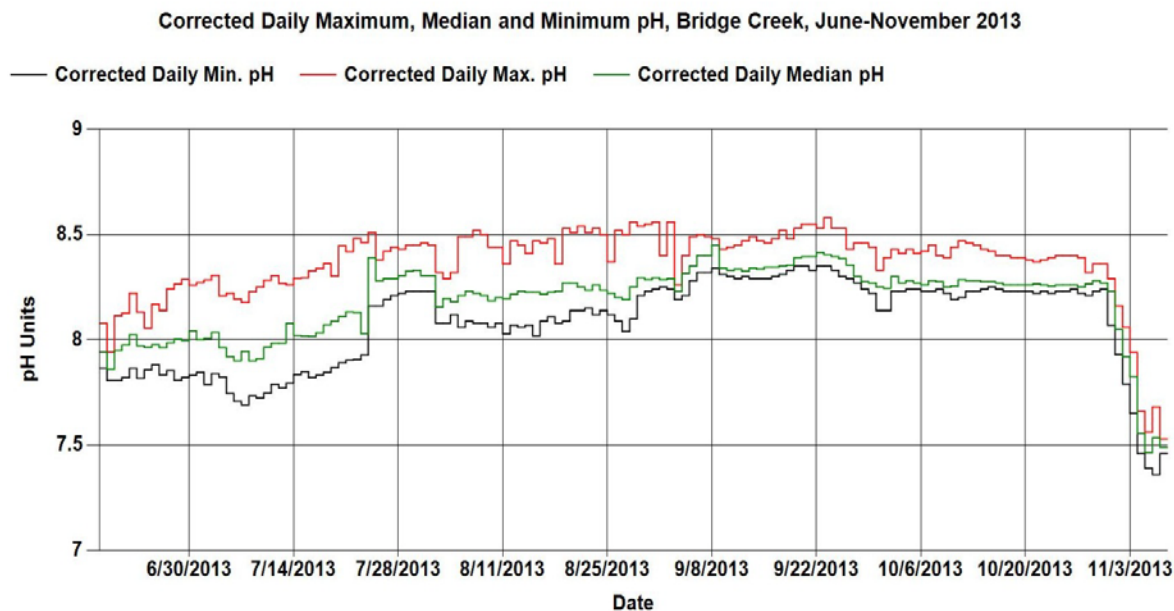


Figure 12. Corrected daily maximum, median and minimum pH in Bridge Creek, JODA, June-November 2013. Note that the maximum and minimum regulatory thresholds were never exceeded (6.5 and 9.0 pH units).

Table 5. Data grade/rating for pH each deployment period June-November 2013 in Bridge Creek, JODA.

pH Data Grade/Rating	From UTC-07:00	To UTC-07:00
FAIR	06/18/2013 15:00	07/23/2013 15:00
EXCELLENT	07/24/2013 11:00	08/28/2013 07:00
EXCELLENT	08/28/2013 13:00	09/26/2013 08:00
EXCELLENT	09/26/2013 15:00	11/07/2013 09:00

Turbidity:

Prior to discussion about turbidity in Bridge Creek, it should be noted that conclusions based on this data are limited due to marginal data quality (Table 6). Sensor fouling due to sediment was the primary factor influencing data quality. It is important to note that the method detection limit (MDL) for this sensor is 0.2 NTU and the minimum level of quantitation (ML) is 0.58 NTU (Appendix D). Figure 13 shows the raw (uncorrected) daily mean turbidity in Bridge Creek from June–November 2013. Raw values were graphed because the program used to manage the water quality data (AQUAIRUS) will only graph corrected data if it has a data grade better than “unusable” (i.e., Poor–Excellent). Corrections applied to turbidity data are listed in Appendix E.

Uncorrected data indicates that the mean turbidity was 66 NTU. This average is influenced by a few elevated turbidity readings near or at the upper sensor threshold (3,000 NTU). The data (see graph in Figure 13) indicates that sensors became blocked and that the blockages gradually cleared. This is consistent with field observations when the turbidity sensor was found partially buried in fine sediment.

Due to poor data quality and lack of historic data for this site the UCBN is unable to determine if conditions exceeded the TMDL. Regulatory thresholds for turbidity state that “< 10% cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity.” Although conclusions are limited based on the quality of data collected in 2013 Bridge Creek does experience relatively high levels of turbidity following rain events. This was particularly evident during the June site visit when a heavy rain event caused particularly high sediment loading and turbidity levels (Figure 14). It is important to note that the “DEQ is in the process of developing quantitative methods and benchmarks to evaluate sedimentation impairment in Oregon streams” (OR DEQ 2010).

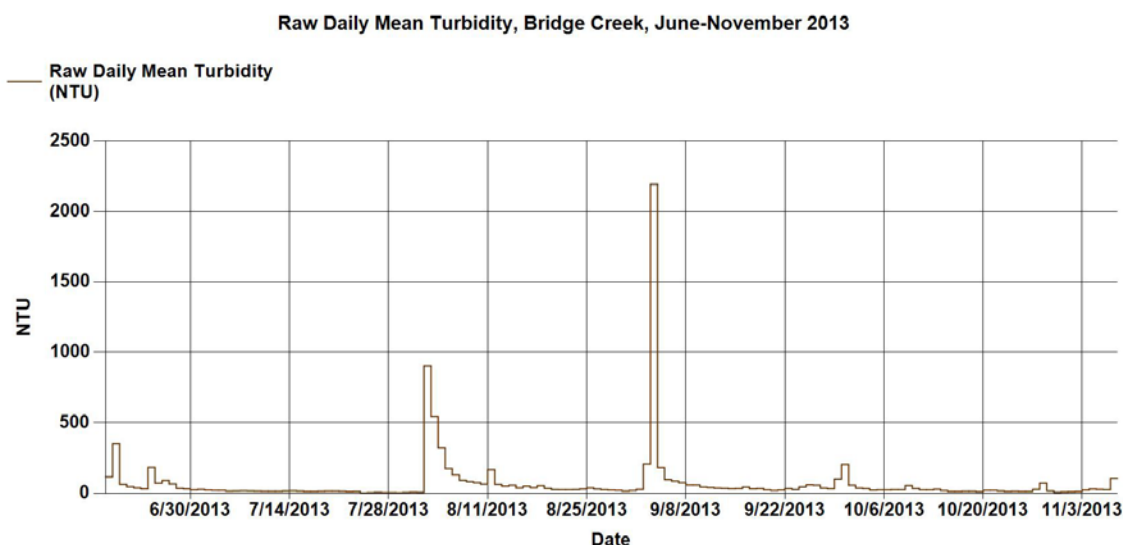


Figure 13. Raw daily mean turbidity in Bridge Creek, JODA June–November 2013. Note that the unusable data grades (blue) presented in table 6 were primarily due to severe fouling.

Table 6. Data grade/rating for turbidity each deployment period June-November 2013 in Bridge Creek, JODA.

Turbidity Data Grade/Rating	From UTC-07:00	To UTC-07:00
UNUSABLE	06/18/2013 15:00	07/23/2013 15:00
UNUSABLE	07/24/2013 11:00	08/28/2013 07:00
UNUSABLE	08/28/2013 13:00	09/26/2013 08:00
UNUSABLE	09/26/2013 15:00	11/07/2013 09:00



Figure 14. Surface flow entering Bridge Creek following a heavy rain event over the Painted Hills (naturally exposed bare soil) and other readily erodible geologic formations.

Macroinvertebrates

Status

The Hilsenhoff Biotic Index (HBI), which summarizes pollution tolerances of the macroinvertebrate taxa within the samples, was 4.18 and 3.48. Values indicate that water quality is “very good” to “excellent”, with “possible slight organic pollution” to “organic pollution unlikely” (Hilsenhoff 1988). HBI values generally increase (HBI ranges from 0.0 to 10.0) as nutrient enrichment increases. While HBI is most sensitive to organic pollution, it may also respond to sediment loading, low dissolved oxygen and elevated water temperatures. The US Forest Service (USFS) community tolerance quotient was between 77 and 83 and indicates that Bridge Creek’s benthic macroinvertebrate community is impaired. Values of the USFS tolerance quotient range from 20 to just over 100, with lower values indicating better water quality. The observed to expected ratio (OE) for both samples was 0.35 and 0.40, with a condition rating of poor. However, due to physiographic and climatic conditions at the sample location the model had to extrapolate rather than interpolate predictor variables. As a result, the condition rating should be interpreted with caution. The number of Ephemeroptera, Plecoptera, Trichoptera (EPT) taxa was 11 and 12; there were 5 and 6 long lived taxa; and the dominant families were Helicopsychidae (snail-case caddisfly) and Leptohyphidae (little stout crawler mayflies).

These benthic macroinvertebrate samples were the first collected in Bridge Creek by the UCBN and will serve as baseline for future comparison. Causes of macroinvertebrate assemblage impairment may be tied to elevated water temperatures and sediment loading. See Table 7 and Appendix F for additional summary metrics.

Table 7. Vital sign summary table for benthic macroinvertebrates in Bridge Creek, 2014.

Bridge Creek Macroinvertebrate Summary July 2014				
PIBO Station		3478		3479
Sample ID		153344		153343
Richness*	RICH	25		25
Shannon's Diversity*	SHDIVER	2.24		2.26
Simpson's Diversity*	SIDIVER	0.83		0.82
Evenness*	Evenness	0.70		0.70
# of EPT Taxa*	EPTT	11		12
Dominant Family	DFAMILY	Helicopsychidae		Leptohyphidae
Dominant Taxa	dtaxonomy	Helicopsyche		Tricorythodes
Hilsenhoff Biotic Index*	tv1	3.48		4.18
# of Intolerant Taxa*	HBIINT1	4		4
# of Tolerant Taxa*	HBITOL1	1		1
USFS Community				
Tolerance Quotient (d)*	ctqd	77		83
# of shredder taxa*	sht	0		2
# of scraper taxa*	sct	2		2
# of collector-filterer taxa*	cft	3		3
# of collector-gatherer taxa*	cgt	11		7
# of predator taxa*	prt	7		7
# of clinger taxa*	clinger	9		5
Long-lived Taxa*	LLTaxa	6		5

John Day River- Sheep Rock Unit

Water Chemistry

Cross Section Survey

A cross section survey was conducted at the proposed multiprobe deployment location to evaluate if the site was reasonably representative of stream conditions throughout the park. As suggested by the water resource division the UCBN judges overall representativeness primarily on the basis of specific conductance (Starkey et al. 2008).

The 2013 deployment location provided adequate water depth throughout the field season, was easily accessible, and was away from heavily trafficked river access points. There are limited other deployment locations along the river due to the proximity of the highway, frequent visitor use and lack of pools. In addition, this deployment location was the same as that used in 2010.

A one way analysis of variance (ANOVA) test was conducted to evaluate representativeness (R v3.0.2). Results of the ANOVA showed that there was a significant difference for specific conductance among the transects and the deployment location in July $F(4,41) = 51.95$, $p < 0.001$ and no significant difference in September $F(4,45) = 2.318$, $p > 0.05$ (Figures 15 and 16).

To determine where the difference in representativeness occurred, a post hoc Tukey's test was conducted (R v3.0.2). Relative to specific conductance, results of the Tukey's test for the cross section conducted in July indicates that the deployment location was significantly different from transects 2, 3, and 4.

In summary, the deployment location was less representative in July than in September; however, this pool and segment of stream likely remains one of the best deployment locations within the Sheep Rock unit.

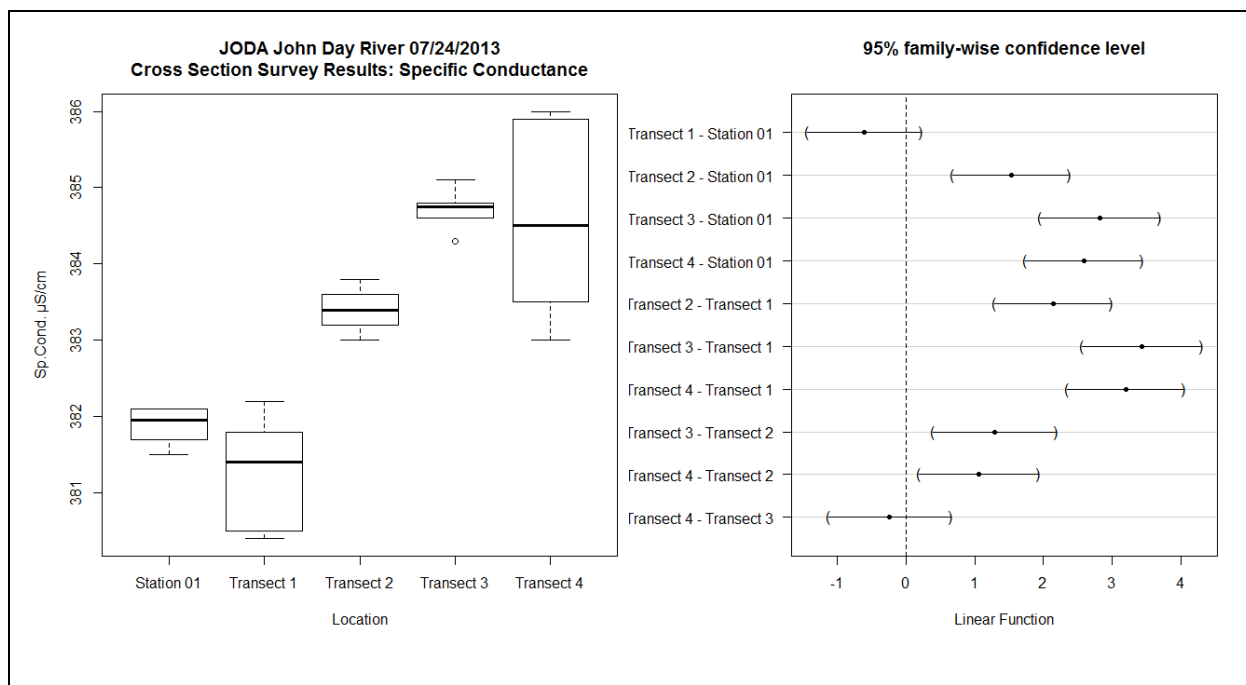


Figure 15. July 2013 cross section survey of John Day River Creek, box plot of specific conductance and plot of 95% family-wise confidence level. Note that “Station01” is the location of the multiprobe deployment and the transects progress upstream (1-4).

