



Upper Columbia Basin Network Integrated Water Quality Annual Report 2014

Whitman Mission National Historic Site (WHMI)

Natural Resource Report NPS/UCBN/NRR—2015/1023



ON THE COVER

Mill Creek, October 2014, Whitman Mission National Historic Site
Photograph courtesy of the National Park Service

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Natural Resource Report NPS/UCBN/NRR—2015/1023

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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 Whitman Mission National Historic Site (WHMI). In 2013 and 2014, monitoring occurred in Doan and Mill Creeks. The primary focus of monitoring in Doan Creek was water temperature, while monitoring in Mill Creek evaluated dissolved oxygen, pH, specific conductance, temperature and turbidity. Both streams were previously sampled by the UCBN in 2008 and 2011 (Starkey 2009 and Starkey 2012). Data from the 2014 field sampling effort was collected following methods detailed in the UCBN integrated water quality monitoring protocol (Starkey et al. 2008). 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>. In both streams, benthic macroinvertebrates were collected by the United States Forest Service- PACFISH/INFISH Biological Opinion (PIBO) according to their peer reviewed protocol during the UCBN’s monitoring of stream channel characteristics and riparian condition in 2014. The UCBN’s peer reviewed stream channel characteristics and riparian condition protocols can also be found on the UCBN’s website listed above.

Water chemistry and macroinvertebrate results indicate that Doan and Mill Creeks are in fair condition, with the primary concerns being elevated water temperatures, low dissolved oxygen, and pH levels occasionally above established thresholds. The status of water quality for Doan and Mill Creeks relative to state regulatory thresholds is given in the summary tables on the following page. For comparison, the summary table for monitoring that occurred in Mill Creek in 2011 is also provided. UCBN water quality monitoring is conducted on a 3 year rotating panel. As a result, conditions in both streams will be re-evaluated in 2017.

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.

Doan Creek Temperature Summary 2014

Measure	Current Condition (June-September, 2014)	State DOE Thresholds ^a	% Exceedance ^c
Temperature (*MDMT, **MDAT)	* MDMT= 22.5 °C ** MDAT= 19.19 °C	***7-DADMax <17.5 °C	60%

Doan Creek Temperature Summary 2013

Measure	Current Condition (June-September, 2013)	State DOE Thresholds ^a	% Exceedance ^c
Temperature (*MDMT, **MDAT)	* MDMT= 23.11 °C ** MDAT= 20.27 °C	***7-DADMax <17.5 °C	85%

Mill Creek Water Chemistry Summary 2014

Measure	Current Condition (June-November, 2014)	State DOE Thresholds ^a	% Exceedance ^c
Temperature (*MDMT, **MDAT)	* MDMT= 25.78 °C ** MDAT= 23.58 °C	***7-DADMax <17.5 °C	70%
Specific conductance (mean)	217.8 µS/cm	N/A	N/A
Dissolved oxygen (mean daily min)	6.7 mg/l	>5.0 mg/l Minimum Daily Minimum ^b	5%
pH (mean daily max)	8.5 pH Units	8.5 pH Units, Max (0.5 units human caused variation)	10%
pH (mean daily min)	7.6 pH Units	6.5 pH Units, Min (0.5 units human caused variation)	0%
Turbidity (mean daily max)	6.8 NTU	< 5 NTU increase above background when background NTU < 50, < 10% increase when background NTU > 50	Insufficient data

*MDMT – Maximum Daily Maximum Temperature, **MDAT – Maximum Daily Average Temperature, ***7-DADMax – 7 Day Average Daily Maximum Temperature, ^a Criteria established for Salmonid Rearing and Migration Only, ^b Special designation for Mill Creek mouth to 13th St. Bridge, ^c Proportion of samples above water quality standard

Mill Creek Water Chemistry Summary 2011

Measure	Current Condition (June-November, 2011)	State DOE Thresholds ^a	% Exceedance ^c
Temperature (*MDMT, **MDAT)	* MDMT= 24.5 °C ** MDAT= 21.7 °C	***7-DADMax <17.5 °C	67%
Specific conductance (mean)	278.7 µS/cm	N/A	N/A
Dissolved oxygen (mean daily min)	7.1 mg/l	>5.0 mg/l Minimum Daily Minimum ^b	2%
pH (mean daily max)	8.7 pH Units	8.5 pH Units, Max (0.5 units human caused variation)	19%
pH (mean daily min)	7.6 pH Units	6.5 pH Units, Min (0.5 units human caused variation)	0%
Turbidity (mean daily max)	Insufficient data due to poor data quality	< 5 NTU increase above background when background NTU < 50, < 10% increase when background NTU > 50	Insufficient data

*MDMT – Maximum Daily Maximum Temperature, **MDAT – Maximum Daily Average Temperature, ***7-DADMax – 7 Day Average Daily Maximum Temperature, ^a Criteria established for Salmonid Rearing and Migration Only, ^b Special designation for Mill Creek mouth to 13th St. Bridge, ^c Proportion of samples above water quality standard

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 WHMI staff for their assistance in the field 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 2014 the UCBN began its third year of water temperature monitoring in Doan Creek, and its fourth year of integrated water quality monitoring in Mill Creek at Whitman Mission National Historic Site (WHMI).

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 WHMI in 2014.

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 this goal, it should be noted that in 2012 Mill Creek was listed as a category 4A water for temperature, pH, fecal coliform, and dissolved oxygen. Doan Creek was also listed as a 4A stream for water temperature. Category 4A means that the water body has a pollution problem, but has total maximum daily loads (TMDL) being actively implemented. According to the Washington Department of Ecology (WADOE) “a TMDL identifies how much pollution needs to be reduced or eliminated to achieve clean water.” After a TMDL has been established, the WADOE works with local stakeholders to reduce pollution and improve water quality. 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?

In light of these questions and the broader goals outlined above, water quality monitoring in the UCBN addresses the following specific measurable monitoring objectives:

- 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

Doan Creek- Whitman Mission National Historic Site (WHMI)

The segment of Doan Creek within the park is in the Walla Walla River subbasin in Hydrologic Unit Code (HUC 6)170701020204 (United States Geologic Survey [USGS]), Lower Mill Creek subwatershed, in Walla Walla County, Washington (Figures 1 and 2; Appendix B). “Doan Creek is a left bank, spring-fed tributary of Mill Creek. Doan Creek originates three miles east of the WHMI and passes through a private airport, a former dairy, and agricultural land before entering the site at the northeastern boundary. From there, Doan Creek runs through a restored channel continuing west along the northern boundary until joining with Mill Creek. An irrigation water pumping station draws water out of Doan Creek into the irrigation ditch that supplies water to the park and to two downstream irrigators (Bell and Hinson 2009).” Restoration of the Doan Creek channel and riparian area began in 2004 with some stream channel modification work occurring in 2008 and again in 2011. See Bell and Hinson 2009 for a more detailed description of modifications.

The WHMI watershed is approximately 276 square km (107 square miles) and consists of several land cover types (Bell and Hinson 2009). According to Bell and Hinson 2009, WHMI’s watershed is primarily dominated by agriculture (73.98%) with a substantial proportion of the watershed being classified as developed (11.16%) or rural development (8.16%). The remaining land was classified as native and non-native dominated grass, shrub, and tree dominated vegetation (6.93%). The majority of this land cover type was found higher in the watershed.

Designated beneficial uses for Doan Creek include Salmonid spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values (WA Admin. Code 2011, 173-201A-600 [through 8/1/03]).

Threats to water resources in WHMI have been identified as: agricultural chemical use, over allocation of irrigation water, and a private airfield 3 miles upstream (Garrett et al. 2007). In 2012, Doan Creek was listed as a category 4A impaired water for temperature (Washington Department of Ecology 2012). The category 4A designation means that it has a pollution problem, but has total maximum daily loads (TMDL) being actively implemented to reduce pollution. Information about the current TMDLs and recent water quality conditions within the Walla Walla watershed can be found in: Joy et al. 2006, Baldwin and Stohr 2007, Joy et al. 2007, Stohr et al. 2007, and Baldwin et al. 2008. Additional information specific to Doan Creek can be found in: UCBN’s water quality monitoring report for WHMI (Starkey 2009 and Starkey 2012), Natural Resource Condition Assessment: Whitman Mission National Historic Site (Bell and Hinson 2009), Baseline Water Quality Data- Inventory and Analysis WHMI (NPS 1997), Doan Creek Restoration Project Phase 1 & 2 Final Report (WWCCD 2008), and Whitman Mission National Historic Site-Doan Creek Restoration Project Environmental Assessment (NPS 2005).

In 2013 and 2014 a temperature logger was deployed approximately 100 m upstream from the mouth of Doan Creek (i.e. confluence with Mill Creek).(Figure 1 and 3; Appendices A and C). This location was chosen primarily due to adequate water depth throughout summer months.

The 2014 macroinvertebrate sample reach on Doan Creek coincided with the stream channel characteristics and riparian condition monitoring reach (see Appendix C for GPS waypoint). See the 2014 WHMI stream channel characteristics and riparian condition annual report for a detailed reach description.



Figure 1. Doan Creek looking downstream towards water quality monitoring station #01 (red circle) and confluence with Mill Creek.

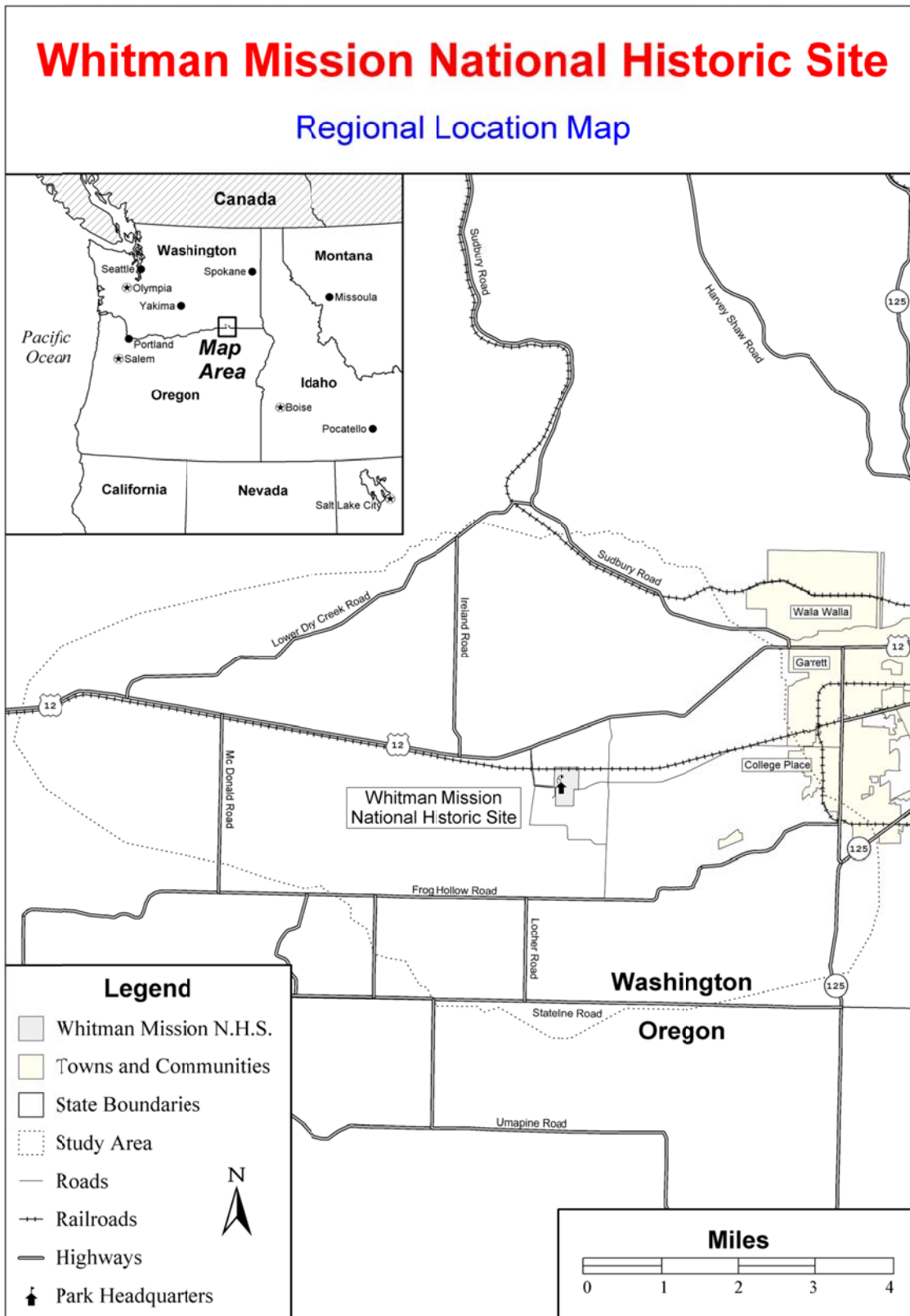


Figure 2. Whitman Mission National Historic Site regional map (NPS 1997)..



