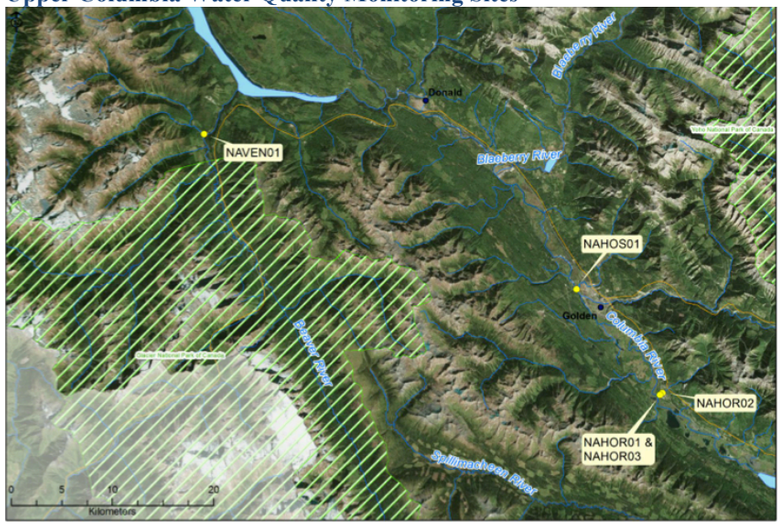
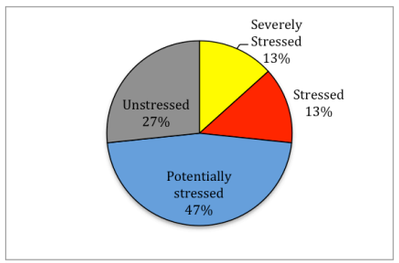
Upper Columbia Water Quality Monitoring Sites



How Are We Doing Overall?

Stream health was assessed using the CABIN (Canadian Aquatic Biomonitoring Network) model. Each site was assessed and given a rating. Ratings ranged from "Unstressed" to "Severely stressed." The graph below depicts, overall, the health ratings of the streams.



Overall stream condition, 2009 - 2014

Water and sediment quality results outside of guidelines may have been human caused or may indicate natural levels in the watershed. There were no clear linkages between the elevated water quality findings and stressed aquatic community conditions.

This baseline dataset is valuable for future comparison. A longer term data set will be valuable to confirm trends.

Working for Healthy Watersheds: Conservation, Management, Sustainability

Who We Are

The **Columbia Basin Water Quality Monitoring Project** (WQMP) is a water stewardship project funded by the **Columbia Basin Trust.**

Members of the WQMP are also members of the **Columbia Basin Watershed Network**, which supports non-government groups working to conserve, protect, and monitor water resources throughout the Canadian-Columbia River basin (www.cbwn.ca).

Wildsight Golden has a 19 year history of initiating conservation, advocacy, and environmental programs in the Upper Columbia. We work towards our vision of a resilient and vibrant Columbia Headwaters: healthy creeks, streams, rivers, and wetlands; teeming aquatic and terrestrial biodiversity; productive and diverse forests that support wildlife connectivity, recreation, and sustainable forestry; and clean air for all to breathe and share.

Lotic Environmental Ltd. is a consulting company based out of Cranbrook, BC, specializing in aquatic science. Lotic Environmental has provided analysis and reporting support to this project since 2012.

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Upper Columbia Water Quality Monitoring

2009-2014

A Columbia Basin Water Quality Monitoring Project

In partnership:

Columbia Basin Watershed Network

Columbia Basin trust

wildsight golden

LOTIC ENVIRONMENTAL
SPECIALISTS IN FRESHWATER ECOSYSTEMS

Why Monitor?

Citizen scientists play a key role in identifying the threats and impacts to water quality and quantity and preserving watershed function for sustainable communities and ecosystems.

Understanding current and future water quality and quantity condition is important, as environmental changes can pose risks to ecosystem and societal health. Land use and climate related changes are specific threats to water resources in the Columbia Valley, since they can lead to introduction of pollutants, alteration of stream temperature and/or reductions in stream flow. In the Upper Columbia, examples of pressures include:

- Logging and road building
- Residential development and industrial development (e.g., cement factory)
- Potential independent power production activity in Ventego Creek
- CP Rail activity, including diversions and engineering of channels to accommodate CP Rail (at Horse Creek)

What Are We Doing?