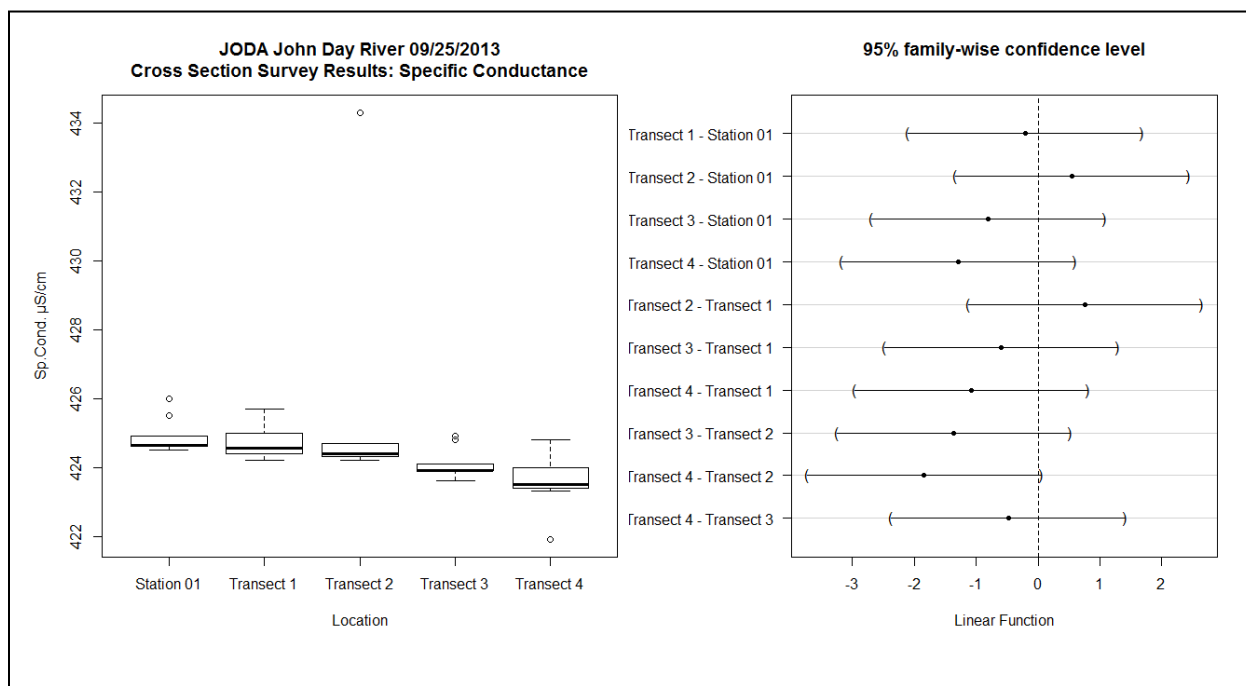


Figure 16. September 2013 cross section survey of John Day River, box plot of specific conductance and plot of 95% family-wise confidence level. Note that “Station01” is the location of the multiprobe deployment and the transects progress upstream (1-4).

Status

Condition of core water quality parameters along with the corresponding Oregon Department of Environmental Quality (DEQ) regulatory threshold are given in Table 8. Data indicate that the primary concerns in the John Day River are elevated water temperatures and dissolved oxygen levels below cool water, non-spawning thresholds. Individual parameters are discussed below.

Table 8. Vital sign summary table for water chemistry in John Day River June-November, 2013.

John Day River Water Chemistry Summary 2013			
Measure	Current Condition (June-November, 2010)	State DEQ Thresholds ^b	% Exceedance ^a
Temperature (*MDMT, **MDAT)	* MDMT= 28.87 °C ** MDAT= 26.21 °C	7 day average of the daily max.< 18 °C (salmon/trout rearing/migration)	60 %
Total dissolved solids /TDS (mean)	233.5 mg/L	TDS < 500 mg/L	0 %
Dissolved oxygen (mean daily min)	7.43 mg/L	> 6.5 mg/L instantaneous (cool water, non-spawning)	16.2 %
pH (mean daily max)	8.56 pH Units	9.0 pH Units	0 %
pH (mean daily min)	8.22 pH Units	6.5 pH Units	0 %
Turbidity (mean daily max)	17.47 NTU	< 10% cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity	Insufficient data

*MDMT – Maximum Daily Maximum Temperature, **MDAT – Maximum Daily Average Temperature, ^a Proportion of samples above water quality standard, ^b OR DEQ 2010, Admin. Rules of OR 2013, 340-041-001 [through 12/15/2013]

0-5% exceedance	
5-25% exceedance	
>25% exceedance	

Temperature:

June-November 2013, the 7 day average of the daily maximum temperature exceeded 18.0 °C in 60.0% of observations and the maximum daily maximum temperature (MDMT) was 28.87 °C. Temperature monitoring also occurred in the John Day River in 2011 and 2012 using a HOBO Pro v2.0 temperature logger. June-October 2012, the 7 day average of the daily maximum temperature exceeded 18.0 °C in 72.2% of observations and the MDMT was 27.86 °C. June-October 2011, the 7 day average of the daily maximum temperature exceeded 18.0 °C in 80.0% of observations and the MDMT was 25.14 °C.

Our data reinforces basin-wide temperature concerns as discussed in the John Day River Basin Total Maximum Daily Load (TMDL) and Water Quality Management Plan (OR DEQ 2010). Figure 17 shows the daily maximum and mean daily temperatures in the John Day River from June-November 2013. Table 9 shows the data rating/grade for each deployment period (monthly interval). These standard USGS ratings are based on the degree of sensor fouling encountered during each deployment period (Wagner et al. 2006; Starkey et al. 2008; Starkey et al. 2013).

Water temperatures are of particular interest in the John Day River, given that its designated fish use is for salmon and trout rearing and migration (note: includes all salmon species, steelhead, rainbow and cutthroat trout). Elevated water temperatures can be caused by poor stream shading and dewatering. It is important to note that elevated water temperatures have the capacity to reduce the total concentration of dissolved oxygen (i.e., there is an inverse relationship between water temperature and dissolved oxygen; Figure 20), thereby impacting aquatic biota. Implications of elevated water temperatures may include decreased salmonid recruitment, decreased salmonid health, and potential shifts in fish and benthic macroinvertebrate communities (Vannote and Sweeney 1980; McCullough 1999).

Maintaining water temperatures suitable for naturally occurring species in the John Day River will depend on riparian condition and reduced dewatering basin-wide. For this reason cooperation with other agencies, stakeholders, and adjacent landowners will be critical for improving water temperature.

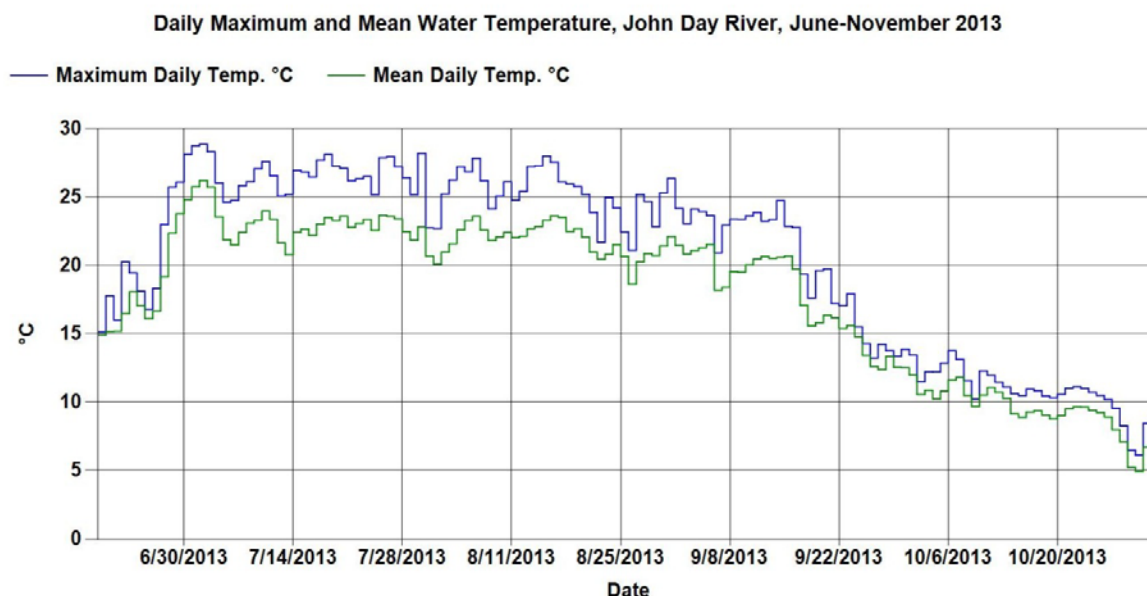


Figure 17. Daily maximum and mean water temperature in John Day River, JODA June-November 2013.

Table 9. Data grade/rating for water temperature each deployment period June-November 2013 in John Day River, JODA.

Temperature Data Grade/Rating	From UTC-07:00	To UTC-07:00
EXCELLENT	06/19/2013 15:00	07/24/2013 10:00
GOOD	07/24/2013 18:00	08/28/2013 13:00
EXCELLENT	08/28/2013 17:00	09/25/2013 08:00
GOOD	09/25/2013 18:00	11/01/2013 17:00

Specific Conductance:

Specific conductance ranged from 242.0 to 455.10 $\mu\text{S}/\text{cm}$, with a mean specific conductance of 351.44 $\mu\text{S}/\text{cm}$. There is no regulatory threshold for specific conductance but rather a threshold for total dissolved solids (see below). The sudden decrease in specific conductance seen in early October was likely due in part to the end of irrigation season (April 1st to September 30th). (Figure 18). This drop in specific conductance corresponds to an increase in stream discharge for the same period (USGS #14046500 at Service Creek). Table 10 shows the data rating/grade for each deployment period (monthly interval). These standard USGS ratings are based on the degree of sensor fouling and drift encountered during each deployment period (Wagner et al. 2006; Starkey et al. 2008). Specific conductance data grades less than excellent were due to a combination of fouling and sensor drift. Corrections applied to the specific conductance data are listed in Appendix E.

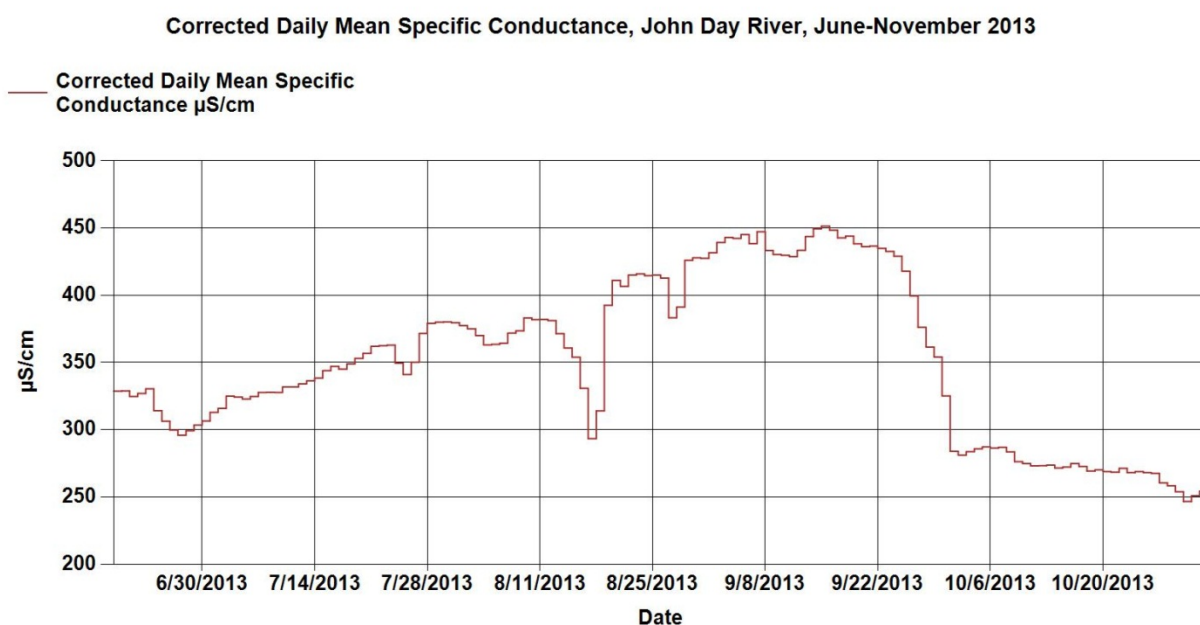


Figure 18. Corrected daily mean specific conductance in John Day River, JODA, June-November 2013.

Table 10. Data grade/rating for specific conductance and TDS each deployment period June-November 2013 in John Day River, JODA.

Specific Conductance Data Grade/Rating	From UTC-07:00	To UTC-07:00
GOOD	06/19/2013 15:00	07/24/2013 10:00
FAIR	07/24/2013 18:00	08/28/2013 13:00
POOR	08/28/2013 17:00	09/25/2013 08:00
EXCELLENT	09/25/2013 18:00	11/01/2013 17:00

Total Dissolved Solids (TDS):

Average total dissolved solids was 233.5 mg/L and never exceeded the regulatory threshold of 500 mg/L (Figure 19). Data rating/grades for each deployment period (monthly interval) are the same as for specific conductance (Table 10).

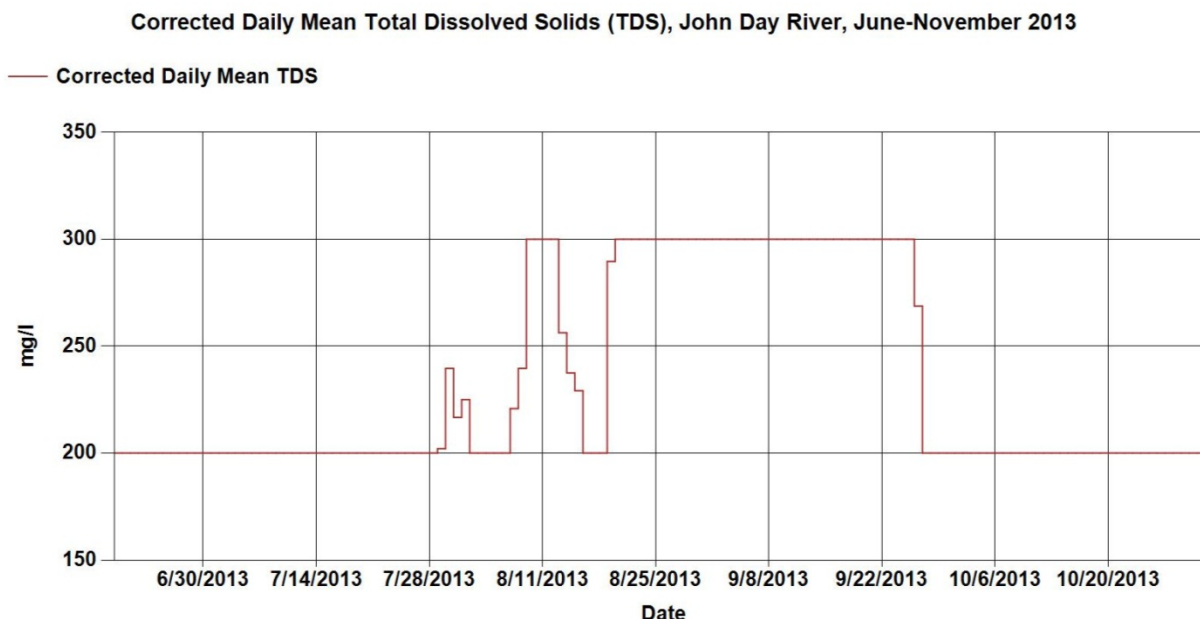


Figure 19. Corrected daily mean total dissolved solids in John Day River, JODA, June-November 2013. Data grades/ratings for each deployment are the same as for specific conductance (Table 10).