WHMI- Water Quality Monitoring 2014



Figure 3. Water quality monitoring location in Doan Creek 2014.



WHMI- Water Quality Monitoring 2014



Figure 4. Water quality monitoring location in Mill Creek 2014.

Mill Creek- Whitman Mission National Historic Site (WHMI)

The segment of Mill Creek within the park is in the Walla Walla River subbasin in Hydrologic Unit Code (HUC 6)170701020204 (United States Geologic Survey [USGS]), Lower Mill Creek subwatershed, in Walla Walla County, Washington (Figures 2, 4, and 5; Appendix B). “Mill Creek originates on the western slopes of the Blue Mountains, in southeastern Washington, at an elevation of 5,500 feet (USACE 1995b). It flows for 15 miles in a relatively deep and narrow canyon, through mountainous terrain, and then enters an alluvial fan a few miles east of the City of Walla Walla. Mill Creek flows through the northern corner of the WHMI property where it collects streamflow from Doan Creek then enters the Walla Walla River about ½ mile west of WHMI (Bell and Hinson 2009).”

The WHMI watershed is approximately 276 square km (107 square miles) and consists of several land cover types (Bell and Hinson 2009). According to Bell and Hinson 2009, WHMI’s watershed is primarily dominated by agriculture (73.98%) with a substantial proportion of the watershed being classified as developed (11.16%) or rural development (8.16%). The remaining land was classified as native and non-native dominated grass, shrub, and tree dominated vegetation (6.93%). The majority of this land cover type was found higher in the watershed.

Designated beneficial uses for Mill Creek (from mouth to 13th street bridge in Walla Walla) include salmonid rearing/migration only; secondary contact recreation; industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values (WA Admin. Code 2011, 173-201A-602 [through 8/1/03]). In addition, this segment of Mill Creek has a special dissolved oxygen designation (WA Admin. Code 2011, 173-201A-602 [through 8/1/03])

Threats to water resources in WHMI have been identified as: agricultural chemical use, over allocation of irrigation water, and a private airfield 3 miles upstream (Garrett et al. 2007). In 2012, Mill Creek was listed as a category 4A impaired water for temperature, pH, fecal coliform, and dissolved oxygen (Washington Department of Ecology 2012). The category 4A designation means that it has a pollution problem, but has total maximum daily loads (TMDL) being actively implemented to reduce pollution. Information about the current TMDLs and recent water quality conditions within the Walla Walla watershed can be found in: Joy et al. 2006, Baldwin and Stohr 2007, Joy et al. 2007, Stohr et al. 2007, and Baldwin et al. 2008. Additional information specific to Mill Creek can be found in: UCBN’s water quality monitoring report for WHMI (Starkey 2009 and Starkey 2012), Natural Resource Condition Assessment: Whitman Mission National Historic Site (Bell and Hinson 2009), Baseline Water Quality Data- Inventory and Analysis WHMI (NPS 1997), and Mill Creek Master Plan, Main Report, volume 1 and 2 (USACE 1995a, USACE 1995b).

In 2014 the Hydrolab was deployed approximately 150 m downstream from the railroad bridge/northern park boundary (Figure 4 and 5; Appendices A and C). This location was the same monitoring location as in previous years and was chosen primarily due to adequate water depth throughout summer months and consistent flow.

The 2014 macroinvertebrate sample reach on Mill Creek coincided with the stream channel characteristics and riparian condition monitoring reach (see Appendix C for GPS waypoint). See the 2014 WHMI stream channel characteristics and riparian condition annual report for a detailed reach description.



Figure 5. Mill Creek looking downstream towards water quality monitoring station #01

Methods

Water Chemistry

A continuous water quality monitor (HACH, MS5 Hydrolab) was deployed from June 19th to November 6th, 2014 in Mill Creek at an index site 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. The 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). A gap in Mill Creek monitoring occurred from July 10th to July 28th when Hydrolab #095 was sent to the Hach Company for repair of the dissolved oxygen sensor.

During the years the UCBN is not conducting the full suite of monitoring, temperature loggers (HOBO, Pro v2) are deployed in both Doan and Mill Creeks. Loggers were deployed in Doan Creek from July 2nd to September 24th, 2013 and from June 20th to November 6th, 2014, and in Mill Creek from July 2nd to September 24th, 2013. Note that cross section surveys are only completed during years with the full suite of monitoring.

Quality Assurance/Quality Control (QA/QC):

Quality assurance and quality control for multiprobe 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.

Discharge

Water discharge was determined by data available from the United States Geological Survey (USGS) real time gauging sites. For Mill Creek, the closest gage is at Walla Walla WA, #14015000. This data was used to aid in the interpretation of continuous water chemistry data collected in Mill Creek June – November 2014. No USGS gauging station exists on Doan Creek.

Macroinvertebrates

On both Doan and Mill Creeks, macroinvertebrates were collected at designated sample reaches (1 on Mill Creek, 1 on Doan Creek) by the United States Forest Service- PACFISH/INFISH Biological Opinion (PIBO) Effectiveness Monitoring Program during the assessment of stream channel characteristics in 2011. 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. (2008).

Results

Doan Creek

Water Chemistry

Status:

Temperature:

A summary of Doan Creek water temperature (2013 and 2014) along with the corresponding Washington DOE regulatory threshold are given in Table 1 and Figure 6. The daily maximum and mean water temperatures in Doan Creek June-November 2014 are shown in Figure 7. For comparison, water temperature as observed in 2010 is also shown in Table 1 and Figure 6. Note that when 2010 results are restricted to data collected June 20-November 19th the %exceedance was 22%.

Elevated water temperatures and their effect on native fish and other cold water biota are of concern in Doan Creek. On site park-staff attributed elevated water temperatures in 2013 and 2014 to reduced stream flow. This observation was not supported quantitatively and suggests the need for routine water quantity monitoring. Monitoring stream flow would also help to make informed management decisions related to the use of Doan Creek water.

Maintaining water temperatures suitable for naturally occurring species in Doan Creek will depend on stream flow regime, and riparian/stream channel conditions basin-wide. For this reason cooperation with other agencies, stakeholders, and adjacent landowners will be critical for improving water temperature. The steps that have been taken by WHMI to restore their segment of Doan Creek and provide year round stream flow are progress towards meeting temperature targets.

Table 1. Vital sign summary table for water temperature in Doan Creek June-November, 2014 and June-September 2013.

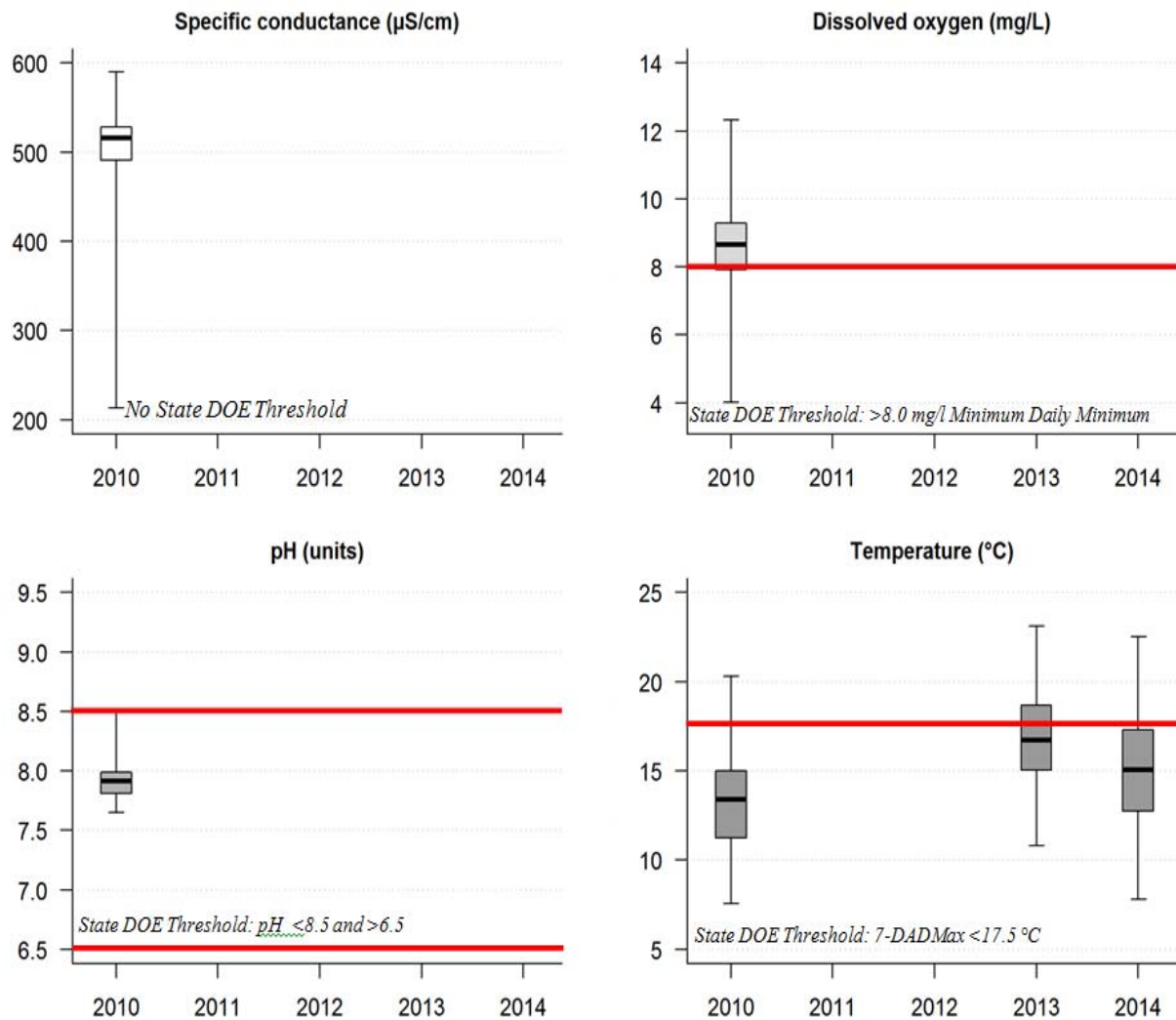
Doan Creek Water Temperature Summary

Monitoring Period	Measure	Condition	State DOE Thresholds ^a	% Exceedance ^b
June-November, 2014	Temperature (*MDMT, **MDAT)	* MDMT= 22.5 °C ** MDAT= 19.19 °C	***7-DADMax <17.5 °C	60%
June-September, 2013	Temperature (*MDMT, **MDAT)	* MDMT= 23.11 °C ** MDAT= 20.27 °C	***7-DADMax <17.5 °C	85%
April-November, 2010	Temperature (*MDMT, **MDAT)	* MDMT= 20.3 °C ** MDAT= 17.8 °C	***7-DADMax <17.5 °C	19%

*MDMT – Maximum Daily Maximum Temperature, **MDAT – Maximum Daily Average Temperature, ***7-DADMax –7 DayAverage Daily Maximum Temperature, ^a Criteria established for Salmonid spawning, rearing, and migration, ^b Proportion of samples above water quality standard

0-5% exceedance	5-25% exceedance	>25% exceedance
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Doan Creek, Water Quality Monitoring Results 2010-2014



Note that box-plot tail ends represent the minimum and maximum values.

