Little Sand Creek Watershed and Sand Creek Water Quality Monitoring

Introduction:

The primary goal of the project was to collect water quality information from 3 locations in the Little Sand Creek Watershed with the intention of creating a baseline dataset. This baseline data will be helpful in determining how future increased trail use either impacts or does not impact water quality in the watershed.

The secondary goal was to collect stormwater from the "Chestnut Drainage" in Sandpoint. The Chestnut Drainage collects stormwater from a former wood treatment facility as well as the surrounding streets and drains to Sand Creek. The stormwater originating from this location is tested for the presence of semi-volatile organic carbons, which can adversely affect the health of the users of Sand Creek.

Methods – Little Sand Creek Watershed

Samples were collected from 3 locations in the Little Sand Creek Watershed between September and November (Table 1; Figures 1-3). The extremely dry conditions over the summer months resulted in low-flow conditions, preventing earlier collection. Fall rains helped to alleviate low flows, for the most part, allowing direct collection of samples into laboratory-provided sample bottles. Bottles were stored at 4 degrees Celsius and transported to Coeur D'Alene.

Laboratory analyses were conducted by SVL Analytical according to LPOW's established Quality Assurance Project Plan that was developed for our seasonal lake and river wide water quality monitoring program. Dissolved oxygen and pH testing were performed by LPOW's Executive Director.

Table 1. GPS Coordinates of Watershed Sample Locations

	Latitude	Longitude
Watershed #1	48.329012	(-)116.612606
Watershed #2	48.330560	(-)116.638366
Watershed #3	48.312431	(-)116.551545

Figure 1. Location of Watershed #1 collection site.

Figure 2. Location of Watershed #2 collection site.

Figure 3. Location of Watershed #3 collection site.

Results – Little Sand Creek Watershed

The water temperature of the samples decreased over time as the air temperature dropped (Figure 4). Watershed #2, which was collected at the highest elevation, was the coldest, while Watershed #3, which was collected in the valley, was the warmest across all sampling dates.

All samples had high concentrations of dissolved oxygen (DO), which generally increased with time. Since DO dissolves better in colder water, this was an expected result (Figure 4). Alternatively, pH measurements across all sites were surprising. With the exception of one measurement from Watershed #3, all pH readings were 6.5 or below (Figure 4).

On the pH scale, 7 is neutral, so the vast majority of Watershed samples were on the acidic side. This is in stark contrast to the pH of lake samples which demonstrate elevated pH above 7. Lake samples are basic due to the presence of limestone. The pH of the Watershed samples reflects a more granitic geology.

Concentrations of total organic carbon (TOC) generally decreased over time, which is consistent with the degradation of organic matter that occurs at the end of the growing season (Figure 4).