Dissolved Oxygen:

Mean daily minimum dissolved oxygen was 7.43 mg/L and dipped below the regulatory threshold (6.5 mg/L) during 16.2% of observations. Note that in 2010, dissolved oxygen was below 6.5 mg/L in less than 1% of observations (Starkey 2013). Low dissolved oxygen levels generally corresponded to spikes in water temperature. Figure 20 shows the daily minimum dissolved oxygen and maximum temperatures in the John Day River from June-November 2013. Table 11 shows the data rating/grade for each deployment period (monthly interval). These standard USGS ratings are based on the degree of sensor fouling and drift encountered during each deployment period (Wagner et al. 2006; Starkey et al. 2008). Unusable and poor data grades were primarily due to sensor fouling. Corrections applied to the dissolved oxygen data are listed in Appendix E.

Data from 2013 monitoring supports the listing of the John Day River as impaired for dissolved oxygen. Low dissolved oxygen can be a threat to aquatic life, especially when coupled with elevated water temperatures.

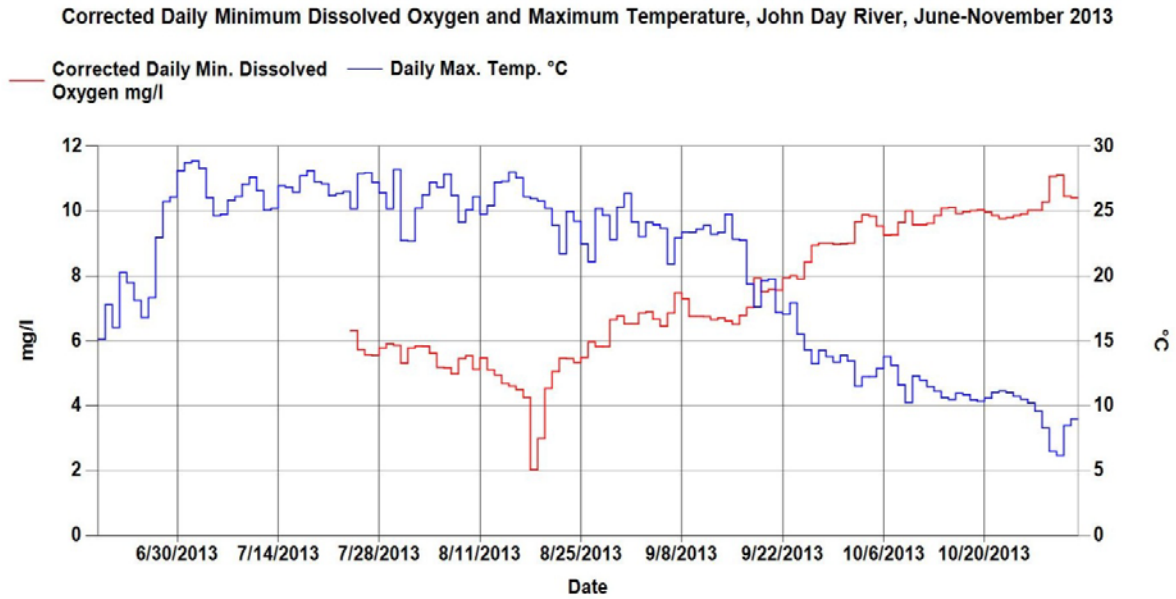


Figure 20. Corrected daily minimum dissolved oxygen and daily maximum temperature in John Day River, JODA, June-November 2013.

Table 11. Data grade/rating for dissolved oxygen each deployment period June-November 2013 in John Day River, JODA.

Dissolved Oxygen Data Grade/Rating	From UTC-07:00	To UTC-07:00
UNUSABLE	06/19/2013 15:00	07/24/2013 10:00
POOR	07/24/2013 18:00	08/28/2013 13:00
EXCELLENT	08/28/2013 17:00	09/25/2013 08:00
EXCELLENT	09/25/2013 18:00	11/01/2013 17:00

pH:

The minimum and maximum pH was 7.73 and 8.77 pH units respectively. pH never exceeded the upper or lower thresholds(9.0 and 6.5 pH units). Figure 21 shows the daily maximum, minimum, and median pH in the John Day River from June-November 2013. Table 12 shows the data rating/grade for each deployment period (monthly interval). These standard USGS ratings are based on the degree of sensor fouling and drift encountered during each deployment period (Wagner et al. 2006; Starkey et al. 2008). The data grade of “good” (July-August) was due to a combination of sensor drift and fouling. Corrections applied to the pH data are listed in Appendix E.

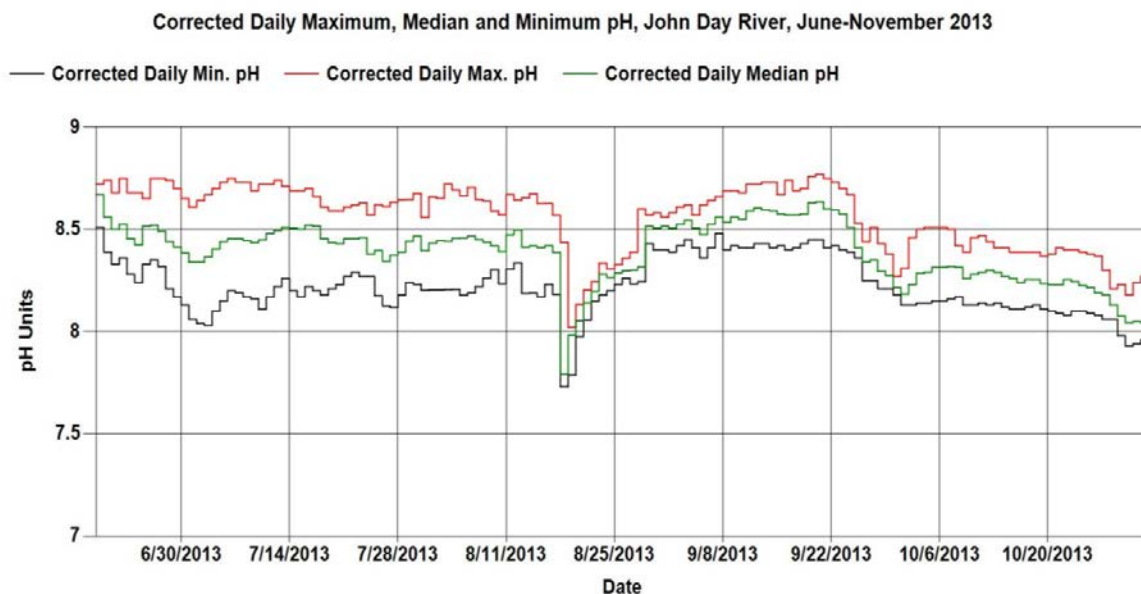


Figure 21. Corrected daily maximum, median and minimum pH in John Day River, JODA, June-November 2013. Note that the maximum and minimum regulatory thresholds were never exceeded (6.5 and 9.0 pH units).

Table 12. Data grade/rating for pH each deployment period June-November 2013 in John Day River, JODA.

pH Data Grade/Rating	From UTC-07:00	To UTC-07:00
EXCELLENT	06/19/2013 15:00	07/24/2013 10:00
GOOD	07/24/2013 18:00	08/28/2013 13:00
EXCELLENT	08/28/2013 17:00	09/25/2013 08:00
EXCELLENT	09/25/2013 18:00	11/01/2013 17:00

Turbidity:

Prior to discussion about turbidity in the John Day River, it should be noted that conclusions based on this data are limited due to marginal data quality (Table 13). Sensor fouling due to sediment was the primary factor influencing data quality. It is important to note that the method detection limit (MDL) for this sensor is 0.2 NTU and the minimum level of quantitation (ML) is 0.53 NTU (Appendix D). Figure 22 shows the raw (uncorrected) daily mean turbidity in the John Day River from June–November 2013. Raw values were graphed because the program used to manage the water quality data (AQUAIRUS) will only graph corrected data if it has a data grade better than “unusable” (i.e., Poor–Excellent). Note that the data grade June–July was “fair” and was the only data used in analysis (outliers removed). Corrections applied to turbidity data are listed in Appendix E.

Corrected data indicates that the mean daily maximum turbidity June–July was 17.47 NTU, the maximum daily maximum was 113.92 NTU.

Due to poor data quality and lack of historic data for this site the UCBN is unable to determine if conditions exceeded the TMDL. Regulatory thresholds for turbidity state that “< 10% cumulative increase in natural stream turbidities may be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity.” Although conclusions are limited based on the quality of data collected in 2013 John Day River does experience relatively high levels of turbidity following locally heavy rain events. This is due in part to readily erodible geologic features within the watershed. It is important to note that the “DEQ is in the process of developing quantitative methods and benchmarks to evaluate sedimentation impairment in Oregon streams” (OR DEQ 2010).

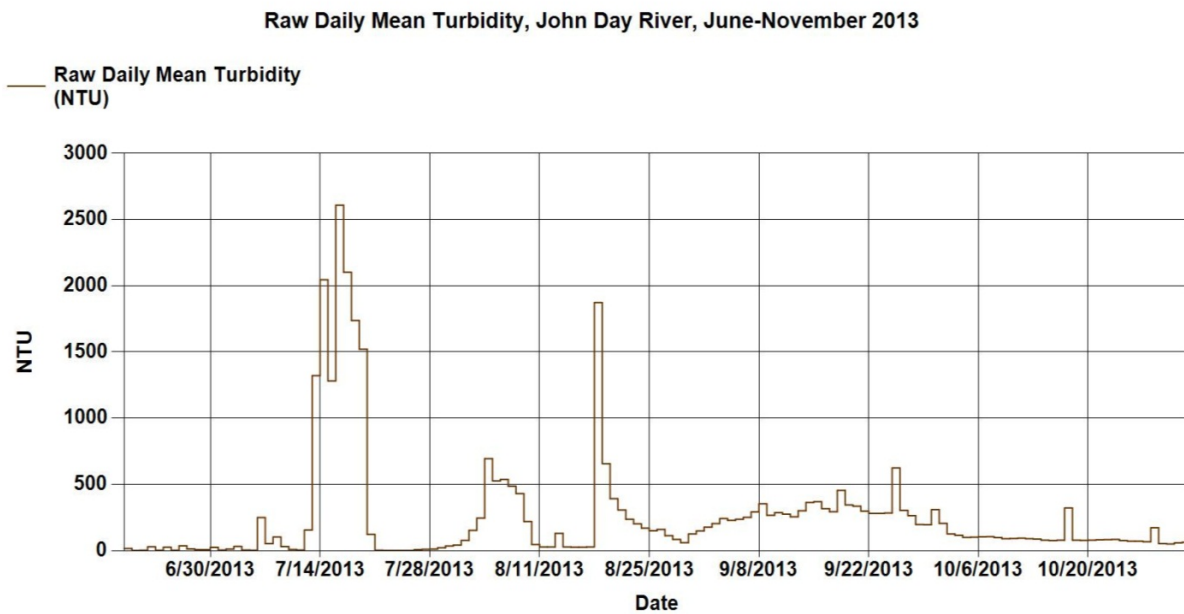


Figure 22. Raw daily mean turbidity in John Day River, JODA June-November 2013. Note that the unusable data grades (blue) presented in table 6 were primarily due to severe fouling.

Table 13. Data grade/rating for turbidity each deployment period June-November 2013 in John Day River, JODA.

Turbidity Data Grade/Rating	From UTC-07:00	To UTC-07:00
FAIR	06/19/2013 15:00	07/24/2013 10:00
UNUSABLE	07/24/2013 18:00	08/28/2013 13:00
UNUSABLE	08/28/2013 17:00	09/25/2013 08:00
UNUSABLE	09/25/2013 18:00	11/01/2013 17:00

Macroinvertebrates

Status

The Hilsenhoff Biotic Index (HBI), which summarizes pollution tolerances of the macroinvertebrate taxa within the sample, ranged from 3.45 to 3.94 with a mean of 3.80. The mean HBI value indicates that the segment of John Day River within the park has “possible slight organic pollution” and “very good” water quality (Hilsenhoff 1988). HBI values generally increase (HBI ranges from 0.0 to 10.0) as nutrient enrichment increases. While HBI is most sensitive to organic pollution, it may also respond to sediment loading, low dissolved oxygen and elevated water temperatures. The US Forest Service (USFS) community tolerance quotient ranged from 67 to 87 and indicates that the John Day River’s benthic macroinvertebrate community is somewhat impaired. Values of the USFS tolerance quotient range from 20 to just over 100, with lower values indicating better water quality. The observed to expected ratio (OE) for these samples ranged from 0.35 to 0.45 and indicated that the John Day River was in “poor” condition. However, due to physiographic and climatic conditions at the sample location the model had to extrapolate rather than interpolate predictor variables. As a result the condition rating should be interpreted with caution. The median number of Ephemeroptera, Plecoptera, Trichoptera (EPT) taxa was 14; the median number of long lived taxa was 6; and the dominate family in 3 of the 6 samples was Elmidae (riffle beetles). In the other 3 samples, the dominate family was Heptageniidae (flat-headed mayflies) (2 samples) and Hydropsychidae (net-spinning caddisflies). See Table 14 and Appendix F for additional summary metrics.

These data suggest that this segment of the John Day River is somewhat impaired. Causes of impairment may be tied to elevated water temperatures, low dissolved oxygen levels, or physical factors such as substrate armoring. See the 2014 stream channel characteristics and riparian condition monitoring annual report for more information about physical factors that may be influencing macroinvertebrate assemblages in the John Day River.

Table 14. Vital sign summary table for benthic macroinvertebrates in John Day River, 2013.