Figure 6. Doan Creek, water quality monitoring results box-plot 2010-2014.

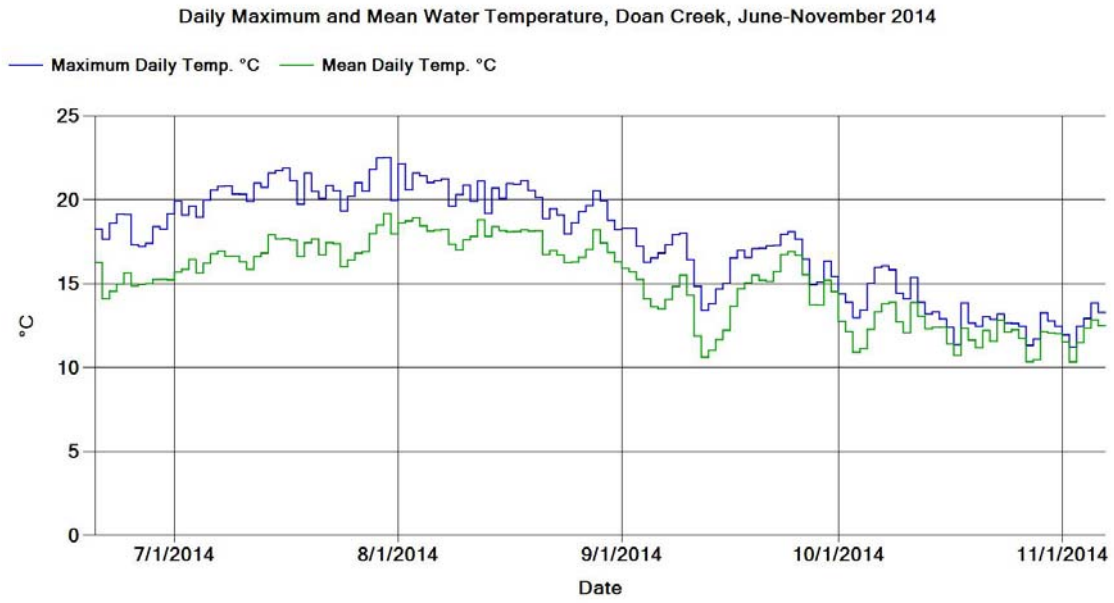


Figure 7. Daily maximum and mean water temperature in Doan Creek, WHMI, 2014.

Macroinvertebrates

Status:

The Hilsenhoff Biotic Index (HBI), which summarizes pollution tolerances of the macroinvertebrate taxa within the sample, indicates that “fairly substantial [organic] pollution is likely” in Doan Creek (HBI= 5.46) and that water quality is “fair” (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. Based on other observations, it seems likely that factors other than organic pollution may be influencing HBI values in Mill Creek. The US Forest Service (USFS) community tolerance quotient was 99 and indicates that Doan 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 this sample reach was 0.16 and indicated that Doan Creek 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 lack of Ephemeroptera, Plecoptera, Trichoptera (EPT) taxa (0), lack of long lived taxa (0), and dominance of Chironomidae (non-biting midges) in the sample suggests that Doan Creek has impaired habitat. See Table 2 and Appendix F for additional summary metrics. Impairment is likely due to several factors, including; recent disturbance (channel modification), persistent near-dewatering, elevated temperatures, and lack of suitable cobble/gravel substrate.

Table 2. Vital sign summary table for benthic macroinvertebrates in Doan Creek, 2014.
Note that the abbreviations are those found in the PIBO MS-Access database.

Doan Creek Macroinvertebrate Summary June 2014		
PIBO Station		3195
Sample ID		153327
Richness*	RICH	8
Shannon's Diversity*	SHDIVER	1.10
Simpson's Diversity*	SIDIVER	0.59
Evenness*	Evenness	0.57
# of EPT Taxa*	EPTT	0
Dominant Family	DFAMILY	Chironomidae
Dominant Taxa	dtaxonomy	Chironominae
Hilsenhoff Biotic Index*	tv1	5.46
# of Intolerant Taxa*	HBIINT1	0
# of Tolerant Taxa*	HBITOL1	0
USFS Community Tolerance Quotient (d)*	ctqd	99
# of shredder taxa*	sht	0
# of scraper taxa*	sct	0
# of collector-filterer taxa*	cft	1
# of collector-gatherer taxa*	cgt	4
# of predator taxa*	prt	2
# of clinger taxa*	clinger	1
Long-lived Taxa*	LLTaxa	0

Mill Creek

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 2014 deployment location (Station #01) 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 v3.1.2). Results of the ANOVA showed that there was no significant difference for specific conductance among the transects and the deployment location in June, $F(4,44) = 1.898$, $p > 0.05$, and a significant difference in November $F(4,39) = 15.81$, $p < 0.05$.

To determine where the difference in representativeness occurred, a post hoc Tukey's test was conducted (R v3.1.2). Relative to specific conductance, results of the Tukey's test for the cross section survey conducted in November indicates that the deployment location was significantly different from transects 2, 3 and 4 (Figure 9). Transects 3 and 4 may have been strongly influenced by water that was flowing into a normally dry side-channel, and re-entering the main channel near transect 3.

In summary, the deployment location was shown to be representative when monitoring began in June (Figure 8) and less representative in November. However, November results were likely heavily influenced by elevated streamflow and the unique flow of water from a side channel. This monitoring location is still considered the most suitable location for permanent deployment.

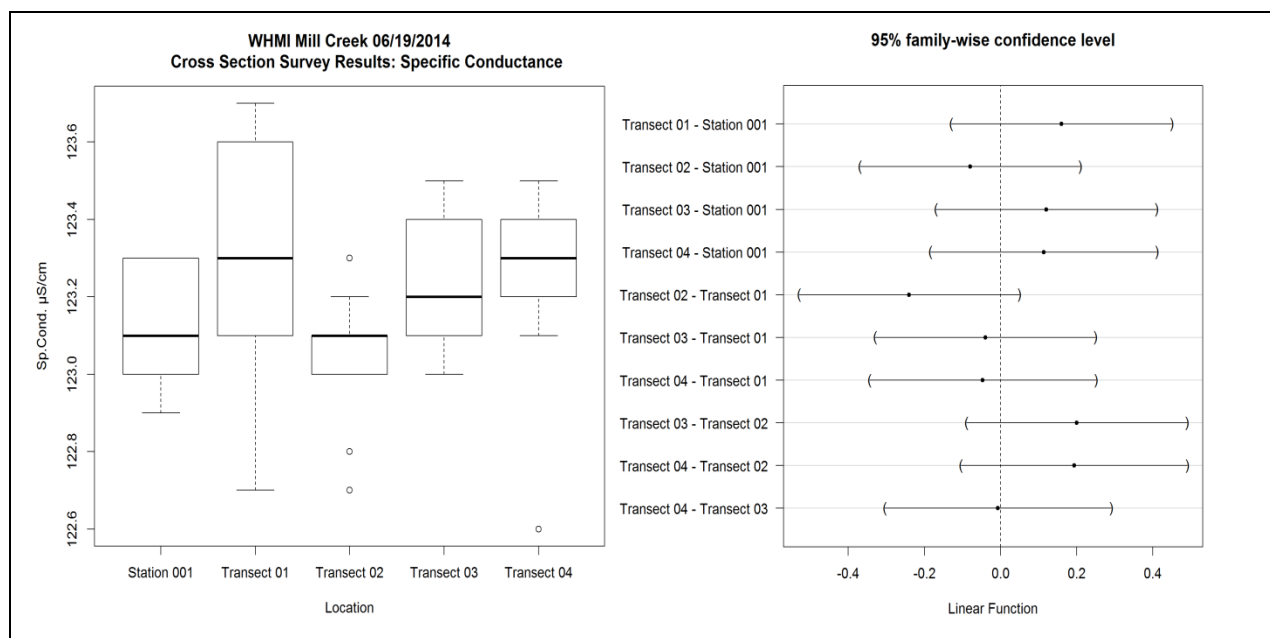


Figure 8. June 2014 cross section survey of Mill Creek, box-plot of specific conductance and plot of 95% family-wise confidence level. Note that “Station 01” is the location of multiprobe deployment and the transects progress downstream (1-4).

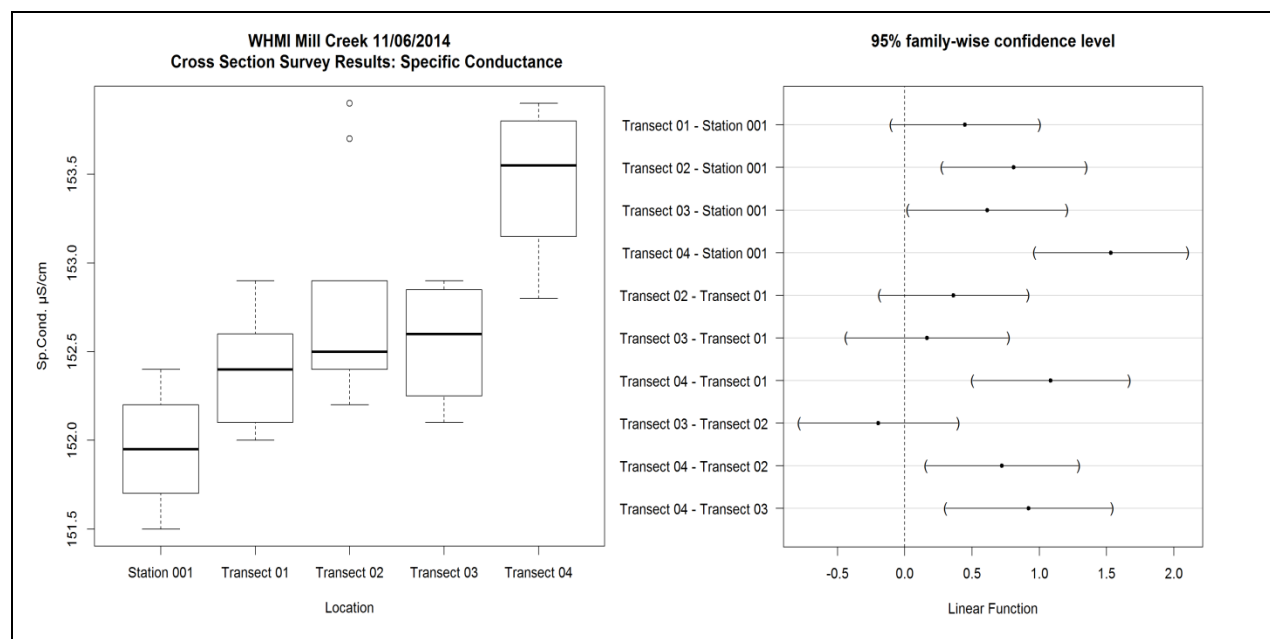


Figure 9. November 2014 cross section survey of Mill Creek, box-plot of specific conductance and plot of 95% family-wise confidence level. Note that “Station 01” is the location of multiprobe deployment and the transects progress downstream (1-4).