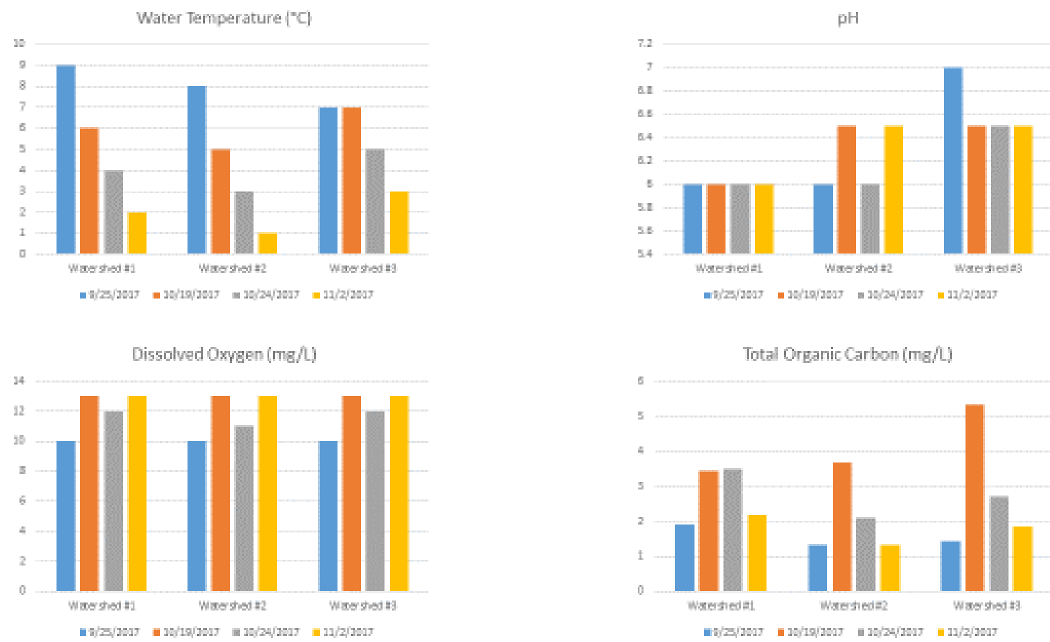

Figure 4. Physical Measurements and Total Organic Carbon concentrations for Watershed samples.

Total phosphorous (TP) concentrations, which includes both inorganic and organic forms of phosphorous, were all below the nearshore total maximum daily load (TMDL) for Lake Pend Oreille (0.012mg/L) (Figure 5). While this TMDL only applies to the nearshore areas of the lake, and is designed to limit phosphorous pollution, we use it as a reference for all of our water quality measurements.

While low TP concentrations were expected for the Watershed samples, we did anticipate that Watershed #3 would have the highest concentration of the 3 locations due to its valley location and proximity to development.

Similarly, we didn’t expect any of the samples to contain measurable levels of ortho phosphrous (OP). All but 4 of the samples registered above the reporting limit for OP, which is 0.002mg/L (Figure 5). OP is rapidly assimilated by plants and phytoplankton (algae) and is usually undetectable in lake and river samples. Detectable levels of OP in the Watershed samples may be related to the fact that photosynthetic activity during the sampling period was rapidly decreasing.

All samples, with the exception of one, were below the level of detection for the two types of nitrogen measurements performed (Figure 5). The reporting limit for nitrate+nitrite (inorganic nitrogen) is 0.05 mg/L while the reporting limit for total kjeldahl nitrogen (organic nitrogen plus ammonia) is 0.5 mg/L. This is similar to observations we have made at most areas of the lake and river that LPOW monitors on a seasonal basis. Low concentrations of nitrogen may reflect limited inputs from the surrounding land and/or microbial removal processes.

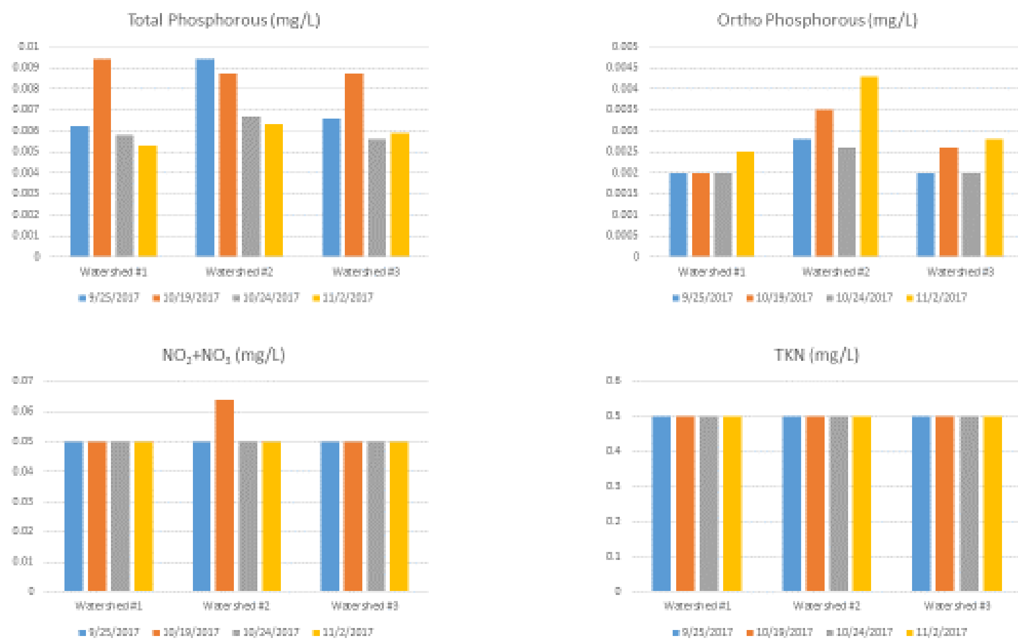

Figure 5. Nutrient concentrations for Watershed samples.