John Day River Macroinvertebrate Summary July 2013							
PIBO Station		3073	3074	3075	3076	3077	3078
Sample ID		150977	150978	150979	150980	150981	151013
Richness*	RICH	33	22	27	24	24	26
Shannon's Diversity*	SHDIVER	2.53	2.11	2.57	2.18	2.56	2.39
Simpson's Diversity*	SIDIVER	0.85	0.78	0.89	0.81	0.90	0.85
Evenness*	Evenness	0.72	0.68	0.78	0.69	0.81	0.73
# of EPT Taxa*	EPTT	21	12	17	12	14	14
Dominant Family	DFAMILY	Heptageniidae	Elmidae	Hydropsychidae	Elmidae	Heptageniidae	Elmidae
Dominant Taxa	dtaxonomy	Rhithrogena	Microcylloepus pusillus	Hydropsyche	Microcylloepus pusillus	Heptageniidae	Microcylloepus pusillus
Hilsenhoff Biotic Index*	tv1	3.45	3.92	3.55	3.94	3.79	3.81
# of Intolerant Taxa*	HBIINT1	9	4	7	2	4	3
# of Tolerant Taxa*	HBITOL1	0	0	0	0	1	0
USFS Community Tolerance Quotient (d)*	ctqd	67	76	73	82	76	87
# of shredder taxa*	sht	1	1	1	1	0	1
# of scraper taxa*	sct	6	2	4	3	2	2
# of collector-filterer taxa*	cft	4	5	4	4	5	4
# of collector-gatherer taxa*	cgt	14	9	12	9	10	10
# of predator taxa*	prt	5	2	4	3	4	4
# of clinger taxa*	clinger	14	12	13	11	12	10
Long-lived Taxa*	LLTaxa	6	6	7	6	8	6

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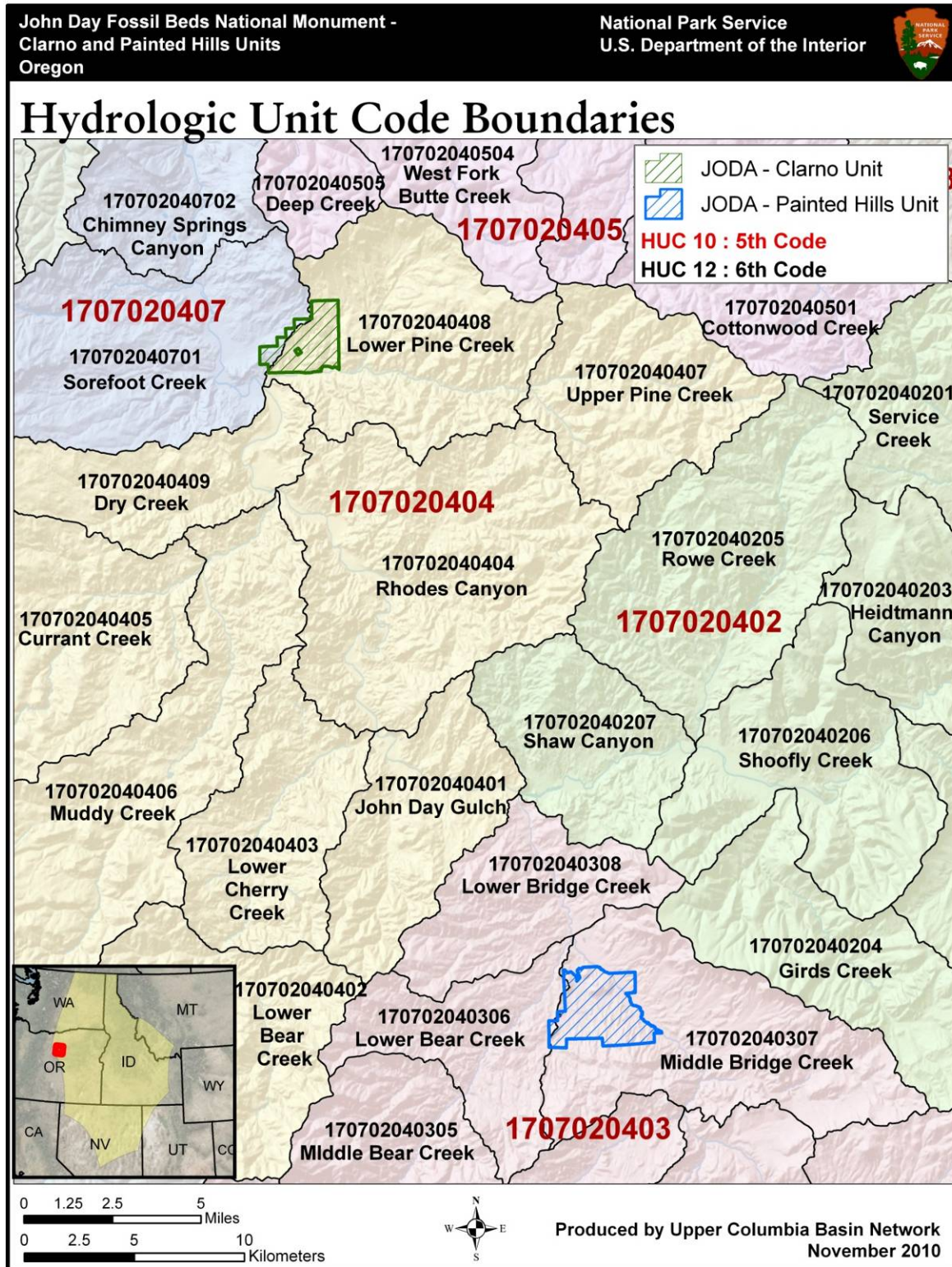
Appendix A. 2013 Water Quality Monitoring Locations



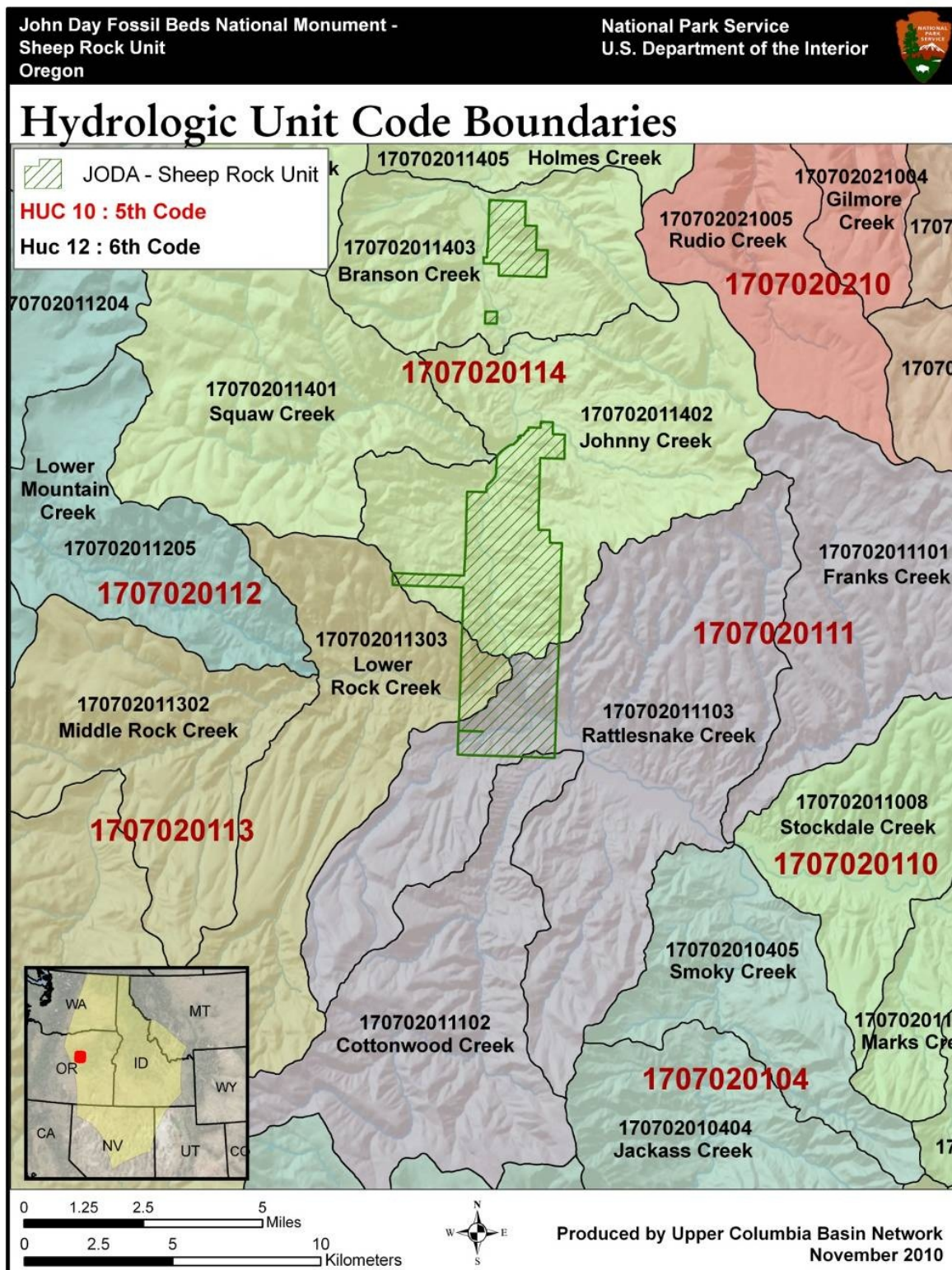
Appendix A. 2013 Water Quality Monitoring Locations (continued)



Appendix B. JODA Hydrologic Unit Code Boundaries



Appendix B. JODA Hydrologic Unit Code Boundaries (continued)



Appendix C. Sample Locations for Water Quality Monitoring at JODA

Park	Stream	Monitoring Type	Station #	Lat.	Long.	Y	X
JODA	Bridge Creek	Water Chemistry	001	44.65517177	-120.25189075	4948319	717889
JODA	John Day River	Water Chemistry	001	44.56650180	-119.64642028	4938202	289853
JODA	Bridge Creek	Macroinvertebrate	3478	44.6577	-120.2556	4948590	717585
JODA	Bridge Creek	Macroinvertebrate	3479	44.6565	-120.2547	4948459	717661
JODA	John Day River	Macroinvertebrate	3073	44.57885	-119.645	4939571	290011
JODA	John Day River	Macroinvertebrate	3074	44.5747	-119.646	4939113	289917
JODA	John Day River	Macroinvertebrate	3075	44.5672	-119.646	4938279	289889
JODA	John Day River	Macroinvertebrate	3076	44.56167	-119.647	4937668	289790
JODA	John Day River	Macroinvertebrate	3077	44.5575	-119.642	4937192	290172
JODA	John Day River	Macroinvertebrate	3078	44.55081	-119.642	4936449	290148

Note that X and Y have been projected in WGS84, UTM Zone 10 (Bridge Creek) Zone 11 (John Day River). These locations were recorded by the field crew with a handheld GPS unit.

Appendix D. Quality Control (QC) Indicators

QC data quality indicators for 2013 season at JODA- Sheep Rock, John Day River, Hydrolab #064, Station ID: JODA-Sheep Rock #001.

STORET Name	Units	Detection Range Description from Manufacture	Method Detection Limit (MDL)	Minimum Level of Quantitation (ML)	Alternative Measurement Sensitivity Plus (AMS+) Beginning of Season	Alternative Measurement Sensitivity Plus (AMS+) End of Season	Precision+ (RPD) Beginning of Season	Precision+ (RPD) End of Season
Temperature, water	deg C	-5 to 50°C	N/A	N/A	0.23	0.02	0.04	0.00
Specific Conductance	µS/cm	0 to 100,000 µS/cm	N/A	N/A	0.8	2.0	0.03	0.00
Dissolved Oxygen	mg/L	0-20 mg/L	N/A	N/A	0.08	0.09	0.10	0.09
pH	pH units	0-14 Units	N/A	N/A	0.03	0.02	0.00	0.12
Turbidity	NTU	0-3000 NTU	0.2	0.53	1.3	54.7	100.0	0.57

QC data quality indicators for 2013 season at JODA-Painted Hills, Bridge Creek Hydrolab #054, Station ID: JODA-Painted Hills #001.

STORET Name	Units	Detection Range Description from Manufacture	Method Detection Limit (MDL)	Minimum Level of Quantitation (ML)	Alternative Measurement Sensitivity Plus (AMS+) Beginning of Season	Alternative Measurement Sensitivity Plus (AMS+) End of Season	Precision+ (RPD) Beginning of Season	Precision+ (RPD) End of Season
Temperature, water	deg C	-5 to 50°C	N/A	N/A	0.09	0.15	0.06	0.08
Specific Conductance	µS/cm	0 to 100,000 µS/cm	N/A	N/A	0.7	1.4	0.02	0.02
Dissolved Oxygen	mg/L	0-20 mg/L	N/A	N/A	0.02	0.04	0.00	0.00
pH	pH units	0-14 Units	N/A	N/A	0.02	0.03	0.00	0.12
Turbidity	NTU	0-3000 NTU	0.2	0.58	8.0	8.0	1.10	2.72

Appendix E. Corrections History

Correction history for Bridge Creek, JODA 2013 temperature data.

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete point(s)- to correct for PDT to PST	11/2/2013 2:00	11/2/2013 2:00	11/7/2013 13:12	1
EStarkey	Clock Drift Correction with start offset of - 60.000 and end offset of -60.000. PDT to PST	11/2/2013 3:00	11/7/2013 9:00	11/7/2013 13:13	210

Correction history for Bridge Creek, JODA 2013 specific conductance data.

