



Water Quality Monitoring in Whitman Mission National Historic Site (WHMI) - Mill Creek

Importance

Freshwater habitats are diverse and productive ecosystems, providing habitat for aquatic plant, invertebrate, and vertebrate species including many fishes and birds. Rivers and streams are intimately connected to riparian zones, providing habitat for many specialist species. Additionally, most upland animals rely on aquatic habitats to one degree or another.

Water resources in the semi-arid west have been strongly affected by human activity, and many Upper Columbia Basin Network (UCBN) streams and rivers are listed by states as impaired for one or more parameters. Most UCBN waterbodies 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 shifting climate and dynamic human influences.



Mill Creek looking downstream towards the water quality monitoring station.

Status of Mill Creek in Whitman Mission National Historic Site (WHMI)

Threats to water resources in WHMI have been identified as: agricultural chemical use, and over allocation of irrigation water. In 2008 Mill Creek was listed as a category 4A water for temperature, pH, fecal coliform, and dissolved oxygen meaning that it 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. In 2011 the UCBN monitored 5 core water chemistry parameters in Mill Creek including: dissolved oxygen, pH, specific conductance, temperature, and turbidity. Each parameter was evaluated hourly between the months of June and November using a continuous water quality monitor.

Prior to discussion on the findings for this stream, it is important to note that the segment of Mill Creek, immediately upstream and downstream of the park is considered a “class B” waterbody and has less stringent water quality standards than exist for the stream as it flows through the park (designated “class AA”). Parameters that exceeded water quality standards between June and November are:

- Temperature, exceeded the standard designated for “class AA core summer salmonid habitat” during 72% of observations (7-DADMax <16 °C), and exceeded the less stringent “class B salmonid rearing and migration” standard (7-DADMax <17.5°C) during 67% of observations. When compared to either “class AA” or “B” standard, these data suggest the need for an increase in stream shading via riparian vegetation within the watershed. In addition, given that streamflow during the summer is maintained by ground/surface water, upstream withdrawals and diversions are likely impacting stream temperatures by reducing streamflow.
- Minimum dissolved oxygen levels failed to meet (100% of observations) the standards for “class AA” streams (> 9.5 mg/l), but only exceeded the “class B special condition” standard (> 5.0mg/l) during 2% of observations.
- pH levels routinely exceeded the desired pH range (6.5 to 8.5 pH Units) with 19% of observations falling above 8.5 pH units and 0% of observations below 6.5 pH units.

UCBN water quality monitoring is conducted on a 3 year rotating panel. Mill Creek will be sampled for water chemistry and macroinvertebrates again in 2014. The following table is a summary of findings from 2011 monitoring along with state regulatory thresholds for Mill Creek.

Mill Creek Water Chemistry Summary 2011

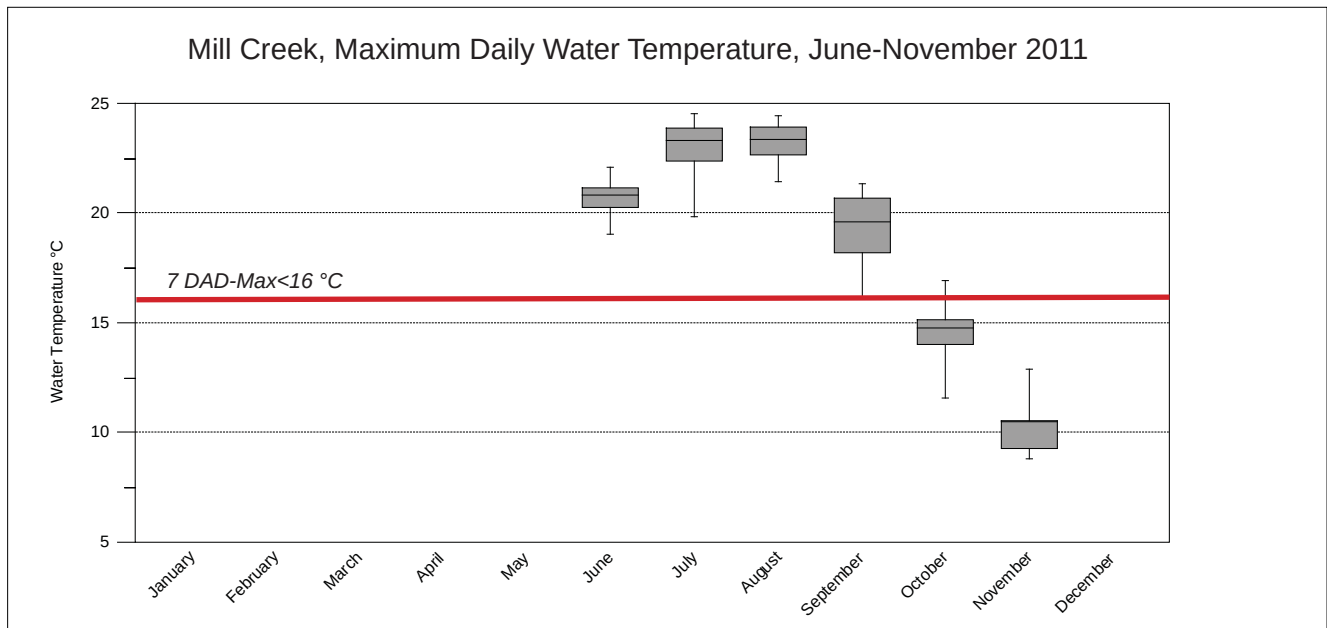
Measure	Current Condition (June-November, 2011)	State DOE Thresholds ^a	% Exceedance ^c
Temperature (*MDMT, **MDAT)	*MDMT=24.5 °C **MDAT=21.7 °C	***7-DADMax<16 °C	72%
Specific Conductance (mean)	278.7 µS/cm	N/A	N/A
Dissolved Oxygen (mean daily min)	7.1 mg/l	>9.5 mg/l Minimum Daily Minimum	100%
pH (mean 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
<i>E. coli</i>	130 cfu/100 ml	Geometric mean of samples < 200 cfu/100 ml, < 10% of the samples can exceed 400 cfu/100 ml ^b	0%

*MDMT – Maximum Daily Maximum Temperature, **MDAT – Maximum Daily Average Temperature, ***7-DADMax – 7 Day Average Daily Maximum Temperature. ^a Criteria established for Class AA. ^b Secondary contact recreational use criteria. ^c Proportion of samples above water quality standard.





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Mill Creek looking upstream towards the confluence of Doan Creek and Mill Creek.



Mill Creek near the city of Walla Walla. Note the flood control structures and shallow channel, both of which contribute to increased water temperature.