Status:

Condition of core water quality parameters (2014) along with the corresponding Washington Department of Ecology (WADOE) regulatory threshold are given in Table 3 and Figure 10. For comparison, the condition of core water quality parameters as observed in 2011 are given in Table 4. As previous monitoring indicated, the primary concerns in Mill Creek are elevated water temperatures, pH, and low dissolved oxygen levels. All three concerns have potential detrimental effect on native aquatic biota and designated aquatic life use (salmonid rearing and migration only).

Table 3. Vital sign summary table for water chemistry in Mill Creek, June-November, 2014.

Mill Creek Water Chemistry Summary 2014			
Measure	Current Condition (June-November, 2014)	State DOE Thresholds ^a	% Exceedance ^c
Temperature (*MDMT, **MDAT)	* MDMT= 25.78 °C ** MDAT= 23.58 °C	***7-DADMax <17.5 °C	70%
Specific conductance (mean)	217.8 µS/cm	N/A	N/A
Dissolved oxygen (mean daily min)	6.7 mg/l	>5.0 mg/l Minimum Daily Minimum ^b	5%
pH (mean daily max)	8.5 pH Units	8.5 pH Units, Max (0.5 units human caused variation)	10%
pH (mean daily min)	7.6 pH Units	6.5 pH Units, Min (0.5 units human caused variation)	0%
Turbidity (mean daily max)	6.8 NTU	< 5 NTU increase above background when background NTU < 50, < 10% increase when background NTU > 50	Insufficient data

*MDMT – Maximum Daily Maximum Temperature, **MDAT – Maximum Daily Average Temperature, ***7-DADMax –7 Day Average Daily Maximum Temperature, ^a Criteria established for Salmonid Rearing and Migration Only, ^b Special designation for Mill Creek mouth to 13th St. Bridge, ^c Proportion of samples above water quality standard

0-5% exceedance	5-25% exceedance	>25% exceedance
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Table 4. Vital sign summary table for water chemistry in Mill Creek, June-November, 2011.

Mill Creek Water Chemistry Summary 2011			
Measure	Current Condition (June-November, 2011)	State DOE Thresholds ^a	% Exceedance ^c
Temperature (*MDMT, **MDAT)	* MDMT= 24.5 °C ** MDAT= 21.7 °C	***7-DADMax <17.5 °C	67%
Specific conductance (mean)	278.7 µS/cm	N/A	N/A
Dissolved oxygen (mean daily min)	7.1 mg/l	>5.0 mg/l Minimum Daily Minimum ^b	2%
pH (mean daily max)	8.7 pH Units	8.5 pH Units, Max (0.5 units human caused variation)	19%
pH (mean daily min)	7.6 pH Units	6.5 pH Units, Min (0.5 units human caused variation)	0%
Turbidity (mean daily max)	Insufficient data due to poor data quality	< 5 NTU increase above background when background NTU < 50, < 10% increase when background NTU > 50	Insufficient data

*MDMT – Maximum Daily Maximum Temperature, **MDAT – Maximum Daily Average Temperature, ***7-DADMax –7 DayAverage Daily Maximum Temperature, ^a Criteria established for Salmonid Rearing and Migration Only, ^b Special designation for Mill Creek mouth to 13th St. Bridge, ^c Proportion of samples above water quality standard

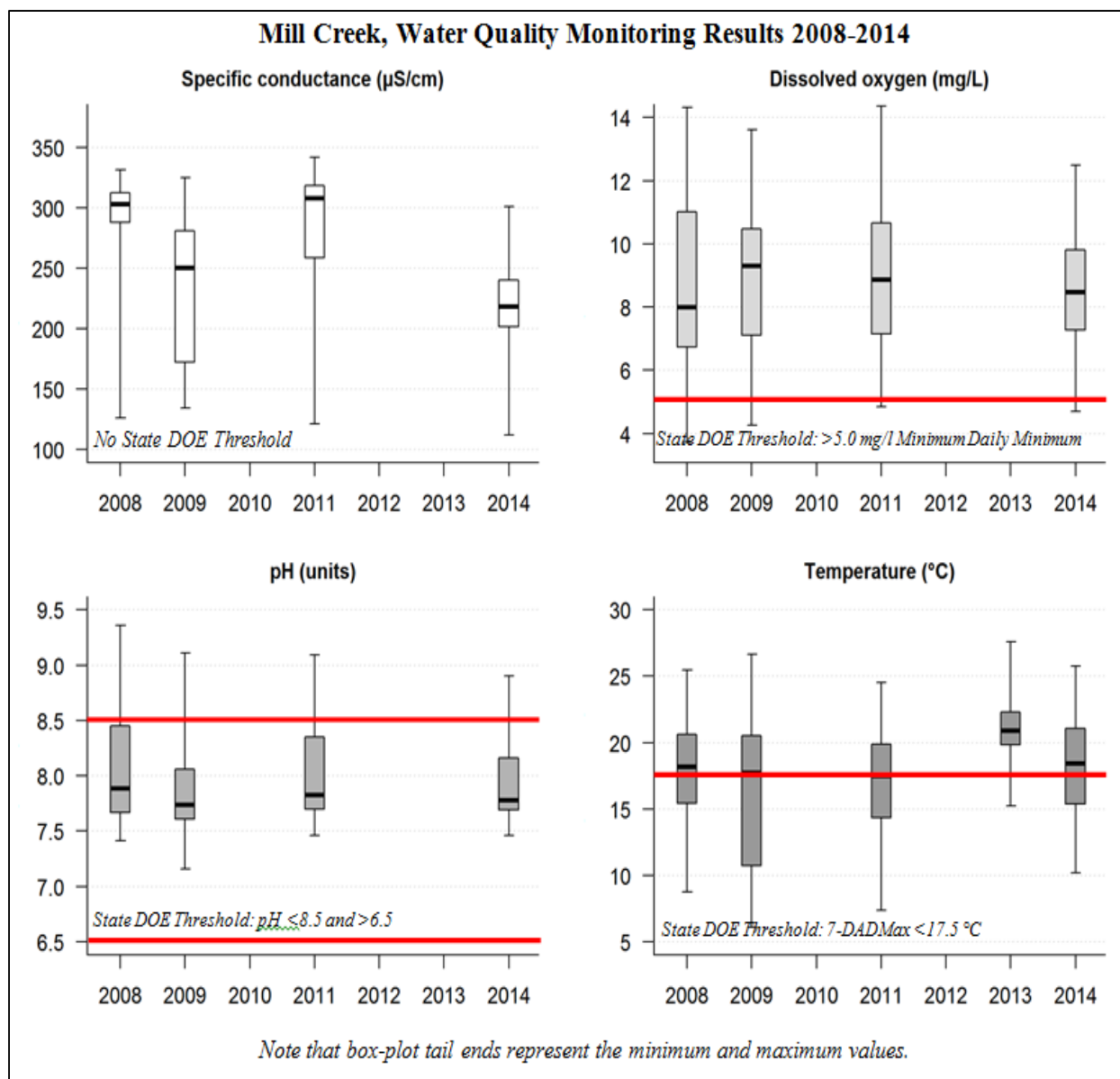


Figure 10. Mill Creek, water quality monitoring results box-plot 2008-2014.

Temperature:

In 2014, the maximum daily maximum temperature (MDMT) was 25.78 °C and the maximum daily average temperature (MDAT) was 23.58 °C. Water temperature routinely exceeded (70% of observations) the criteria for “salmonid rearing and migration only” (7-DADMax <17.5°C). Data from 2014 reinforces previous UCBN findings (Starkey 2009 and Starkey 2012) and basin-wide temperature concerns mentioned in the Walla Walla Watershed Temperature TMDL- Water Quality Improvement Report (Baldwin and Stohr 2007), Walla Walla Watershed PCB's, Chlorinated Pesticides....TMDL- Water Quality Implementation Plan (Baldwin et al. 2008) and the 2008 303(d) list (Washington Department of Ecology 2008). For comparison, Figure 10 and Table 5 show 2014 results relative to previous monitoring years. Figure 11 shows the daily maximum and mean daily temperatures in Mill Creek from June-November 2014. Table 6 lists 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). Data grades less than “excellent” were primarily due to inaccurate field thermometer readings during evaluation of sensor fouling. Corrections that have been applied to the specific conductance data are listed in Appendix E.

Water temperatures are of particular interest in Mill Creek, given that its designated use include salmonid rearing/migration only, and that it provides habitat for: bull trout (*Salvelinus confluentus*), and steelhead (*Oncorhynchus mykiss*) 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). It is also 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 13), thereby impacting aquatic biota.

Maintaining water temperatures suitable for naturally occurring species in Mill Creek will depend on stream flow regime, and riparian/stream channel conditions basin-wide. For this reason cooperation with other agencies, stakeholders, and adjacent landowners will be critical for improving water temperature.

Table 5. Water temperature summary table for Mill Creek 2008-2014.

Monitoring Dates	State DEQ Threshold	% Exceedance	MDMT °C	MDAT °C
06/30/2008-10/18/2008*	7-DADMax <17.5 °	73	25.5	24.0
07/21/2009-11/24/2009*	7-DADMax <17.5 °	59	26.7	23.8
06/22/2011-11/08/2011*	7-DADMax <17.5	67	24.5	21.7
06/02/2013-09/24/2013**	7-DADMax <17.5	92	27.6	26.7
06/19/2014-11/06/2014*	7-DADMax <17.5	70	25.8	23.6

* Collected with Hydrolab,**Collected with HOBO Pro v2.0 temperature logger, 7-DADMax – Seven day average of the daily maximum, MDMT – Maximum Daily Maximum Temperature, MDAT – Maximum Daily Average Temperature

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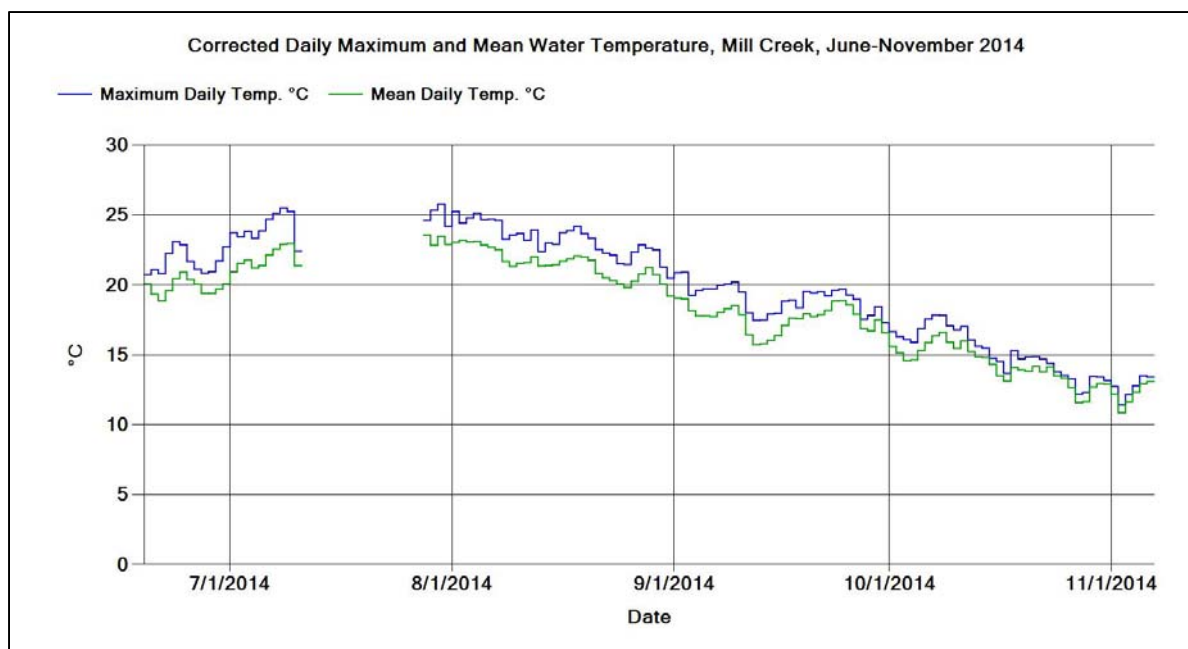


Figure 11. Daily maximum and mean water temperature in Mill Creek, WHMI, 2014.