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Drift Correction with Calibration Drift value of 6.950µS/cm and Fouling Drift value of 0.400µS/cm	6/18/2013 15:00	7/23/2013 15:00	8/1/2013 13:58	841
EStarkey	Delete Region-outlier	8/1/2013 8:00	8/1/2013 8:00	9/4/2013 10:32	1
EStarkey	Delete Region-outlier	8/1/2013 19:00	8/1/2013 19:00	9/4/2013 10:33	1
EStarkey	Drift Correction with Calibration Drift value of -4.900µS/cm and Fouling Drift value of -0.500µS/cm	7/24/2013 11:00	8/28/2013 7:00	9/4/2013 10:35	837
EStarkey	Delete Region- due to outlier	9/17/2013 16:00	9/17/2013 16:00	10/23/2013 15:06	1
EStarkey	Delete Region- due to outlier	9/23/2013 0:00	9/23/2013 0:00	10/23/2013 15:07	1
EStarkey	Delete Region- due to outlier	9/25/2013 18:00	9/25/2013 18:00	10/23/2013 15:08	1
EStarkey	Drift Correction with Calibration Drift value of -5.200µS/cm and Fouling Drift value of 1.200µS/cm	8/28/2013 13:00	9/26/2013 8:00	10/23/2013 15:09	692
EStarkey	Delete Region- due to outlier	10/14/2013 2:00	10/14/2013 2:00	11/7/2013 13:16	1
EStarkey	Delete Region- due to outlier	10/14/2013 9:00	10/14/2013 9:00	11/7/2013 13:16	1
EStarkey	Delete Region- due to outlier	10/14/2013 12:00	10/14/2013 12:00	11/7/2013 13:16	1
EStarkey	Delete Region- due to outlier	10/14/2013 11:00	10/14/2013 11:00	11/7/2013 13:16	1
EStarkey	Delete Region- due to outlier	10/14/2013 5:00	10/14/2013 5:00	11/7/2013 13:17	1
EStarkey	Delete point(s)-to correct PDT to PST	11/2/2013 2:00	11/2/2013 2:00	11/7/2013 13:18	1
EStarkey	Clock Drift Correction with start offset of - 60.000 and end offset of -60.000. PDT to PST.	11/2/2013 3:00	11/7/2013 9:00	11/7/2013 13:19	210

Appendix E. Correction History (continued)

Correction history for Bridge Creek, JODA 2013 dissolved oxygen data.					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Drift Correction with Calibration Drift value of -0.360mg/l and Fouling Drift value of -0.040mg/l	6/18/2013 15:00	7/23/2013 15:00	8/1/2013 14:09	841
EStarkey	Delete Region-outlier	8/18/2013 14:00	8/18/2013 14:00	9/4/2013 10:49	1
EStarkey	Delete Region- due to outlier	9/17/2013 0:00	9/17/2013 0:00	10/23/2013 15:29	1
EStarkey	Delete Region- due to outlier	9/16/2013 23:00	9/16/2013 23:00	10/23/2013 15:30	1
EStarkey	Delete Region- due to outlier	9/17/2013 11:00	9/17/2013 11:00	10/23/2013 15:30	1
EStarkey	Delete Region- due to outlier	9/18/2013 7:00	9/18/2013 7:00	10/23/2013 15:30	1
EStarkey	Delete Region- due to outlier	9/23/2013 3:00	9/23/2013 3:00	10/23/2013 15:31	1
EStarkey	Drift Correction with Calibration Drift value of 0.210mg/l and Fouling Drift value of 0.090mg/l	8/28/2013 13:00	9/26/2013 8:00	10/23/2013 15:32	692
EStarkey	Delete Region- due to outlier	10/12/2013 19:00	10/12/2013 20:00	11/7/2013 13:24	2
EStarkey	Delete point(s)- to correct for PDT to PST	11/2/2013 2:00	11/2/2013 2:00	11/7/2013 13:25	1
EStarkey	Clock Drift Correction with start offset of -60.000 and end offset of -60.000. PDT to PST	11/2/2013 3:00	11/7/2013 9:00	11/7/2013 13:26	210

Correction history for Bridge Creek, JODA 2013 pH data.					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Drift Correction with Calibration Drift value of 0.593pH and Fouling Drift value of -0.160pH	6/18/2013 15:00	7/23/2013 15:00	8/1/2013 14:13	841
EStarkey	Delete Region- due to outlier	10/4/2013 8:00	10/4/2013 8:00	11/7/2013 13:28	1
EStarkey	Delete Region- due to outlier	10/30/2013 9:00	10/30/2013 9:00	11/7/2013 13:28	1
EStarkey	Delete Region- due to outlier	11/1/2013 9:00	11/1/2013 9:00	11/7/2013 13:29	1
EStarkey	Delete point(s). to correct for PDT to PST	11/2/2013 0:00	11/2/2013 0:00	11/7/2013 13:30	1
EStarkey	Clock Drift Correction with start offset of -60.000 and end offset of -60.000. PDT to PST	11/2/2013 1:00	11/7/2013 9:00	11/7/2013 13:31	214

Appendix E. Correction History (continued)

Correction history for Bridge Creek, JODA 2013 turbidity data.					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region- due to suspected outlier	6/19/2013 22:00	6/19/2013 22:00	10/23/2013 13:48	1
EStarkey	Delete Region-due to outlier	6/21/2013 23:00	6/21/2013 23:00	10/23/2013 13:49	1
EStarkey	Delete Region-due to outlier	6/22/2013 6:00	6/22/2013 6:00	10/23/2013 13:49	1
EStarkey	Delete Region-due to outlier	6/25/2013 23:00	6/25/2013 23:00	10/23/2013 13:54	1
EStarkey	Delete Region-due to outlier	6/26/2013 6:00	6/26/2013 6:00	10/23/2013 13:54	1
EStarkey	Delete Region-due to outlier	6/26/2013 19:00	6/26/2013 20:00	10/23/2013 13:55	2
EStarkey	Delete Region-due to outlier	6/29/2013 6:00	6/29/2013 6:00	10/23/2013 13:56	1
EStarkey	Delete Region-due to outlier	7/1/2013 1:00	7/1/2013 1:00	10/23/2013 13:57	1
EStarkey	Delete Region-due to outlier	7/1/2013 8:00	7/1/2013 8:00	10/23/2013 13:57	1
EStarkey	Delete Region-due to outlier	7/3/2013 6:00	7/3/2013 6:00	10/23/2013 13:57	1
EStarkey	Delete Region-due to outlier	7/4/2013 4:00	7/4/2013 4:00	10/23/2013 13:58	1
EStarkey	Delete Region-due to outlier	7/9/2013 0:00	7/9/2013 0:00	10/23/2013 13:58	1
EStarkey	Delete Region-due to outlier	7/8/2013 11:00	7/8/2013 11:00	10/23/2013 13:59	1
EStarkey	Delete Region-due to outlier	7/10/2013 23:00	7/10/2013 23:00	10/23/2013 13:59	1
EStarkey	Delete Region-due to outlier	7/11/2013 13:00	7/11/2013 13:00	10/23/2013 13:59	1
EStarkey	Delete Region-due to outlier	7/13/2013 0:00	7/13/2013 0:00	10/23/2013 14:00	1
EStarkey	Delete Region-due to outlier	7/13/2013 4:00	7/13/2013 4:00	10/23/2013 14:00	1
EStarkey	Delete Region-due to outlier	7/13/2013 23:00	7/13/2013 23:00	10/23/2013 14:00	1
EStarkey	Delete Region-due to outlier	7/15/2013 3:00	7/15/2013 3:00	10/23/2013 14:01	1
EStarkey	Delete Region-due to outlier	7/15/2013 10:00	7/15/2013 10:00	10/23/2013 14:01	1
EStarkey	Delete Region-due to outlier	7/20/2013 15:00	7/20/2013 15:00	10/23/2013 14:02	1
EStarkey	Delete Region-due to outlier	7/22/2013 12:00	7/22/2013 12:00	10/23/2013 14:02	1
EStarkey	Delete Region-due to outlier	6/19/2013 7:00	6/19/2013 7:00	10/23/2013 14:03	1

Appendix E. Correction History (continued)

Correction history for Bridge Creek, JODA 2013 turbidity data (continued).					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region-due to outlier	6/19/2013 23:00	6/19/2013 23:00	10/23/2013 14:03	1
EStarkey	Delete Region-due to outlier	6/24/2013 15:00	6/24/2013 15:00	10/23/2013 14:04	1
EStarkey	Delete Region-due to outlier	8/2/2013 2:00	8/2/2013 2:00	10/23/2013 14:40	1
EStarkey	Delete Region- suspected blocked sensor optic	8/2/2013 12:00	8/2/2013 14:00	10/23/2013 14:41	3
EStarkey	Delete Region-due to outlier	8/2/2013 11:00	8/2/2013 15:00	10/23/2013 14:41	5
EStarkey	Delete Region-due to outlier	8/5/2013 0:00	8/5/2013 0:00	10/23/2013 14:42	1
EStarkey	Delete Region-due to outlier	8/7/2013 5:00	8/7/2013 5:00	10/23/2013 14:42	1
EStarkey	Delete Region-due to outlier	8/11/2013 2:00	8/11/2013 2:00	10/23/2013 14:43	1
EStarkey	Delete Region-due to outlier	8/11/2013 13:00	8/11/2013 13:00	10/23/2013 14:43	1
EStarkey	Delete Region	8/14/2013 12:00	8/14/2013 12:00	10/23/2013 14:43	1
EStarkey	Delete Region-due to outlier	8/18/2013 11:00	8/18/2013 11:00	10/23/2013 14:44	1
EStarkey	Delete Region-due to outlier	8/19/2013 7:00	8/19/2013 7:00	10/23/2013 14:44	1
EStarkey	Delete Region-due to outlier	8/22/2013 0:00	8/22/2013 0:00	10/23/2013 14:44	1
EStarkey	Delete Region-due to outlier	8/23/2013 6:00	8/23/2013 6:00	10/23/2013 14:44	1
EStarkey	Delete Region-due to outlier	8/25/2013 17:00	8/25/2013 17:00	10/23/2013 14:45	1
EStarkey	Delete Region-due to outlier	8/27/2013 4:00	8/27/2013 5:00	10/23/2013 14:45	2
EStarkey	Delete Region-due to outlier	8/27/2013 23:00	8/27/2013 23:00	10/23/2013 14:45	1
EStarkey	Drift Correction with Calibration Drift value of -0.400NTU and Fouling Drift value of -8.300NTU	7/24/2013 11:00	8/28/2013 7:00	10/23/2013 14:47	837
EStarkey	Delete Region- due to outlier	9/1/2013 2:00	9/1/2013 2:00	10/23/2013 14:53	1
EStarkey	Delete Region- suspect blocked sensor optic	9/2/2013 23:00	9/3/2013 15:00	10/23/2013 14:54	17
EStarkey	Delete Region-suspect blocked sensor optic	9/3/2013 16:00	9/3/2013 17:00	10/23/2013 14:55	2
EStarkey	Delete Region- due to outlier	9/6/2013 4:00	9/6/2013 4:00	10/23/2013 14:55	1

Appendix E. Correction History (continued)

Correction history for Bridge Creek, JODA 2013 turbidity data (continued).					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region- due to outlier	9/9/2013 20:00	9/9/2013 20:00	10/23/2013 14:55	1
EStarkey	Delete Region- due to outlier	9/9/2013 9:00	9/9/2013 9:00	10/23/2013 14:56	1
EStarkey	Delete Region- due to outlier	9/11/2013 5:00	9/11/2013 5:00	10/23/2013 14:56	1
EStarkey	Delete Region- due to outlier	9/12/2013 7:00	9/12/2013 7:00	10/23/2013 14:56	1
EStarkey	Delete Region- due to outlier	9/19/2013 15:00	9/19/2013 15:00	10/23/2013 14:57	1
EStarkey	Delete Region- due to outlier	9/24/2013 8:00	9/24/2013 8:00	10/23/2013 14:57	1
EStarkey	Delete Region- due to outlier	9/24/2013 11:00	9/24/2013 11:00	10/23/2013 14:57	1
EStarkey	Drift Correction with Calibration Drift value of -0.550NTU and Fouling Drift value of 6.700NTU	8/28/2013 13:00	9/26/2013 8:00	10/23/2013 14:59	692
EStarkey	Delete Region- due to outlier	9/29/2013 23:00	9/29/2013 23:00	11/7/2013 13:33	1
EStarkey	Delete Region- due to outlier	10/2/2013 22:00	10/2/2013 22:00	11/7/2013 13:34	1
EStarkey	Delete Region- due to outlier	10/3/2013 3:00	10/3/2013 3:00	11/7/2013 13:34	1
EStarkey	Delete Region- due to outlier	10/4/2013 20:00	10/4/2013 20:00	11/7/2013 13:34	1
EStarkey	Delete Region- due to outlier	10/5/2013 12:00	10/5/2013 12:00	11/7/2013 13:34	1
EStarkey	Delete Region- due to outlier	10/5/2013 17:00	10/5/2013 17:00	11/7/2013 13:35	1
EStarkey	Delete Region- due to outlier	10/5/2013 23:00	10/5/2013 23:00	11/7/2013 13:35	1
EStarkey	Delete Region- due to outlier	10/6/2013 4:00	10/6/2013 4:00	11/7/2013 13:35	1
EStarkey	Delete Region- due to outlier	10/6/2013 17:00	10/6/2013 17:00	11/7/2013 13:35	1
EStarkey	Delete Region- due to outlier	10/10/2013 10:00	10/10/2013 10:00	11/7/2013 13:35	1
EStarkey	Delete Region- due to outlier	10/13/2013 6:00	10/13/2013 6:00	11/7/2013 13:36	1
EStarkey	Delete Region- due to outlier	10/14/2013 5:00	10/14/2013 5:00	11/7/2013 13:36	1
EStarkey	Delete Region- due to outlier	10/14/2013 9:00	10/14/2013 9:00	11/7/2013 13:36	1
EStarkey	Delete Region- due to outlier	10/14/2013 16:00	10/14/2013 16:00	11/7/2013 13:36	1
EStarkey	Delete Region- due to outlier	10/15/2013 23:00	10/15/2013 23:00	11/7/2013 13:37	1

Appendix E. Correction History (continued)

Correction history for Bridge Creek, JODA 2013 turbidity data (continued).					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region- due to outlier	10/16/2013 3:00	10/16/2013 3:00	11/7/2013 13:37	1
EStarkey	Delete Region- due to outlier	10/16/2013 15:00	10/16/2013 15:00	11/7/2013 13:38	1
EStarkey	Delete Region- due to outlier	10/21/2013 3:00	10/21/2013 3:00	11/7/2013 13:38	1
EStarkey	Delete Region- due to outlier	10/21/2013 6:00	10/21/2013 6:00	11/7/2013 13:38	1
EStarkey	Delete Region- due to outlier	10/22/2013 19:00	10/22/2013 19:00	11/7/2013 13:39	1
EStarkey	Delete Region- due to outlier	10/22/2013 23:00	10/22/2013 23:00	11/7/2013 13:39	1
EStarkey	Delete Region- due to outlier	10/24/2013 1:00	10/24/2013 1:00	11/7/2013 13:39	1
EStarkey	Delete Region- due to outlier	10/25/2013 5:00	10/25/2013 5:00	11/7/2013 13:39	1
EStarkey	Delete Region- due to outlier	11/3/2013 13:00	11/3/2013 13:00	11/7/2013 13:40	1
EStarkey	Delete Region- due to outlier	11/3/2013 21:00	11/3/2013 21:00	11/7/2013 13:40	1
EStarkey	Delete Region- due to outlier	11/7/2013 4:00	11/7/2013 4:00	11/7/2013 13:40	1
EStarkey	Delete Region- due to outlier	11/7/2013 8:00	11/7/2013 8:00	11/7/2013 13:40	1
EStarkey	Delete point(s)- to correct for PDT to PST	11/2/2013 2:00	11/2/2013 2:00	11/7/2013 13:42	1
EStarkey	Clock Drift Correction with start offset of - 60.000 and end offset of -60.000. PDT to PST	11/2/2013 3:00	11/7/2013 9:00	11/7/2013 13:42	210

Appendix E. Correction History (continued)

Correction history for John Day River, JODA 2013 temperature data.					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
N/A	No Corrections Applied	N/A	N/A	N/A	0

Correction history for John Day River, JODA 2013 specific conductance data.					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete point(s)- outlier	6/28/2013 9:00	6/28/2013 9:00	8/1/2013 15:11	1
EStarkey	Delete point(s)- outlier	7/1/2013 11:00	7/1/2013 12:00	8/1/2013 15:12	2
EStarkey	Delete point(s)- outlier	7/1/2013 22:00	7/1/2013 22:00	8/1/2013 15:14	1
EStarkey	Delete point(s)- outlier	7/2/2013 12:00	7/2/2013 12:00	8/1/2013 15:15	1
EStarkey	Delete point(s)-outlier	7/4/2013 23:00	7/5/2013 0:00	8/1/2013 15:16	2
EStarkey	Delete point(s)-outlier	7/6/2013 9:00	7/6/2013 10:00	8/1/2013 15:16	2
EStarkey	Delete point(s)-outlier	7/9/2013 4:00	7/9/2013 5:00	8/1/2013 15:17	2
EStarkey	Delete point(s)-outlier	7/9/2013 11:00	7/9/2013 11:00	8/1/2013 15:17	1
EStarkey	Delete point(s)-outlier	7/10/2013 13:00	7/10/2013 14:00	8/1/2013 15:18	2
EStarkey	Delete Region-outlier	7/12/2013 10:00	7/12/2013 10:00	8/1/2013 15:18	1
EStarkey	Delete Region-outlier	7/12/2013 16:00	7/12/2013 16:00	8/1/2013 15:19	1
EStarkey	Delete Region-outlier	7/14/2013 9:00	7/14/2013 9:00	8/1/2013 15:19	1
EStarkey	Delete Region-outlier	7/14/2013 23:00	7/15/2013 0:00	8/1/2013 15:19	2
EStarkey	Delete Region-outlier	7/15/2013 6:00	7/15/2013 7:00	8/1/2013 15:19	2
EStarkey	Delete Region-outlier	7/15/2013 16:00	7/15/2013 16:00	8/1/2013 15:20	1
EStarkey	Delete Region-outlier	7/18/2013 6:00	7/18/2013 6:00	8/1/2013 15:20	1
EStarkey	Delete Region-outlier	7/21/2013 3:00	7/21/2013 4:00	8/1/2013 15:21	2
EStarkey	Delete Region-outlier	7/21/2013 17:00	7/21/2013 18:00	8/1/2013 15:21	2
EStarkey	Drift Correction with Calibration Drift value of 2.800µS/cm and Fouling Drift value of -21.400µS/cm	6/19/2013 15:00	7/24/2013 10:00	8/1/2013 15:23	836

Appendix E. Correction History (continued)

Correction history for John Day River, JODA 2013 specific conductance data (continued).