Eight community stewardship groups in the Canadian-Columbia River Basin are conducting water quality monitoring as a part of the Water Quality Monitoring Project (WQMP).

The goals of the WQMP are to:

1. *Develop a science-based model for community-based water quality monitoring*
2. *Provide online accessibility to water quality data*
3. *Increase community awareness of watershed health*

Wildsight Golden has completed water quality and quantity monitoring in the Upper Columbia since 2009.

Data collection and analyses:

The benthic invertebrate community was monitored using the Canadian aquatic biomonitoring network (CABIN) methods. CABIN is the protocol used by the Canadian Federal government for monitoring water and stream health. A kicknet was used to collect the invertebrate samples. Samples were analyzed by a taxonomist. Stream health was then rated using CABIN analytical tools, which identify community composition and compare test site results to reference streams with similar environmental characteristics.

Water and sediment quality data were collected using field measurements and lab analysis. Results were compared to the British Columbia and Canadian guidelines for the protection of aquatic life and drinking water.

What have we found?

Benthic Invertebrates

Streams provide habitat for aquatic life, including small critters called benthic invertebrates, who may live in stream sediment and beneath pebbles and rocks. There are thousands of different species, or taxa, of benthic invertebrates. We collected samples of these species to determine the richness of the benthic community, abundance of species, diversity, and composition. Assessment of these measures helps us understand the health of a stream: healthy streams support a wide abundance and diversity of aquatic life. For example, benthic critters are a source of food for fish, amphibians, and water birds. Stress levels are measured from 1 (Unstressed) to 4 (Severely Stressed).

Some taxa are more sensitive to disturbance and pollution than others. Therefore, when there is a high abundance of species that are pollution tolerant, and few species that are pollution intolerant, this can indicate that a stream is stressed. Another indicator that a stream is stressed is when there are low numbers, or abundance, of benthic invertebrates. Graphs on the right visualize the results of some of our data collection and important analysis.

The first graph shows the inverse relationship between stress level and the percentage of organisms that are sensitive to disturbance and pollution (ephemeroptera, plecoptera, tricoptera, or, "EPT%") at **a downstream Horse Creek site (NAHOR01).** In 2010 when the EPT% went down, the stress level rating corresponded by going up to a severely stressed rating. However, at the **upstream Horse Creek site,** trends in the data were less clear. This tells us that other measures need to be analyzed and considered.

The second graph illustrates how in both Horse Creek and Ventego Creek, as total abundance of organisms declined, stress levels increased.

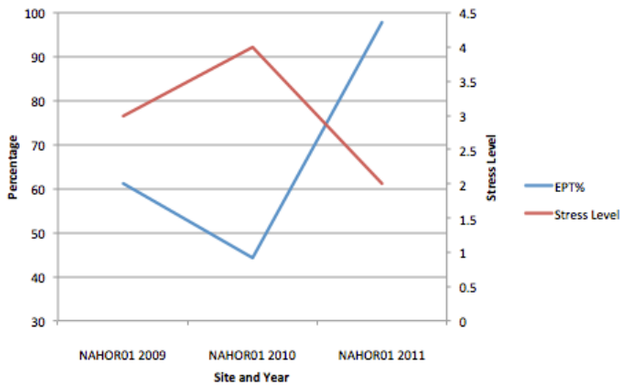
Water quality and sediment

Monitoring results of water and sediment quality data indicated that BC approved, BC working, and/or Canadian guidelines for the protection of aquatic life were exceeded on some occasions. For example, dissolved oxygen and pH did not meet guidelines for the protection of aquatic life periodically at the downstream Horse Creek sites and Ventego Creek between 2009 – 2014.

Residents around Horse Creek may notice that the creek can appear red in colour. This is believed to be caused from natural iron sources, but discoloration could also be due to other or additional iron effluents discharged from upstream industrial activities. In the sediment quality from Horse Creek, several metals parameters (arsenic, mercury, iron, and nickel) exceeded guidelines for protection of aquatic life in 2011. The low effect guideline represents conditions for low level adverse biological effects. The high effect guidelines, which indicate a greater risk to aquatic life were not exceeded. Drinking water guidelines were not exceeded.

Water Quality Trends

Decreasing EPT% and increasing stress level at Downstream Horse Creek Monitoring Site



Total Number of Organisms in Ventego and Horse Creek and Corresponding Stress Level