Table 6. Data grade/rating for water temperature each deployment period June-November 2014 in Mill Creek, WHMI.

Temperature Data Grade/Rating	From UTC-07:00	To UTC-07:00
GOOD	06/19/2014 17:00	07/10/2014 10:00
EXCELLENT	07/28/2014 13:00	09/03/2014 10:00
EXCELLENT	09/03/2014 16:00	10/02/2014 11:00
EXCELLENT	10/02/2014 14:00	11/06/2014 10:00

Specific Conductance:

Specific conductance ranged from 112.0 to 301.2 $\mu\text{S}/\text{cm}$, with an average specific conductance of 217.8 $\mu\text{S}/\text{cm}$ (Figure 12). Table 7 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 were never below the rating of “excellent.” Corrections applied to the specific conductance data are listed in Appendix E.

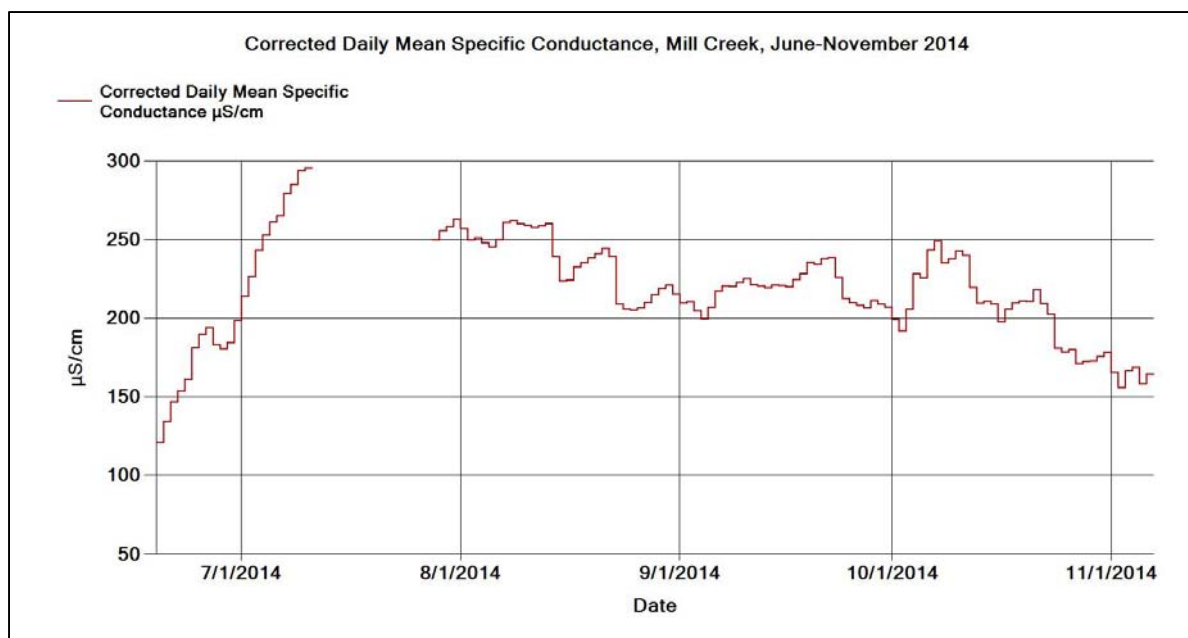


Figure 12. Corrected daily mean specific conductance in Mill Creek, WHMI, 2014.

Table 7. Data grade/rating for specific conductance each deployment period June-November 2014 in Mill Creek, WHMI.

Specific Conductance Data Grade/Rating	From UTC-07:00	To UTC-07:00
EXCELLENT	06/19/2014 17:00	07/10/2014 10:00
EXCELLENT	07/28/2014 13:00	09/03/2014 10:00
EXCELLENT	09/03/2014 16:00	10/02/2014 11:00
EXCELLENT	10/02/2014 14:00	11/06/2014 10:00

Dissolved Oxygen:

Mean daily minimum dissolved oxygen was 6.7 mg/l and the minimum daily minimum fell below the special designation for Mill Creek mouth to 13th St. bridge (>5.0 mg/l min. daily min.) during 5% of observations. In Mill Creek, low dissolved oxygen levels are likely driven by two sources; elevated temperatures and eutrophication from upstream sources. If water temperatures fell below regulatory thresholds it is likely that dissolved oxygen levels in the lower portion of Mill Creek would meet the special condition standard of >5.0 mg/l. Figure 13 shows the daily minimum dissolved oxygen and maximum temperatures in Mill Creek from June-November 2014. Table 8 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 grades less than “excellent” were primarily due to sensor fouling. Corrections applied to the dissolved oxygen data are listed in Appendix E.

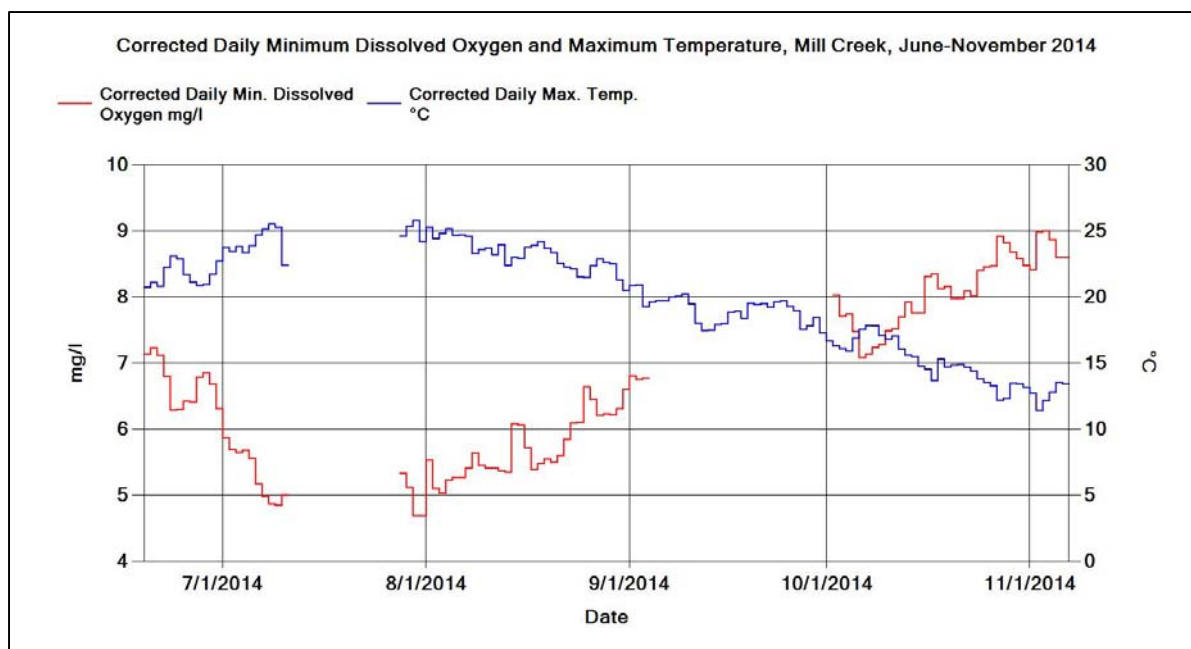


Figure 13. Corrected daily minimum dissolved oxygen and daily maximum temperature in Mill Creek, WHMI, 2014.

Table 8. Data grade/rating for dissolved oxygen each deployment period June-November 2014 in Mill Creek, WHMI.

Dissolved Oxygen Data Grade/Rating	From UTC-07:00	To UTC-07:00
FAIR	06/19/2014 17:00	07/10/2014 10:00
EXCELLENT	07/28/2014 13:00	09/03/2014 10:00
UNUSABLE	09/03/2014 16:00	10/02/2014 11:00
EXCELLENT	10/02/2014 14:00	11/06/2014 10:00

pH:

The minimum and maximum pH was 7.46 and 8.9 pH units respectively. pH exceeded the upper threshold of 8.5 pH units in 10% of observations. Monitoring in 2008, 2009 and 2011 indicated that exceedances of the upper pH limit were between 10% and 23% of observations (Starkey 2009 and Starkey 2012). Elevated pH may be cause for concern as it may indicate pollution from an upstream source. No observations fell below the lower pH threshold (6.5 pH units). Figure 14 shows the daily maximum, minimum, and median pH in Mill Creek from June-November 2014. 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 and drift encountered during each deployment period (Wagner et al. 2006; Starkey et al. 2008). Data quality ratings were never below “excellent”, however minor corrections applied to the pH data are listed in Appendix E.

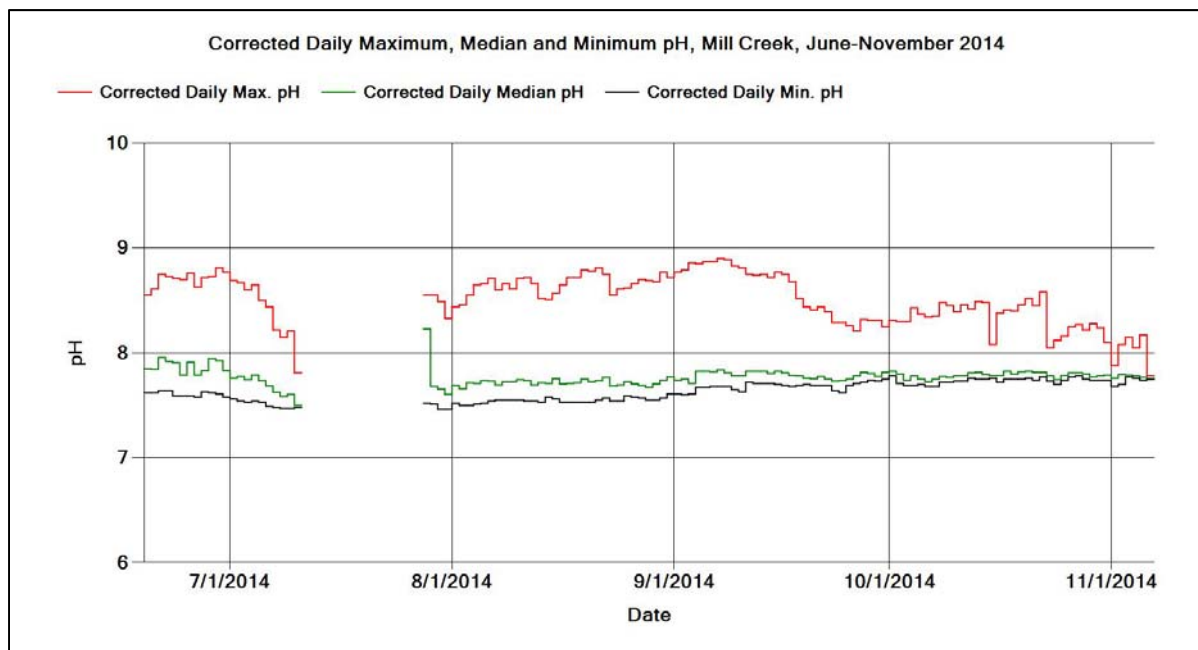


Figure 14. Corrected daily maximum, minimum and median pH in Mill Creek, WHMI, 2014.