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Drift Correction with Calibration Drift value of -0.550µS/cm and Fouling Drift value of -39.700µS/cm	7/24/2013 18:00	8/28/2013 13:00	9/4/2013 13:32	836
EStarkey	Drift Correction with Calibration Drift value of -11.350µS/cm and Fouling Drift value of -88.600µS/cm	8/28/2013 17:00	9/25/2013 8:00	10/21/2013 11:26	664
EStarkey	Delete point(s)- due to outlier	9/10/2013 8:00	9/10/2013 8:00	10/21/2013 11:27	1
EStarkey	Delete point(s)- due to outlier	9/3/2013 14:00	9/3/2013 14:00	10/21/2013 11:28	1
EStarkey	Delete Region- due to outlier	10/7/2013 4:00	10/7/2013 5:00	11/6/2013 14:39	2

Correction history for John Day River, JODA 2013 dissolved oxygen data.

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region- suspect that sensor was burried in sediment	6/25/2013 19:00	6/26/2013 17:00	8/1/2013 15:37	23
EStarkey	Delete Region- suspect that sensor was burried in sediment	6/27/2013 5:00	6/29/2013 7:00	8/1/2013 15:37	51
EStarkey	Drift Correction with Calibration Drift value of -0.350mg/l and Fouling Drift value of -2.360mg/l	6/19/2013 15:00	7/24/2013 10:00	8/1/2013 15:38	836
EStarkey	Drift Correction with Calibration Drift value of -0.430mg/l and Fouling Drift value of -0.850mg/l	7/24/2013 18:00	8/28/2013 13:00	9/4/2013 13:41	836
EStarkey	Delete Region-outlier	9/20/2013 2:00	9/20/2013 4:00	10/21/2013 12:14	3
EStarkey	Delete Region-suspected outlier	9/24/2013 22:00	9/24/2013 23:00	10/21/2013 12:16	2

Correction history for John Day River, JODA 2013 pH data.

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Drift Correction with Calibration Drift value of -0.167pH Units and Fouling Drift value of -0.140pH Units	7/24/2013 18:00	8/28/2013 13:00	9/4/2013 13:49	836

Appendix E. Correction History (continued)

Correction history for John Day River, JODA 2013 turbidity data.					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region-outlier	6/22/2013 4:00	6/22/2013 4:00	8/1/2013 15:43	1
EStarkey	Delete Region-outlier	6/22/2013 11:00	6/22/2013 11:00	8/1/2013 15:43	1
EStarkey	Delete Region-outlier	6/24/2013 5:00	6/24/2013 5:00	8/1/2013 15:43	1
EStarkey	Delete Region-outlier	6/26/2013 17:00	6/26/2013 17:00	8/1/2013 15:43	1
EStarkey	Delete Region-outlier	6/26/2013 20:00	6/26/2013 20:00	8/1/2013 15:44	1
EStarkey	Delete Region-outlier	6/30/2013 11:00	6/30/2013 11:00	8/1/2013 15:44	1
EStarkey	Delete Region-outlier	7/2/2013 17:00	7/2/2013 17:00	8/1/2013 15:44	1
EStarkey	Delete Region-outlier	7/3/2013 10:00	7/3/2013 10:00	8/1/2013 15:44	1
EStarkey	Delete Region-outlier	7/6/2013 14:00	7/6/2013 14:00	8/1/2013 15:45	1
EStarkey	Delete Region-outlier	7/6/2013 17:00	7/6/2013 17:00	8/1/2013 15:45	1
EStarkey	Delete Region-outlier	7/6/2013 23:00	7/6/2013 23:00	8/1/2013 15:45	1
EStarkey	Delete Region-outlier	7/6/2013 22:00	7/6/2013 22:00	8/1/2013 15:45	1
EStarkey	Delete Region-outlier	7/6/2013 13:00	7/6/2013 13:00	8/1/2013 15:45	1
EStarkey	Delete Region-outlier	7/7/2013 4:00	7/7/2013 4:00	8/1/2013 15:45	1
EStarkey	Delete Region-outlier	7/7/2013 17:00	7/7/2013 17:00	8/1/2013 15:45	1
EStarkey	Delete Region-outlier	7/9/2013 17:00	7/9/2013 17:00	8/1/2013 15:46	1
EStarkey	Delete Region-outlier	7/12/2013 17:00	7/12/2013 17:00	8/1/2013 15:46	1
EStarkey	Delete Region- suspect that sensor was buried in sediment	7/12/2013 19:00	7/20/2013 23:00	8/1/2013 15:52	197
EStarkey	Delete Region- suspect that sensor was buried in sediment	7/12/2013 14:00	7/12/2013 18:00	8/1/2013 15:52	5
EStarkey	Delete Region-outlier	7/8/2013 12:00	7/8/2013 13:00	8/1/2013 15:53	2
EStarkey	Delete Region-outlier	7/8/2013 11:00	7/8/2013 11:00	8/1/2013 15:53	1
EStarkey	Drift Correction with Calibration Drift value of -0.650NTU and Fouling Drift value of 1.700NTU	6/19/2013 15:00	7/24/2013 10:00	8/1/2013 15:55	836
EStarkey	Delete Region-outlier	6/21/2013 0:00	6/21/2013 0:00	8/1/2013 16:03	1

Appendix E. Correction History (continued)

Correction history for John Day River, JODA 2013 turbidity data (continued).					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region	6/21/2013 15:00	6/21/2013 15:00	8/1/2013 16:03	1
EStarkey	Delete Region-outlier	6/23/2013 10:00	6/23/2013 10:00	8/1/2013 16:03	1
EStarkey	Delete Region-outlier	6/24/2013 6:00	6/24/2013 6:00	8/1/2013 16:04	1
EStarkey	Delete Region-outlier	6/26/2013 18:00	6/26/2013 23:00	8/1/2013 16:05	6
EStarkey	Delete Region-outlier	6/27/2013 9:00	6/27/2013 9:00	8/1/2013 16:05	1
EStarkey	Delete Region-outlier	6/27/2013 15:00	6/27/2013 15:00	8/1/2013 16:05	1
EStarkey	Delete Region-outlier	6/27/2013 22:00	6/27/2013 22:00	8/1/2013 16:05	1
EStarkey	Delete Region-outlier	6/28/2013 1:00	6/28/2013 1:00	8/1/2013 16:05	1
EStarkey	Delete Region-outlier	6/29/2013 1:00	6/29/2013 1:00	8/1/2013 16:05	1
EStarkey	Delete Region-outlier	6/29/2013 10:00	6/29/2013 10:00	8/1/2013 16:05	1
EStarkey	Delete Region-outlier	7/1/2013 10:00	7/1/2013 10:00	8/1/2013 16:06	1
EStarkey	Delete Region-outlier	7/2/2013 9:00	7/2/2013 9:00	8/1/2013 16:06	1
EStarkey	Delete Region-outlier	7/3/2013 1:00	7/3/2013 1:00	8/1/2013 16:06	1
EStarkey	Delete Region-outlier	7/3/2013 6:00	7/3/2013 6:00	8/1/2013 16:06	1
EStarkey	Delete Region-outlier	7/4/2013 8:00	7/4/2013 8:00	8/1/2013 16:08	1
EStarkey	Delete Region-outlier	7/4/2013 11:00	7/4/2013 11:00	8/1/2013 16:08	1
EStarkey	Delete Region-outlier	7/4/2013 21:00	7/4/2013 21:00	8/1/2013 16:08	1
EStarkey	Delete Region-outlier	7/5/2013 10:00	7/5/2013 10:00	8/1/2013 16:09	1
EStarkey	Delete point(s)	7/6/2013 9:00	7/6/2013 11:00	8/1/2013 16:10	3
EStarkey	Delete point(s)	7/6/2013 4:00	7/6/2013 4:00	8/1/2013 16:11	1
EStarkey	Delete Region-outlier	7/6/2013 7:00	7/6/2013 8:00	8/1/2013 16:11	2
EStarkey	Delete Region-erratic readings	7/7/2013 5:00	7/7/2013 15:00	8/1/2013 16:12	11
EStarkey	Delete Region-outlier	7/8/2013 9:00	7/8/2013 10:00	8/1/2013 16:12	2

Appendix E. Correction History (continued)

Correction history for John Day River, JODA 2013 turbidity data (continued).					
Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region-outlier	7/10/2013 8:00	7/10/2013 8:00	8/1/2013 16:12	1
EStarkey	Delete Region-outlier	7/10/2013 15:00	7/10/2013 15:00	8/1/2013 16:12	1
EStarkey	Delete Region-outlier	7/21/2013 20:00	7/21/2013 20:00	8/1/2013 16:13	1
EStarkey	Delete Region-outlier	8/2/2013 13:00	8/2/2013 13:00	9/4/2013 13:52	1
EStarkey	Delete Region-outlier	8/13/2013 17:00	8/13/2013 17:00	9/4/2013 13:52	1
EStarkey	Delete Region- sensor limits reached, sensor likely blocked	8/18/2013 3:00	8/18/2013 18:00	9/4/2013 13:53	16
EStarkey	Delete point(s)- due to outlier	9/18/2013 9:00	9/18/2013 9:00	10/21/2013 13:13	1
EStarkey	Delete point(s)- due to outlier	9/20/2013 17:00	9/20/2013 17:00	10/21/2013 13:14	1
EStarkey	Delete Region- due to outlier	10/17/2013 16:00	10/17/2013 17:00	11/6/2013 16:03	2
EStarkey	Delete Region- due to outlier	10/17/2013 18:00	10/17/2013 18:00	11/6/2013 16:03	1
EStarkey	Delete Region- due to outlier	10/28/2013 16:00	10/28/2013 16:00	11/6/2013 16:06	1
EStarkey	Delete Region- due to outlier	10/8/2013 22:00	10/8/2013 22:00	11/6/2013 16:07	1
EStarkey	Delete Region- due to outlier	9/26/2013 13:00	9/26/2013 13:00	11/6/2013 16:07	1
EStarkey	Delete Region- due to outlier	9/27/2013 8:00	9/27/2013 8:00	11/6/2013 16:08	1
EStarkey	Delete Region- due to outlier	9/27/2013 17:00	9/27/2013 17:00	11/6/2013 16:08	1
EStarkey	Delete Region- due to outlier	9/26/2013 20:00	9/26/2013 20:00	11/6/2013 16:09	1
EStarkey	Delete Region- due to outlier	9/26/2013 18:00	9/26/2013 18:00	11/6/2013 16:09	1
EStarkey	Delete Region- due to outlier	9/29/2013 2:00	9/29/2013 2:00	11/6/2013 16:09	1
EStarkey	Delete Region- due to outlier	9/30/2013 4:00	9/30/2013 4:00	11/6/2013 16:10	1
EStarkey	Delete Region- due to outlier	9/30/2013 18:00	9/30/2013 18:00	11/6/2013 16:10	1
EStarkey	Drift Correction with Calibration Drift value of 1.450NTU and Fouling Drift value of 11.000NTU	9/25/2013 18:00	11/1/2013 17:00	11/6/2013 16:13	889

Appendix F. Macroinvertebrate Metrics

NPS Upper Columbia Basin Benthos 2014 – JODA - Bridge Creek
*Standardized to OTU and fixed count

SampleID	153344	153343
Station	PIBO:3478	PIBO:3479
ReachID	8322	8323
Waterbody	Bridge1	Bridge 2
County	Wheeler	Wheeler
State	OR	OR
Latitude	44.6577	44.6565
Longitude	-120.256	-120.255
Collection Date	7/29/2014	7/30/2014
Habitat Sampled	Targeted Riffle	Targeted Riffle
Collection Method	Surber net	Surber net
Field Notes	--	--
Lab Notes	--	--
Area sampled (m^2)	0.74	0.74
Field Split	100	100
Lab Split	6.25	12.5
Split Count	593	653
Fixed Count	300	300
Big Rare Count	8	18
Richness*	25	25
Abundance	12832	7084
Shannon's Diversity*	2.259515	2.2431
Simpson's Diversity*	0.821672	0.827023
Evenness*	0.701958	0.696858
# of EPT Taxa*	12	11
EPT Taxa Abundance	8223	5191
Dominant Family	Leptohyphidae	Helicopsychidae

Appendix F. Macroinvertebrate Metrics (continued)

NPS Upper Columbia Basin Benthos 2014 – JODA - Bridge Creek (continued)

*Standardized to OTU and fixed count

SampleID	153344	153343
Station	PIBO:3478	PIBO:3479
ReachID	8322	8323
Waterbody	Bridge1	Bridge 2
County	Wheeler	Wheeler
State	OR	OR
Latitude	44.6577	44.6565
Longitude	-120.256	-120.255
Collection Date	7/29/2014	7/30/2014
Habitat Sampled	Targeted Riffle	Targeted Riffle
Collection Method	Surber net	Surber net
Abundance of Dominant Family	3376	2205
Dominant Taxa	Tricorythodes	Helicopsyche
Abundance of Dominant Taxa	3376	2205
Hilsenhoff Biotic Index*	4.183333	3.483333
# of Intolerant Taxa*	4	4
Intolerant Taxa abundance	588	801
# of Tolerant Taxa*	1	1
Tolerant Taxa abundance	86	22
USFS Community Tolerance Quotient (d)*	83	77
# of shredder taxa*	2	0
Shredder Abundance	108	34
# of scraper taxa*	2	2
Scraper abundance	2318	2846
# of collector-filterer taxa*	3	3
Collector-filterer abundance	2573	1435
# of collector-gatherer taxa*	7	11

Appendix F. Macroinvertebrate Metrics (continued)

NPS Upper Columbia Basin Benthos 2014 – JODA - Bridge Creek (continued)

*Standardized to OTU and fixed count

SampleID	153344	153343
Station	PIBO:3478	PIBO:3479
ReachID	8322	8323
Waterbody	Bridge1	Bridge 2
County	Wheeler	Wheeler
State	OR	OR
Latitude	44.6577	44.6565
Longitude	-120.256	-120.255
Collection Date	7/29/2014	7/30/2014
Habitat Sampled	Targeted Riffle	Targeted Riffle
Collection Method	Surber net	Surber net
Collector-gatherer abundance	5581	1427
# of predator taxa*	7	7
Predator abundance	1193	843
# of clinger taxa*	5	9
Long-lived Taxa*	5	6
# of Ephemeroptera taxa*	3	4
Ephemeroptera abundance	4846	962
# of Plecoptera taxa*	2	2
Plecoptera abundance	239	446
# of Trichoptera taxa*	7	5
Trichoptera abundance	3138	3782
# of Coleoptera taxa*	2	2
Coleoptera abundance	2207	976
# of Elmidae Taxa*	2	2
Elmidae abundance	1276	508
# of Megaloptera taxa*	0	1

Appendix F. Macroinvertebrate Metrics (continued)

NPS Upper Columbia Basin Benthos 2014 – JODA - Bridge Creek (continued)

*Standardized to OTU and fixed count

SampleID	153344	153343
Station	PIBO:3478	PIBO:3479
ReachID	8322	8323
Waterbody	Bridge1	Bridge 2
County	Wheeler	Wheeler
State	OR	OR
Latitude	44.6577	44.6565
Longitude	-120.256	-120.255
Collection Date	7/29/2014	7/30/2014
Habitat Sampled	Targeted Riffle	Targeted Riffle
Collection Method	Surber net	Surber net
Megaloptera abundance	0	32
# of Diptera taxa*	6	7
Diptera abundance	1751	672
# of Chironomidae taxa*	3	3
Chironomidae abundance	1600	562
# of Crustacea taxa*	0	0
Crustacea abundance	0	0
# of Oligochaete taxa*	0	0
Oligochaete abundance	0	0
# of Mollusca taxa*	1	2
Mollusca abundance	43	76
# of Insect taxa*	22	23
Insect abundance	12746	6986
# of Non-insect taxa*	3	2
Non-insect abundance	86	97

Appendix F. Macroinvertebrate Metrics (continued)

NPS Upper Columbia Basin Benthos 2013 – JODA- John Day River

*Standardized to OTU and fixed count

SampleID	150977	150978	150979	150980	150981	151013
Station	PIBO:3073	PIBO:3074	PIBO:3075	PIBO:3076	PIBO:3077	PIBO:3078
ReachID	7687	7688	7689	7690	7691	7692
Waterbody	John Day	John Day	John Day	John Day	John Day	John Day
County	Grant	Grant	Grant	Grant	Grant	Grant
State	OR	OR	OR	OR	OR	OR
Latitude	44.57885	44.5747	44.5672	44.56167	44.5575	44.55081
Longitude	-119.645	-119.646	-119.646	-119.647	-119.642	-119.642
Collection Date	8/18/2013	8/30/2013	8/18/2013	8/31/2013	9/1/2013	9/1/2013
Habitat Sampled	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle
Collection Method	Surber net	Surber net	Surber net	Surber net	Surber net	Surber net
Field Notes	--	--	--	--	--	Bug sample only
Lab Notes	--	--	--	--	--	--
Area sampled (m^2)	0.74	0.74	0.74	0.74	0.74	0.74
Field Split	100	100	100	100	100	100
Lab Split	100	31.25	31.25	15.63	43.75	25
Split Count	450	650	654	622	684	663
Fixed Count	300	300	300	300	300	300
Big Rare Count	0	10	28	6	6	12
Richness*	33	22	27	24	24	26
Abundance	608	2824	2866	5386	2121	3600
Shannon's Diversity*	2.531202	2.108752	2.568148	2.181532	2.56408	2.388272
Simpson's Diversity*	0.84767	0.780178	0.89291	0.811304	0.903099	0.849877
Evenness*	0.723923	0.682214	0.77921	0.686436	0.806808	0.733027
# of EPT Taxa*	21	12	17	12	14	14
EPT Taxa Abundance	497	1016	1779	2581	1468	1653
Dominant Family	Heptageniidae	Elmidae	Hydropsychidae	Elmidae	Heptageniidae	Elmidae

Appendix F. Macroinvertebrate Metrics (continued)

NPS Upper Columbia Basin Benthos 2013 – JODA - John Day River (continued)

*Standardized to OTU and fixed count

SampleID	150977	150978	150979	150980	150981	151013
Station	PIBO:3073	PIBO:3074	PIBO:3075	PIBO:3076	PIBO:3077	PIBO:3078
ReachID	7687	7688	7689	7690	7691	7692
Waterbody	John Day	John Day	John Day	John Day	John Day	John Day
County	Grant	Grant	Grant	Grant	Grant	Grant
State	OR	OR	OR	OR	OR	OR
Latitude	44.57885	44.5747	44.5672	44.56167	44.5575	44.55081
Longitude	-119.645	-119.646	-119.646	-119.647	-119.642	-119.642
Collection Date	8/18/2013	8/30/2013	8/18/2013	8/31/2013	9/1/2013	9/1/2013
Habitat Sampled	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle
Collection Method	Surber net	Surber net	Surber net	Surber net	Surber net	Surber net
Abundance of Dominant Family	299	1431	844	2016	584	1455
Dominant Taxa	Rhithrogena	Microcylloepus pusillus	Hydropsyche	Microcylloepus pusillus	Heptageniidae	Microcylloepus pusillus
Abundance of Dominant Taxa	154	1159	449	1108	562	753
Hilsenhoff Biotic Index*	3.453333	3.92	3.546667	3.936667	3.79	3.806667
# of Intolerant Taxa*	9	4	7	2	4	3
Intolerant Taxa abundance	64	134	259	243	214	82
# of Tolerant Taxa*	0	0	0	0	1	0
Tolerant Taxa abundance	1	0	0	0	6	0
USFS Community Tolerance Quotient (d)*	67	76	73	82	76	87
# of shredder taxa*	1	1	1	1	0	1
Shredder Abundance	0	7	0	1	0	0
# of scraper taxa*	6	2	4	3	2	2
Scraper abundance	185	389	783	1937	1013	700
# of collector-filterer taxa*	4	5	4	4	5	4
Collector-filterer abundance	86	395	895	859	266	1011

Appendix F. Macroinvertebrate Metrics (continued)

NPS Upper Columbia Basin Benthos 2013 – JODA - John Day River (continued)

*Standardized to OTU and fixed count

SampleID	150977	150978	150979	150980	150981	151013
Station	PIBO:3073	PIBO:3074	PIBO:3075	PIBO:3076	PIBO:3077	PIBO:3078
ReachID	7687	7688	7689	7690	7691	7692
Waterbody	John Day	John Day	John Day	John Day	John Day	John Day
County	Grant	Grant	Grant	Grant	Grant	Grant
State	OR	OR	OR	OR	OR	OR
Latitude	44.57885	44.5747	44.5672	44.56167	44.5575	44.55081
Longitude	-119.645	-119.646	-119.646	-119.647	-119.642	-119.642
Collection Date	8/18/2013	8/30/2013	8/18/2013	8/31/2013	9/1/2013	9/1/2013
Habitat Sampled	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle
Collection Method	Surber net	Surber net	Surber net	Surber net	Surber net	Surber net
# of collector-gatherer taxa*	14	9	12	9	10	10
Collector-gatherer abundance	268	653	429	1141	593	788
# of predator taxa*	5	2	4	3	4	4
Predator abundance	24	73	129	62	65	109
# of clinger taxa*	14	12	13	11	12	10
Long-lived Taxa*	6	6	7	6	8	6
# of Ephemeroptera taxa*	12	6	8	5	6	7
Ephemeroptera abundance	392	601	663	1634	1084	518
# of Plecoptera taxa*	3	0	3	1	1	0
Plecoptera abundance	15	3	116	62	23	22
# of Trichoptera taxa*	6	6	6	6	7	7
Trichoptera abundance	91	412	999	885	361	1114
# of Coleoptera taxa*	3	4	4	4	4	4
Coleoptera abundance	61	1648	948	2569	571	1576
# of Elmidae Taxa*	2	3	3	3	3	3
Elmidae abundance	42	670	363	1401	263	789

Appendix F. Macroinvertebrate Metrics (continued)

NPS Upper Columbia Basin Benthos 2013 – JODA - John Day River (continued)

*Standardized to OTU and fixed count

SampleID	150977	150978	150979	150980	150981	151013
Station	PIBO:3073	PIBO:3074	PIBO:3075	PIBO:3076	PIBO:3077	PIBO:3078
ReachID	7687	7688	7689	7690	7691	7692
Waterbody	John Day	John Day	John Day	John Day	John Day	John Day
County	Grant	Grant	Grant	Grant	Grant	Grant
State	OR	OR	OR	OR	OR	OR
Latitude	44.57885	44.5747	44.5672	44.56167	44.5575	44.55081
Longitude	-119.645	-119.646	-119.646	-119.647	-119.642	-119.642
Collection Date	8/18/2013	8/30/2013	8/18/2013	8/31/2013	9/1/2013	9/1/2013
Habitat Sampled	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle	Targeted Riffle
Collection Method	Surber net	Surber net	Surber net	Surber net	Surber net	Surber net
# of Megaloptera taxa*	0	0	0	0	0	0
Megaloptera abundance	0	0	0	0	0	0
# of Diptera taxa*	5	5	3	4	3	3
Diptera abundance	9	155	43	157	52	223
# of Chironomidae taxa*	2	1	3	3	1	2
Chironomidae abundance	3	69	35	121	15	184
# of Crustacea taxa*	1	1	1	1	1	0
Crustacea abundance	15	6	79	10	17	1
# of Oligochaete taxa*	0	0	0	0	0	0
Oligochaete abundance	0	0	0	0	0	27
# of Mollusca taxa*	1	0	1	1	0	0
Mollusca abundance	14	0	13	9	0	0
# of Insect taxa*	31	21	25	21	23	23
Insect abundance	578	2819	2774	5324	2104	3507
# of Non-insect taxa*	2	1	2	3	1	3
Non-insect abundance	30	6	92	62	17	93

Appendix G. Macroinvertebrate Taxa List

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	1248	Ophiogomphus severus	3	6
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	499	Hydropsyche	73	5
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	932	Brachycentrus occidentalis	23	1
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	847	Microcylloepus pusillus	5	1
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	536	Dicosmoecus	6	1
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	135	Optioservus	42	1
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	838	Hesperoperla pacifica	5	1
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	247	Tipula	0	1
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	469	Skwala	36	1
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	385	Gomphidae	5	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	144	Zaitzevia	1	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	280	Epeorus	1	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	187	Tanypodinae	11	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	200	Empididae	3	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	1742	Optioservus pecosensis	1	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	153	Hydrophilidae	2	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	276	Heptageniidae	10	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	374	Coenagrionidae	2	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	307	Tricorythodes	69	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	241	Hexatoma	1	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	525	Oecetis	1	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	847	Microcylloepus pusillus	23	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	236	Antocha monticola	1	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	610	Physa	5	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	359	Sialis	3	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	1076	Optioservus quadrimaculatus	16	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	184	Orthoclaadiinae	29	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	494	Helicopsyche	204	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	1645	Fallceon	2	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	285	Rhithrogena	7	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	180	Chironomidae	6	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	63	Lebertia	1	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	182	Chironominae	6	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	495	Hydropsychidae	34	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	1488	Onocosmoecus unicolor	2	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	519	Lepidostoma	1	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	509	Hydroptila	1	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	908	Probezzia	1	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	203	Hemerodromia	2	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	223	Simulium	2	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	927	Lymnaea	2	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	520	Leptoceridae	4	0
153344	8322	Bridge1	7/29/2014	12.5	100	0.74	58	Trombidiformes	1	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	386	Erpetogomphus	1	2
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	307	Tricorythodes	156	2
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	536	Dicosmoecus	5	2
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	135	Optioservus	23	1
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	838	Hesperoperla pacifica	0	1
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	182	Chironominae	18	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	499	Hydropsyche	35	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	509	Hydroptila	3	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	280	Epeorus	1	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	495	Hydropsychidae	71	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	67	Sperchon	1	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	932	Brachycentrus occidentalis	9	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	908	Probezzia	1	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	121	Elmidae	33	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	184	Orthocladiinae	41	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	180	Chironomidae	3	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	287	Leptophlebiidae	1	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	469	Skwala	7	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	221	Simuliidae	2	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	241	Hexatoma	2	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	652	Nemata	1	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	276	Heptageniidae	61	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	201	Chelifera	2	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	847	Microcylloepus pusillus	25	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	1742	Optioservus pecosensis	1	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	2307	Anisoptera	16	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	647	Pisidium	2	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	847	Microcylloepus pusillus	9	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	834	Dipheter hageni	1	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	525	Oecetis	1	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	522	Nectopsyche	2	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	494	Helicopsyche	17	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	455	Perlodidae	3	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	1645	Fallceon	1	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	385	Gomphidae	5	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	250	Baetis	3	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	1076	Optioservus quadrimaculatus	11	0
153343	8323	Bridge2	7/30/2014	6.25	100	0.74	1488	Onocosmoecus unicolor	2	0
151013	7692	John Day	9/1/2013	25	100	0.74	499	Hydropsyche	86	2
151013	7692	John Day	9/1/2013	25	100	0.74	907	Acentrella	11	2
151013	7692	John Day	9/1/2013	25	100	0.74	4941	Orconectes rusticus	0	1
151013	7692	John Day	9/1/2013	25	100	0.74	932	Brachycentrus occidentalis	9	1
151013	7692	John Day	9/1/2013	25	100	0.74	566	Chimarra	11	1
151013	7692	John Day	9/1/2013	25	100	0.74	1407	Fallceon quilleri	6	1
151013	7692	John Day	9/1/2013	25	100	0.74	170	Psephenus	3	1
151013	7692	John Day	9/1/2013	25	100	0.74	847	Microcylloepus pusillus	130	1
151013	7692	John Day	9/1/2013	25	100	0.74	241	Hexatoma	0	1
151013	7692	John Day	9/1/2013	25	100	0.74	350	Petrophila	9	1
151013	7692	John Day	9/1/2013	25	100	0.74	221	Simuliidae	2	0
151013	7692	John Day	9/1/2013	25	100	0.74	847	Microcylloepus pusillus	9	0
151013	7692	John Day	9/1/2013	25	100	0.74	509	Hydroptila	4	0
151013	7692	John Day	9/1/2013	25	100	0.74	495	Hydropsychidae	51	0
151013	7692	John Day	9/1/2013	25	100	0.74	480	Trichoptera	3	0
151013	7692	John Day	9/1/2013	25	100	0.74	291	Leptophlebia	1	0
151013	7692	John Day	9/1/2013	25	100	0.74	203	Hemerodromia	4	0
151013	7692	John Day	9/1/2013	25	100	0.74	180	Chironomidae	9	0
151013	7692	John Day	9/1/2013	25	100	0.74	249	Baetidae	9	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
151013	7692	John Day	9/1/2013	25	100	0.74	182	Chironominae	1	0
151013	7692	John Day	9/1/2013	25	100	0.74	184	Orthoclaadiinae	23	0
151013	7692	John Day	9/1/2013	25	100	0.74	1539	Asiopanax	5	0
151013	7692	John Day	9/1/2013	25	100	0.74	167	Psephenidae	19	0
151013	7692	John Day	9/1/2013	25	100	0.74	280	Epeorus	2	0
151013	7692	John Day	9/1/2013	25	100	0.74	173	Diptera	1	0
151013	7692	John Day	9/1/2013	25	100	0.74	250	Baetis	5	0
151013	7692	John Day	9/1/2013	25	100	0.74	276	Heptageniidae	42	0
151013	7692	John Day	9/1/2013	25	100	0.74	121	Elmidae	50	0
151013	7692	John Day	9/1/2013	25	100	0.74	1076	Optioservus quadrimaculatus	15	0
151013	7692	John Day	9/1/2013	25	100	0.74	144	Zaitzevia	7	0
151013	7692	John Day	9/1/2013	25	100	0.74	187	Tanypodinae	1	0
151013	7692	John Day	9/1/2013	25	100	0.74	19	Oligochaeta	5	0
151013	7692	John Day	9/1/2013	25	100	0.74	66	Sperchonidae	8	0
151013	7692	John Day	9/1/2013	25	100	0.74	655	Turbellaria	4	0
151013	7692	John Day	9/1/2013	25	100	0.74	385	Gomphidae	1	0
151013	7692	John Day	9/1/2013	25	100	0.74	307	Tricorythodes	14	0
151013	7692	John Day	9/1/2013	25	100	0.74	455	Perlodidae	4	0
151013	7692	John Day	9/1/2013	25	100	0.74	525	Oecetis	2	0
151013	7692	John Day	9/1/2013	25	100	0.74	511	Leucotrichia	1	0
151013	7692	John Day	9/1/2013	25	100	0.74	497	Cheumatopsyche	27	0
151013	7692	John Day	9/1/2013	25	100	0.74	494	Helicopsyche	11	0
151013	7692	John Day	9/1/2013	25	100	0.74	135	Optioservus	44	0
151013	7692	John Day	9/1/2013	25	100	0.74	144	Zaitzevia	14	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	241	Hexatoma	8	2