Table 9. Data grade/rating for pH each deployment period June-November 2014 in Mill Creek, WHMI.

pH Data Grade/Rating	From UTC-07:00	To UTC-07:00
EXCELLENT	06/19/2014 17:00	07/10/2014 10:00
EXCELLENT	07/28/2014 13:00	09/03/2014 10:00
EXCELLENT	09/03/2014 16:00	10/02/2014 11:00
EXCELLENT	10/02/2014 14:00	11/06/2014 10:00

Turbidity:

Mean daily maximum turbidity in Mill Creek between June and November 2014 was 6.8 NTU and turbidity ranged from <0.22 to 170.5 NTU. The regulatory threshold for turbidity states that the following are acceptable turbidity levels, “< 5 NTU increase above background when background NTU < 50, < 10% increase when background NTU > 50” (WA Admin. Code 2011, 173-201A-600 [through 8/1/03]). Given that 2014 represents the third year of useable monitoring data and that background levels are important in the determination of percent exceedance, no exceedance was calculated for this parameter. Following multiple years of monitoring in Mill Creek, the UCBN may set a background level for Mill Creek as it flows through WHMI. It is important to note that the method detection limit (MDL) for this sensor was 0.22 NTU and the minimum level of quantitation (ML) was 0.7 NTU (Appendix D).

Figure 15 shows the daily mean turbidity in Mill Creek from June-November 2014. 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). The data grades less than “excellent” were due to a combination of calibration drift and sensor fouling. Corrections applied to turbidity data are listed in Appendix E.

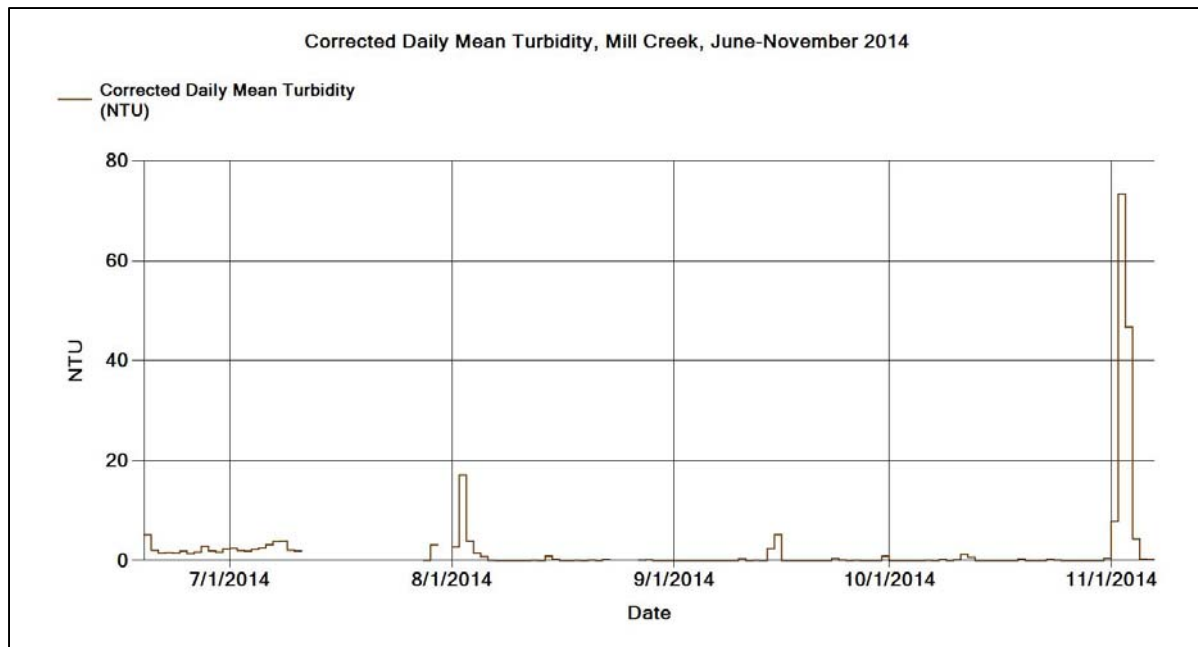


Figure 15. Corrected daily mean turbidity in Mill Creek, WHMI, 2014.

Table 10. Data grade/rating for turbidity each deployment period June-November 2014 in Mill Creek, WHMI.

Turbidity Data Grade/Rating	From UTC-07:00	To UTC-07:00
GOOD	06/19/2014 17:00	07/10/2014 10:00
POOR	07/28/2014 13:00	09/03/2014 10:00
EXCELLENT	09/03/2014 16:00	10/02/2014 11:00
EXCELLENT	10/02/2014 14:00	11/06/2014 10:00

Macroinvertebrates

Status:

The Hilsenhoff Biotic Index (HBI), which summarizes pollution tolerances of the macroinvertebrate taxa within the sample, indicates that Mill Creek has “some organic pollution probable” (HBI= 4.66) and “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 was 93 and indicates that Mill 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. It should be noted that the Mill Creek macroinvertebrate sample scored better on the USFS community tolerance quotient than Doan Creek (99). The observed to expected ratio (OE) for this sample reach was 0.25 and indicated that Mill Creek 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 number of Ephemeroptera, Plecoptera, Trichoptera (EPT) taxa was 7; there were 4 long lived taxa; and the dominate family was Chironomidae (non-biting midges). Additional summary metrics can be found in Table 11 and Appendix F.

These data suggest that, while Mill Creek is in better condition than Doan Creek, it is still impaired. Causes of impairment may be tied to elevated water temperatures, low dissolved oxygen levels and elevated pH. Substrate armoring and fine sediment input may also be having a detrimental impact on benthic macroinvertebrate habitat.

Table 11. Vital sign summary table for benthic macroinvertebrates in Mill Creek, 2014. Note that the abbreviations are those found in the PIBO MS-Access database.

Mill Creek Macroinvertebrate Summary June 2014		
PIBO Station		3194
Sample ID		153326
Richness*	RICH	16
Shannon's Diversity*	SHDIVER	2.0
Simpson's Diversity*	SIDIVER	0.83
Evenness*	Evenness	0.72
# of EPT Taxa*	EPTT	7
Dominant Family	DFAMILY	Chironomidae
Dominant Taxa	dtaxonomy	Orthoclaadiinae
Hilsenhoff Biotic Index*	tv1	4.66
# of Intolerant Taxa*	HBIINT1	1
# of Tolerant Taxa*	HBITOL1	0
USFS Community Tolerance Quotient (d)*	ctqd	93
# of shredder taxa*	sht	0
# of scraper taxa*	sct	2
# of collector-filterer taxa*	cft	2
# of collector-gatherer taxa*	cgt	7
# of predator taxa*	prt	2
# of clinger taxa*	clinger	6
Long-lived Taxa*	LLTaxa	4

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Appendix A. 2014 Water Quality Monitoring Locations



Appendix A. 2014 Water Quality Monitoring Locations (continued)

Whitman Mission National Historical Park
Mill Creek
Washington

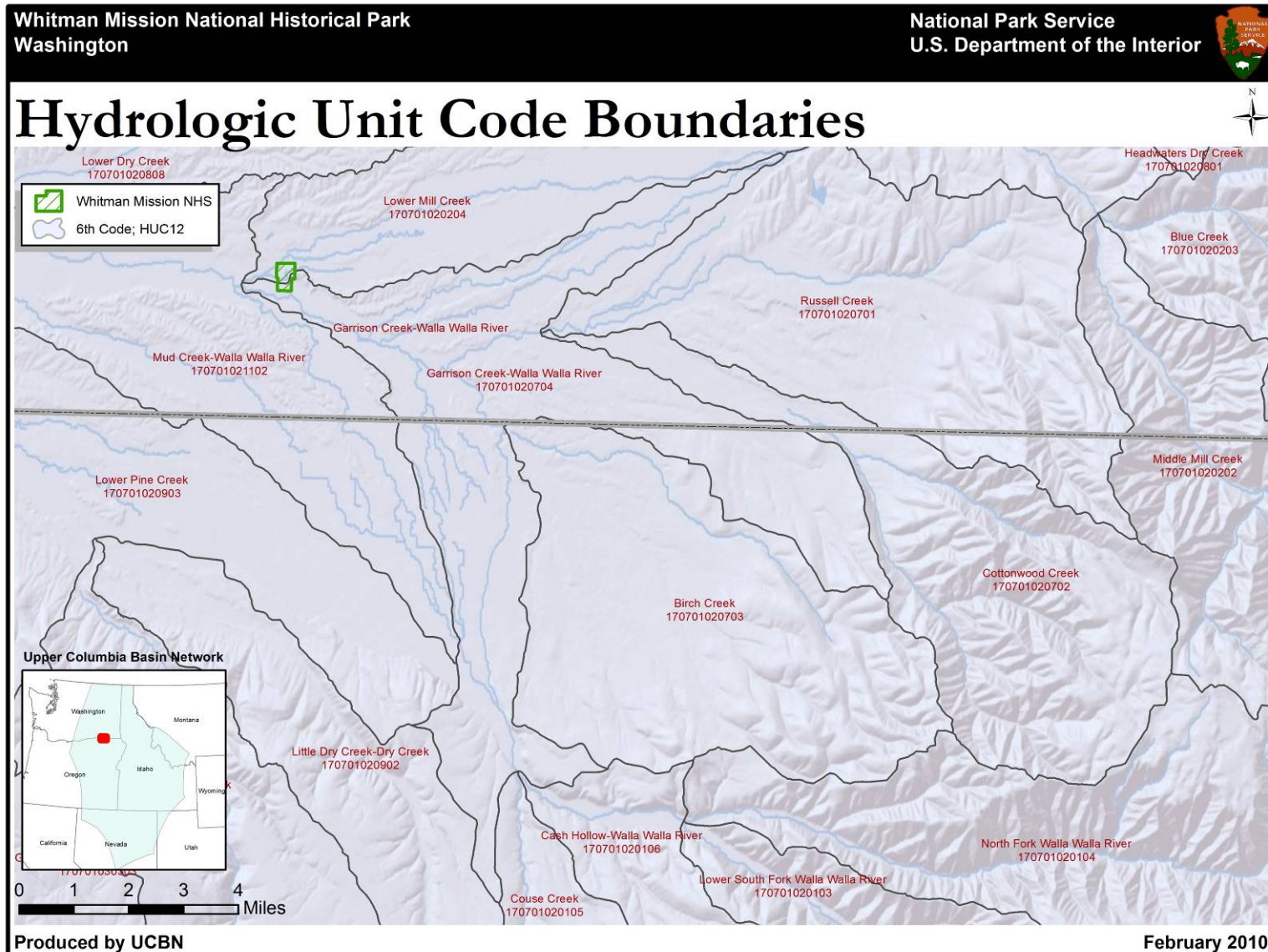
National Park Service
U.S. Department of the Interior



WHMI- Water Quality Monitoring 2014



Appendix B. WHMI Hydrologic Unit Code Boundaries



Appendix C. Sample Locations for Water Quality Monitoring at WHMI

Park	Stream	Monitoring Type	Station #	Lat.	Long.	Y	X
WHMI	Doan Creek	Water Chemistry	001	46.044167	-118.463377	5099996	386778
WHMI	Mill Creek	Water Chemistry	001	46.04366488	-118.46517032	5099943	386638
WHMI	Doan Creek	Macroinvertebrates	3195	46.04414805	-118.4604884	5099989	387001
WHMI	Mill Creek	Macroinvertebrates	3194	46.04218851	-118.4687082	5099783	386361

Note that X and Y have been projected in WGS84, UTM Zone 11. These locations were recorded by the field crew with a handheld GPS unit.

Appendix D. Quality Control (QC) Indicators

QC data quality indicators for 2014 season at WHMI, Mill Creek, Hydrolab #095, Station ID: WHMI #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	0.11	0.02	0.05	0.07
Specific Conductance	µS/cm	0 to 100,000 µS/cm	N/A	N/A	0.56	1.09	0.16	0.33
Dissolved Oxygen	mg/L	0-20 mg/L	N/A	N/A	0.04	0.1	0	0.2
pH	pH units	0-14 Units	N/A	N/A	0.06	0.17	0	0.26
Turbidity	NTU	0-3000 NTU	0.22	0.7	1.05	0	0	0

Appendix E. Corrections History

Correction history for Mill Creek, WHMI 2014 temperature data.

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete point(s) to adjust time, DST to ST	11/2/2014 1:00	11/2/2014 1:00	11/11/2014 15:41	1
EStarkey	Clock Drift Correction with start offset of -60.000 and end offset of -60.000 DST to ST	11/2/2014 2:00	11/6/2014 11:00	11/11/2014 15:42	105

Correction history for Mill Creek, WHMI 2014 specific conductance data.

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete point(s)- due to outlier	7/10/2014 6:00	7/10/2014 6:00	7/16/2014 9:57	1
EStarkey	Drift Correction with Calibration Drift value of 7.650µS/cm and Fouling Drift value of 7.200µS/cm	6/19/2014 17:00	7/10/2014 10:00	7/16/2014 9:58	498
EStarkey	Delete Region-due to outlier	8/4/2014 23:00	8/4/2014 23:00	9/5/2014 11:11	1
EStarkey	Drift Correction with Calibration Drift value of 1.400µS/cm and Fouling Drift value of 3.700µS/cm	7/28/2014 13:00	9/3/2014 10:00	9/5/2014 11:14	886
EStarkey	Delete Region-due to outlier	7/29/2014 7:00	7/29/2014 7:00	9/5/2014 13:17	1
EStarkey	Delete Region-due to outlier	8/1/2014 13:00	8/1/2014 13:00	9/5/2014 13:17	1
EStarkey	Delete Region-due to outlier	8/4/2014 8:00	8/4/2014 8:00	9/5/2014 13:17	1
EStarkey	Delete Region-due to outlier	8/5/2014 14:00	8/5/2014 14:00	9/5/2014 13:18	1
EStarkey	Delete Region-due to outlier	8/6/2014 7:00	8/6/2014 7:00	9/5/2014 13:18	1
EStarkey	Delete Region-due to outlier	8/7/2014 7:00	8/7/2014 7:00	9/5/2014 13:18	1
EStarkey	Delete Region-due to outlier	9/4/2014 15:00	9/4/2014 15:00	10/8/2014 13:30	1
EStarkey	Delete Region-due to outlier	9/12/2014 13:55	9/12/2014 14:08	10/8/2014 13:31	1
EStarkey	Delete Region-due to outlier	9/17/2014 16:24	9/17/2014 17:32	10/8/2014 13:32	1
EStarkey	Delete Region-due to outlier	9/17/2014 18:37	9/17/2014 19:24	10/8/2014 13:32	1

Appendix E. Corrections History (continued)

Correction history for Mill Creek, WHMI 2014 specific conductance data (continued).

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Drift Correction with Calibration Drift value of 20.700µS/cm and Fouling Drift value of -0.400µS/cm	9/3/2014 16:00	10/2/2014 11:00	10/8/2014 13:32	692
EStarkey	Delete Region due to outlier	10/6/2014 14:00	10/6/2014 15:00	11/11/2014 15:44	2
EStarkey	Delete Region due to outlier	10/9/2014 6:00	10/9/2014 7:00	11/11/2014 15:44	2
EStarkey	Delete Region due to outlier	10/13/2014 12:00	10/13/2014 12:00	11/11/2014 15:44	1
EStarkey	Delete Region due to outlier	11/2/2014 11:00	11/2/2014 11:00	11/11/2014 15:45	1
EStarkey	Delete Region due to outlier	11/3/2014 7:00	11/3/2014 7:00	11/11/2014 15:45	1
EStarkey	Drift Correction with Calibration Drift value of 14.650µS/cm and Fouling Drift value of -0.200µS/cm	10/2/2014 14:00	11/6/2014 11:00	11/11/2014 15:45	837
EStarkey	Delete point(s) due to shift from DST to ST	11/2/2014 1:00	11/2/2014 1:00	11/11/2014 15:46	1
EStarkey	Clock Drift Correction with start offset of -60.000 and end offset of -60.000 DST to ST	11/2/2014 2:00	11/6/2014 11:00	11/11/2014 15:46	105

Correction history for Mill Creek, WHMI 2014 dissolved oxygen data.

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete point(s)- due to outlier	7/9/2014 22:00	7/9/2014 22:00	7/16/2014 10:17	1
EStarkey	Delete point(s)- due to outlier	7/7/2014 20:00	7/7/2014 20:00	7/16/2014 10:17	1
EStarkey	Delete Region-due to outlier	8/24/2014 21:00	8/24/2014 21:00	9/5/2014 13:22	1
EStarkey	Delete Region-due to outlier	9/24/2014 1:00	9/24/2014 1:00	10/8/2014 13:58	1
EStarkey	Drift Correction with Calibration Drift value of -0.320mg/l and Fouling Drift value of 2.470mg/l	9/3/2014 16:00	10/2/2014 11:00	10/8/2014 13:59	692
EStarkey	Delete Region due to outlier	10/18/2014 4:00	10/18/2014 4:00	11/11/2014 15:48	1
EStarkey	Delete point(s) to apply DST to ST	11/2/2014 1:00	11/2/2014 1:00	11/11/2014 15:50	1
EStarkey	Clock Drift Correction with start offset of -60.000 and end offset of -60.000 DST to ST	11/2/2014 2:00	11/6/2014 11:00	11/11/2014 15:50	105

Appendix E. Corrections History (continued)

Correction history for Mill Creek, WHMI 2014 pH data.

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete point(s) to apply DST to ST	11/2/2014 1:00	11/2/2014 1:00	11/11/2014 15:52	1
EStarkey	Clock Drift Correction with start offset of -60.000 and end offset of -60.000 DST to ST	11/2/2014 2:00	11/6/2014 11:00	11/11/2014 15:53	105

Correction history for Mill Creek, WHMI 2014 turbidity data.

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete point(s)- due to outlier	6/27/2014 11:00	6/27/2014 11:00	7/16/2014 10:27	1
EStarkey	Delete point(s)- due to outlier	7/2/2014 19:00	7/2/2014 20:00	7/16/2014 10:28	2
EStarkey	Delete point(s)- due to outlier	6/25/2014 12:00	6/25/2014 12:00	7/16/2014 10:29	1
EStarkey	Delete point(s)- due to outlier	6/27/2014 19:00	6/27/2014 19:00	7/16/2014 10:30	1
EStarkey	Delete point(s)- due to outlier	6/20/2014 16:00	6/20/2014 16:00	7/16/2014 10:30	1
EStarkey	Delete point(s)- due to outlier	7/1/2014 16:00	7/1/2014 16:00	7/16/2014 10:31	1
EStarkey	Delete point(s)- due to outlier	7/3/2014 14:00	7/3/2014 14:00	7/16/2014 10:31	1
EStarkey	Delete point(s)- due to outlier	7/9/2014 1:00	7/9/2014 1:00	7/16/2014 10:32	1
EStarkey	Delete Region	7/10/2014 9:00	7/10/2014 9:00	7/16/2014 10:32	1
EStarkey	Drift Correction with Calibration Drift value of 0.900NTU and Fouling Drift value of -0.300NTU	6/19/2014 17:00	7/10/2014 10:00	7/16/2014 10:34	498
AQ_AUTO	Remove flag Values for ROCS type and 21 code	7/28/2014 13:00	Open	9/5/2014 13:33	137
AQ_AUTO	Remove flag Values for THRESHS type and 1 code	7/28/2014 13:00	Open	9/5/2014 13:33	14
EStarkey	Delete Region-due to outlier. Cause of elevated turbidity readings appears to be due to filamentous algae. Did not correspond to increase in discharge.	7/29/2014 9:00	7/31/2014 13:00	9/5/2014 13:38	53
EStarkey	Delete Region-due to outlier	8/2/2014 22:00	8/2/2014 22:00	9/5/2014 13:39	1
EStarkey	Delete Region-due to outlier	8/5/2014 16:00	8/5/2014 16:00	9/5/2014 13:39	1

Appendix E. Corrections History (continued)

Correction history for Mill Creek, WHMI 2014 turbidity data (continued).

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region-due to outlier. Cause of elevated turbidity readings appears to be due to filamentous algae. Did not correspond to increase in discharge.	8/6/2014 3:00	8/6/2014 3:00	9/5/2014 13:39	1
EStarkey	Delete Region-due to outlier. Cause of elevated turbidity readings appears to be due to filamentous algae. Did not correspond to increase in discharge.	8/23/2014 13:00	8/27/2014 11:00	9/5/2014 13:40	95
EStarkey	Delete Region-due to outlier	8/8/2014 16:00	8/8/2014 17:00	9/5/2014 13:42	2
EStarkey	Delete Region-due to outlier	8/9/2014 14:00	8/9/2014 16:00	9/5/2014 13:42	3
EStarkey	Delete Region-due to outlier	8/10/2014 14:00	8/10/2014 15:00	9/5/2014 13:42	2
EStarkey	Delete Region-due to outlier	8/11/2014 15:00	8/11/2014 15:00	9/5/2014 13:42	1
EStarkey	Delete Region-due to outlier	8/12/2014 15:00	8/12/2014 16:00	9/5/2014 13:42	2
EStarkey	Delete Region-due to outlier	8/7/2014 6:00	8/7/2014 7:00	9/5/2014 13:42	2
EStarkey	Delete Region-due to outlier	8/5/2014 13:00	8/5/2014 19:00	9/5/2014 13:42	7
EStarkey	Delete Region-due to outlier	8/1/2014 1:00	8/1/2014 2:00	9/5/2014 13:43	2
EStarkey	Delete Region-due to outlier	8/4/2014 6:00	8/4/2014 7:00	9/5/2014 13:43	2
EStarkey	Delete Region	8/3/2014 5:00	8/3/2014 6:00	9/5/2014 13:43	2
EStarkey	Delete Region	8/2/2014 20:00	8/2/2014 20:00	9/5/2014 13:43	1
EStarkey	Delete Region-due to outlier	8/14/2014 14:00	8/14/2014 15:00	9/5/2014 13:43	2
EStarkey	Delete Region	8/15/2014 16:00	8/15/2014 16:00	9/5/2014 13:44	1
EStarkey	Delete Region-due to outlier	8/16/2014 3:00	8/16/2014 3:00	9/5/2014 13:44	1
EStarkey	Delete Region-due to outlier	8/17/2014 14:00	8/17/2014 14:00	9/5/2014 13:44	1
EStarkey	Delete Region-due to outlier	8/18/2014 14:00	8/18/2014 14:00	9/5/2014 13:44	1
EStarkey	Delete Region-due to outlier	8/18/2014 17:00	8/18/2014 17:00	9/5/2014 13:44	1
EStarkey	Delete Region-due to outlier	8/21/2014 17:00	8/21/2014 17:00	9/5/2014 13:45	1
EStarkey	Delete Region-due to outlier	8/27/2014 17:00	8/27/2014 17:00	9/5/2014 13:45	1
EStarkey	Delete Region-due to outlier	8/30/2014 17:00	8/30/2014 18:00	9/5/2014 13:45	2

Appendix E. Corrections History (continued)

Correction history for Mill Creek, WHMI 2014 turbidity data (continued).