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
150981	7691	John Day	9/1/2013	43.75	100	0.74	469	Skwala	6	2
150981	7691	John Day	9/1/2013	43.75	100	0.74	4941	Orconectes rusticus	3	1
150981	7691	John Day	9/1/2013	43.75	100	0.74	837	Calineuria californica	0	1
150981	7691	John Day	9/1/2013	43.75	100	0.74	262	Ephemerellidae	6	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	135	Optioservus	46	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	1076	Optioservus quadrimaculatus	9	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	525	Oecetis	1	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	566	Chimarra	2	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	385	Gomphidae	2	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	374	Coenagrionidae	2	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	494	Helicopsyche	32	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	907	Acentrella	7	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	250	Baetis	7	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	847	Microcylloepus pusillus	12	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	276	Heptageniidae	182	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	121	Elmidae	16	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	82	Cambaridae	2	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	170	Psephenus	68	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	144	Zaitzevia	21	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	144	Zaitzevia	4	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	932	Brachycentrus occidentalis	2	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	497	Cheumatopsyche	44	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	223	Simulium	2	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
150981	7691	John Day	9/1/2013	43.75	100	0.74	509	Hydroptila	1	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	499	Hydropsyche	25	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	495	Hydropsychidae	10	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	288	Choroterpes	4	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	280	Epeorus	7	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	221	Simuliidae	1	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	249	Baetidae	29	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	180	Chironomidae	4	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	182	Chironominae	1	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	1407	Fallceon quilleri	58	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	834	Diphetor hageni	3	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	847	Microcylloepus pusillus	9	0
150981	7691	John Day	9/1/2013	43.75	100	0.74	287	Leptophlebiidae	48	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	499	Hydropsyche	40	2
150980	7690	John Day	8/31/2013	15.63	100	0.74	241	Hexatoma	0	1
150980	7690	John Day	8/31/2013	15.63	100	0.74	847	Microcylloepus pusillus	95	1
150980	7690	John Day	8/31/2013	15.63	100	0.74	4941	Orconectes rusticus	1	1
150980	7690	John Day	8/31/2013	15.63	100	0.74	799	Pteronarcys californica	0	1
150980	7690	John Day	8/31/2013	15.63	100	0.74	135	Optioservus	28	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	287	Leptophlebiidae	11	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	167	Psephenidae	46	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	184	Orthoclaadiinae	8	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	182	Chironominae	4	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	180	Chironomidae	1	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	249	Baetidae	10	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
150980	7690	John Day	8/31/2013	15.63	100	0.74	221	Simuliidae	2	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	144	Zaitzevia	4	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	280	Epeorus	2	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	907	Acentrella	9	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	285	Rhithrogena	2	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	495	Hydropsychidae	16	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	509	Hydroptila	1	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	469	Skwala	1	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	932	Brachycentrus occidentalis	3	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	854	Ferrissia rivularis	1	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	203	Hemerodromia	2	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	403	Plecoptera	4	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	144	Zaitzevia	5	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	170	Psephenus	18	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	187	Tanypodinae	1	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	250	Baetis	6	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	262	Ephemerellidae	11	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	497	Cheumatopsyche	33	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	1407	Fallceon quilleri	12	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	444	Perlidae	2	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	847	Microcylloepus pusillus	33	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	350	Petrophila	2	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	276	Heptageniidae	126	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	566	Chimarra	5	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
150980	7690	John Day	8/31/2013	15.63	100	0.74	655	Turbellaria	4	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	1240	Actinopterygii	1	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	1076	Optioservus quadrimaculatus	16	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	121	Elmidae	52	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	494	Helicopsyche	3	0
150980	7690	John Day	8/31/2013	15.63	100	0.74	480	Trichoptera	1	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	499	Hydropsyche	101	9
150979	7689	John Day	8/18/2013	31.25	100	0.74	4941	Orconectes rusticus	17	4
150979	7689	John Day	8/18/2013	31.25	100	0.74	497	Cheumatopsyche	74	4
150979	7689	John Day	8/18/2013	31.25	100	0.74	847	Microcylloepus pusillus	61	3
150979	7689	John Day	8/18/2013	31.25	100	0.74	460	Isogenoides	19	3
150979	7689	John Day	8/18/2013	31.25	100	0.74	847	Microcylloepus pusillus	28	3
150979	7689	John Day	8/18/2013	31.25	100	0.74	907	Acentrella	5	1
150979	7689	John Day	8/18/2013	31.25	100	0.74	144	Zaitzevia	9	1
150979	7689	John Day	8/18/2013	31.25	100	0.74	135	Optioservus	29	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	144	Zaitzevia	8	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	170	Psephenus	4	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	187	Tanypodinae	1	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	262	Ephemerellidae	1	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	250	Baetis	8	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	494	Helicopsyche	1	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	455	Perlodidae	2	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	350	Petrophila	1	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	276	Heptageniidae	61	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
150979	7689	John Day	8/18/2013	31.25	100	0.74	292	Paraleptophlebia	4	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	647	Pisidium	1	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	285	Rhithrogena	42	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	495	Hydropsychidae	16	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	492	Protoptila	19	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	798	Claassenia sabulosa	2	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	1539	Asioplax	4	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	2179	Postelichus	1	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	1407	Fallceon quilleri	21	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	167	Psephenidae	62	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	184	Orthoclaadiinae	5	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	288	Choroterpes	2	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	182	Chironominae	2	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	203	Hemerodromia	2	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	280	Epeorus	5	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	566	Chimarra	4	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	2095	Optioservus divergens/pecosensis	2	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	1076	Optioservus quadrimaculatus	13	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	854	Ferrissia rivularis	2	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	838	Hesperoperla pacifica	1	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	932	Brachycentrus occidentalis	7	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	480	Trichoptera	2	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	469	Skwala	2	0
150979	7689	John Day	8/18/2013	31.25	100	0.74	506	Hydroptilidae	3	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	2195	Atherix pachypus	14	4

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
150978	7688	John Day	8/30/2013	31.25	100	0.74	799	Pteronarcys californica	0	2
150978	7688	John Day	8/30/2013	31.25	100	0.74	241	Hexatoma	1	2
150978	7688	John Day	8/30/2013	31.25	100	0.74	4941	Orconectes rusticus	1	1
150978	7688	John Day	8/30/2013	31.25	100	0.74	499	Hydropsyche	45	1
150978	7688	John Day	8/30/2013	31.25	100	0.74	135	Optioservus	17	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	494	Helicopsyche	3	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	495	Hydropsychidae	17	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	276	Heptageniidae	16	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	292	Paraleptophlebia	1	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	144	Zaitzevia	6	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	285	Rhithrogena	16	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	121	Elmidae	12	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	250	Baetis	36	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	170	Psephenus	50	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	932	Brachycentrus occidentalis	5	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	2095	Optioservus divergens/pecosensis	4	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	1076	Optioservus quadrimaculatus	19	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	509	Hydroptila	3	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	495	Hydropsychidae	1	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	262	Ephemerellidae	3	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	847	Microcylloepus pusillus	84	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	907	Acentrella	4	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	144	Zaitzevia	5	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	847	Microcylloepus pusillus	184	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
150978	7688	John Day	8/30/2013	31.25	100	0.74	288	Choroterpes	3	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	1407	Fallceon quilleri	51	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	566	Chimarra	9	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	182	Chironominae	2	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	184	Orthoclaadiinae	14	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	223	Simulium	2	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	244	Limonia	1	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	497	Cheumatopsyche	12	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	249	Baetidae	5	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	280	Epeorus	1	0
150978	7688	John Day	8/30/2013	31.25	100	0.74	287	Leptophlebiidae	3	0
150977	7687	John Day	8/18/2013	100	100	0.74	2389	Ecdyonurus criddlei	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	287	Leptophlebiidae	15	0
150977	7687	John Day	8/18/2013	100	100	0.74	285	Rhithrogena	114	0
150977	7687	John Day	8/18/2013	100	100	0.74	280	Epeorus	15	0
150977	7687	John Day	8/18/2013	100	100	0.74	252	Centroptilum	2	0
150977	7687	John Day	8/18/2013	100	100	0.74	241	Hexatoma	2	0
150977	7687	John Day	8/18/2013	100	100	0.74	236	Antocha monticola	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	184	Orthoclaadiinae	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	1549	Limnopus	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	167	Psephenidae	8	0
150977	7687	John Day	8/18/2013	100	100	0.74	288	Choroterpes	11	0
150977	7687	John Day	8/18/2013	100	100	0.74	2195	Atherix pachypus	2	0
150977	7687	John Day	8/18/2013	100	100	0.74	907	Acentrella	4	0
150977	7687	John Day	8/18/2013	100	100	0.74	1407	Fallceon quilleri	19	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
150977	7687	John Day	8/18/2013	100	100	0.74	182	Chironominae	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	784	Camelobaetidiid	2	0
150977	7687	John Day	8/18/2013	100	100	0.74	376	Argia	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	847	Microcylloepus pusillus	8	0
150977	7687	John Day	8/18/2013	100	100	0.74	4941	Orconectes rusticus	9	0
150977	7687	John Day	8/18/2013	100	100	0.74	2104	Culoptila/Protoptila	2	0
150977	7687	John Day	8/18/2013	100	100	0.74	2095	Optioservus divergens/pecosensis	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	1947	Crangonyctidae	2	0
150977	7687	John Day	8/18/2013	100	100	0.74	4017	Paraleptophlebia with tusks	2	0
150977	7687	John Day	8/18/2013	100	100	0.74	854	Ferrissia rivularis	10	0
150977	7687	John Day	8/18/2013	100	100	0.74	419	Sweltsa	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	506	Hydroptilidae	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	499	Hydropsyche	42	0
150977	7687	John Day	8/18/2013	100	100	0.74	495	Hydropsychidae	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	495	Hydropsychidae	6	0
150977	7687	John Day	8/18/2013	100	100	0.74	469	Skwala	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	460	Isogenoides	5	0
150977	7687	John Day	8/18/2013	100	100	0.74	932	Brachycentrus occidentalis	3	0
150977	7687	John Day	8/18/2013	100	100	0.74	250	Baetis	8	0
150977	7687	John Day	8/18/2013	100	100	0.74	847	Microcylloepus pusillus	9	0
150977	7687	John Day	8/18/2013	100	100	0.74	497	Cheumatopsyche	11	0
150977	7687	John Day	8/18/2013	100	100	0.74	58	Trombidiformes	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	170	Psephenus	2	0
150977	7687	John Day	8/18/2013	100	100	0.74	267	Drunella doddsii	1	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos – JODA- Bridge Creek (2014), John Day River (2013)

Note that all samples were from targeted riffles and sampled using Surber nets.

Sample ID	Reach ID	Name	Sample Date	Lab Split	Field Split	Area	Code	Taxon	Split Count	Big Rare Count
150977	7687	John Day	8/18/2013	100	100	0.74	276	Heptageniidae	91	0
150977	7687	John Day	8/18/2013	100	100	0.74	307	Tricorythodes	5	0
150977	7687	John Day	8/18/2013	100	100	0.74	350	Petrophila	4	0
150977	7687	John Day	8/18/2013	100	100	0.74	798	Claassenia sabulosa	3	0
150977	7687	John Day	8/18/2013	100	100	0.74	455	Perlodidae	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	566	Chimarra	1	0
150977	7687	John Day	8/18/2013	100	100	0.74	314	Corixidae	2	0
150977	7687	John Day	8/18/2013	100	100	0.74	135	Optioservus	17	0

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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National Park Service
U.S. Department of the Interior



Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov

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