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region-due to outlier	9/1/2014 15:00	9/1/2014 17:00	9/5/2014 13:45	3
EStarkey	Delete Region-due to outlier	8/29/2014 13:00	8/29/2014 15:00	9/5/2014 13:45	3
EStarkey	Delete Region-due to outlier	8/30/2014 15:00	8/30/2014 16:00	9/5/2014 13:45	2
EStarkey	Delete Region-due to outlier	9/2/2014 22:00	9/2/2014 22:00	9/5/2014 13:45	1
EStarkey	Delete Region-due to outlier	9/6/2014 20:00	9/6/2014 20:00	10/8/2014 14:03	1
EStarkey	Delete Region-due to outlier	9/7/2014 10:00	9/7/2014 10:00	10/8/2014 14:04	1
EStarkey	Delete Region-due to outlier	9/7/2014 11:00	9/7/2014 11:00	10/8/2014 14:04	1
EStarkey	Delete Region-due to outlier	9/11/2014 10:00	9/11/2014 10:00	10/8/2014 14:04	1
EStarkey	Delete Region-due to outlier	9/14/2014 20:00	9/14/2014 20:00	10/8/2014 14:05	1
EStarkey	Delete Region-due to outlier	9/30/2014 14:00	9/30/2014 14:00	10/8/2014 14:05	1
EStarkey	Delete Region-due to outlier	9/30/2014 20:00	9/30/2014 20:00	10/8/2014 14:06	1
EStarkey	Delete Region-due to outlier	9/4/2014 15:00	9/4/2014 15:00	10/8/2014 14:07	1
EStarkey	Delete Region-due to outlier	9/9/2014 7:00	9/9/2014 7:00	10/8/2014 14:07	1
EStarkey	Delete Region-due to outlier	9/12/2014 7:00	9/12/2014 7:00	10/8/2014 14:07	1
EStarkey	Delete Region-due to outlier	9/13/2014 8:00	9/13/2014 8:00	10/8/2014 14:08	1
EStarkey	Delete Region-due to outlier	9/17/2014 23:00	9/17/2014 23:00	10/8/2014 14:10	1
EStarkey	Delete Region-due to outlier	9/27/2014 8:00	9/27/2014 8:00	10/8/2014 14:11	1
EStarkey	Delete Region-due to outlier	9/27/2014 16:00	9/27/2014 16:00	10/8/2014 14:11	1
EStarkey	Delete Region-due to outlier	9/27/2014 21:00	9/27/2014 21:00	10/8/2014 14:11	1
EStarkey	Delete Region-due to outlier	9/29/2014 19:00	9/29/2014 19:00	10/8/2014 14:12	1
EStarkey	Delete Region-due to outlier	9/29/2014 14:00	9/29/2014 14:00	10/8/2014 14:12	1
EStarkey	Delete Region-due to outlier	10/2/2014 4:00	10/2/2014 4:00	10/8/2014 14:12	1
EStarkey	Delete Region-due to outlier	9/30/2014 22:00	9/30/2014 22:00	10/8/2014 14:12	1
EStarkey	Delete Region due to outlier	10/4/2014 7:00	10/4/2014 7:00	11/11/2014 15:54	1
EStarkey	Delete Region due to outlier	10/7/2014 19:00	10/7/2014 19:00	11/11/2014 15:55	1

Appendix E. Corrections History (continued)

Correction history for Mill Creek, WHMI 2014 turbidity data (continued).

Creator	Comment	From Time	To Time	Applied Time	Points Modified
EStarkey	Delete Region due to outlier	10/3/2014 7:00	10/3/2014 7:00	11/11/2014 15:56	1
EStarkey	Delete Region due to outlier	10/3/2014 23:00	10/3/2014 23:00	11/11/2014 15:56	1
EStarkey	Delete Region due to outlier	10/6/2014 1:00	10/6/2014 1:00	11/11/2014 15:56	1
EStarkey	Delete Region due to outlier	10/9/2014 13:00	10/9/2014 13:00	11/11/2014 15:56	1
EStarkey	Delete Region due to outlier	10/9/2014 19:00	10/9/2014 19:00	11/11/2014 15:56	1
EStarkey	Delete Region due to outlier	10/9/2014 21:00	10/9/2014 21:00	11/11/2014 15:56	1
EStarkey	Delete Region due to outlier	10/12/2014 8:00	10/12/2014 8:00	11/11/2014 15:57	1
EStarkey	Delete Region due to outlier	10/12/2014 17:00	10/12/2014 17:00	11/11/2014 15:57	1
EStarkey	Delete Region due to outlier	10/14/2014 23:00	10/14/2014 23:00	11/11/2014 15:57	1
EStarkey	Delete Region due to outlier	10/15/2014 14:00	10/15/2014 14:00	11/11/2014 15:57	1
EStarkey	Delete Region due to outlier	10/21/2014 8:00	10/21/2014 8:00	11/11/2014 15:57	1
EStarkey	Delete Region due to outlier	10/23/2014 9:00	10/23/2014 9:00	11/11/2014 15:57	1
EStarkey	Delete Region due to outlier	11/2/2014 9:00	11/2/2014 9:00	11/11/2014 15:58	1
EStarkey	Delete Region due to outlier	11/2/2014 13:00	11/2/2014 13:00	11/11/2014 15:58	1
EStarkey	Delete Region due to outlier	11/2/2014 10:00	11/2/2014 10:00	11/11/2014 15:58	1
EStarkey	Delete Region due to outlier	11/2/2014 17:00	11/2/2014 17:00	11/11/2014 15:59	1
EStarkey	Delete Region due to outlier	11/4/2014 5:00	11/4/2014 7:00	11/11/2014 15:59	3
EStarkey	Delete Region due to outlier	11/4/2014 9:00	11/4/2014 9:00	11/11/2014 15:59	1
EStarkey	Delete Region due to outlier	11/4/2014 21:00	11/4/2014 21:00	11/11/2014 15:59	1
EStarkey	Delete Region due to outlier	11/2/2014 16:00	11/2/2014 18:00	11/11/2014 15:59	3
EStarkey	Delete point(s) to shift DST to ST	11/2/2014 1:00	11/2/2014 1:00	11/11/2014 16:00	1
EStarkey	Clock Drift Correction with start offset of - 60.000 and end offset of -60.000 DST to ST	11/2/2014 2:00	11/6/2014 11:00	11/11/2014 16:01	105

Appendix F. Macroinvertebrate Metrics

NPS Upper Columbia Basin Benthos 2014 – WHMI
*Standardized to OTU and fixed count

SampleID	153326	153327
Station	PIBO:3194	PIBO:3195
ReachID	8226	8227
Waterbody	Mill	Doan
County	Walla Walla	Walla Walla
State	WA	WA
Latitude	46.04218851	46.04414805
Longitude	-118.4687082	-118.4604884
Collection Date	6/20/2014	6/18/2014
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	9.375	26.56
Split Count	679	576
Fixed Count	300	300
Big Rare Count	10	1
Richness*	16	8
Abundance	9801	2932
Shannon's Diversity*	1.999958	1.095477
Simpson's Diversity*	0.827113	0.585842
Evenness*	0.721332	0.526813
# of EPT Taxa*	7	0
EPT Taxa Abundance	5180	15
Dominant Family	Chironomidae	Chironomidae
Abundance of Dominant Family	4036	2625
Dominant Taxa	Orthocladiinae	Chironominae
Abundance of Dominant Taxa	2479	1582
Hilsenhoff Biotic Index*	4.66	5.46
# of Intolerant Taxa*	1	0
Intolerant Taxa abundance	29	0
# of Tolerant Taxa*	0	0
Tolerant Taxa abundance	14	5
USFS Community Tolerance Quotient (d)*	93	99
# of shredder taxa*	0	0
Shredder Abundance	0	0

Appendix F. Macroinvertebrate Metrics (continued)

NPS Upper Columbia Basin Benthos 2014 – WHMI

*Standardized to OTU and fixed count

SampleID	153326	153327
Station	PIBO:3194	PIBO:3195
ReachID	8226	8227
Waterbody	Mill	Doan
County	Walla Walla	Walla Walla
State	WA	WA
Latitude	46.04218851	46.04414805
Longitude	-118.4687082	-118.4604884
Collection Date	6/20/2014	6/18/2014
Habitat Sampled	Targeted Riffle	Targeted Riffle
Collection Method	Surber net	Surber net
# of scraper taxa*	2	0
Scraper abundance	163	0
# of collector-filterer taxa*	2	1
Collector-filterer abundance	564	112
# of collector-gatherer taxa*	7	4
Collector-gatherer abundance	8657	2697
# of predator taxa*	2	2
Predator abundance	159	103
# of clinger taxa*	6	1
Long-lived Taxa*	4	0
# of Ephemeroptera taxa*	4	0
Ephemeroptera abundance	4602	0
# of Plecoptera taxa*	1	0
Plecoptera abundance	14	0
# of Trichoptera taxa*	2	0
Trichoptera abundance	564	15
# of Coleoptera taxa*	4	0
Coleoptera abundance	422	5
# of Elmidæ Taxa*	3	0
Elmidæ abundance	130	0
# of Megaloptera taxa*	0	0
Megaloptera abundance	0	0
# of Diptera taxa*	3	4
Diptera abundance	4050	2673
# of Chironomidæ taxa*	3	2
Chironomidæ abundance	4036	2625
# of Crustacea taxa*	1	0
Crustacea abundance	73	5

Appendix F. Macroinvertebrate Metrics (continued)

NPS Upper Columbia Basin Benthos 2014 – WHMI
*Standardized to OTU and fixed count

SampleID	153326	153327
Station	PIBO:3194	PIBO:3195
ReachID	8226	8227
Waterbody	Mill	Doan
County	Walla Walla	Walla Walla
State	WA	WA
Latitude	46.04218851	46.04414805
Longitude	-118.4687082	-118.4604884
Collection Date	6/20/2014	6/18/2014
Habitat Sampled	Targeted Riffle	Targeted Riffle
Collection Method	Surber net	Surber net
# of Oligochaete taxa*	0	0
Oligochaete abundance	3	0
# of Mollusca taxa*	0	3
Mollusca abundance	0	178
# of Insect taxa*	14	4
Insect abundance	9653	2698
# of Non-insect taxa*	2	4
Non-insect abundance	148	234

Appendix G. Macroinvertebrate Taxa List

NPS Upper Columbia Basin Benthos 2014 – WHMI
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
153327	8227	Doan	6/18/2014	26.56	100	0.74	237	Dicranota	6	1
153327	8227	Doan	6/18/2014	26.56	100	0.74	202	Clinocera	2	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	927	Lymnaea	1	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	480	Trichoptera	1	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	69	Amphipoda	1	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	66	Sperchonidae	10	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	182	Chironominae	311	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	184	Orthoclaadiinae	204	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	509	Hydroptila	2	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	610	Physa	11	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	187	Tanypodinae	1	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	153	Hydrophilidae	1	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	216	Pericoma	1	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	314	Corixidae	1	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	647	Pisidium	22	0
153327	8227	Doan	6/18/2014	26.56	100	0.74	628	Planorbidae	1	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	307	Tricorythodes	86	3
153326	8226	Mill	6/20/2014	9.375	100	0.74	170	Psephenus	8	3
153326	8226	Mill	6/20/2014	9.375	100	0.74	19	Oligochaeta	0	2
153326	8226	Mill	6/20/2014	9.375	100	0.74	499	Hydropsyche	9	1
153326	8226	Mill	6/20/2014	9.375	100	0.74	1030	Pacifastacus leniusculus	0	1
153326	8226	Mill	6/20/2014	9.375	100	0.74	250	Baetis	111	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	1076	Optioservus quadrimaculatus	10	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	1077	Ordobrevia nubifera	6	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	187	Tanypodinae	5	0

Appendix G. Macroinvertebrate Taxa List (continued)

NPS Upper Columbia Basin Benthos 2014 – WHMI
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
153326	8226	Mill	6/20/2014	9.375	100	0.74	907	Acentrella	3	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	834	Dipheter hageni	119	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	135	Optioservus	3	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	497	Cheumatopsyche	12	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	144	Zaitzevia	2	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	932	Brachycentrus occidentalis	1	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	184	Orthocladinae	172	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	182	Chironominae	51	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	67	Sperchon	5	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	180	Chironomidae	52	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	71	Gammarus	4	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	87	Caecidotea	1	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	236	Antocha monticola	1	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	469	Skwala	1	0
153326	8226	Mill	6/20/2014	9.375	100	0.74	495	Hydropsychidae	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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