The highest bacterial concentrations were observed for Watershed #1 in early October (Figure 6). While *E. Coli* is a direct indicator of fecal pollution by either animals or humans, total coliforms also include bacteria that are naturally occurring in soil. The concentration of total coliforms was generally higher for Watershed #3, which would be consistent with higher sedimentation from more intense land use.

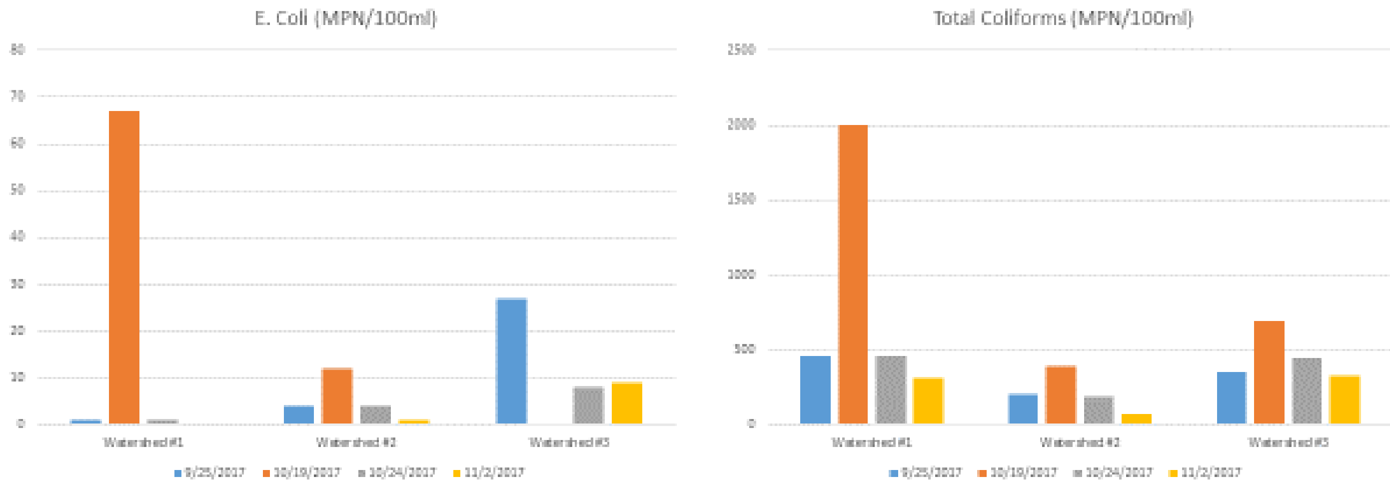

Figure 6. Bacteria concentrations for Watershed samples.

Conclusions – Little Sand Creek Watershed

The data collected from the 3 Little Sand Creek Watershed locations indicate that water quality appears to be adequately protected as demonstrated by the high levels of dissolved oxygen coupled with low levels of nutrients and bacteria.

If recreational use in the Watershed intensifies, we would expect to see changes to these water quality parameters. For example, nutrient concentrations and bacterial loading would likely increase due to erosion. Additionally, total organic carbon concentrations would likely increase due to increased biological activity (in response to more nutrients) and we would likely witness decreased dissolved oxygen from microbial breakdown of vegetative matter.

If the proposed HiTest silica smelter is approved, we may also detect decreases in pH in response to acid rain resulting from air emissions from HiTest's operations. We would likely witness a more rapid change in pH in the mountain streams compared to the lake due to the lake's high buffering capacity.

Additional sample collection and analysis in the future will help to flush out this initial baseline of information, allowing us to more easily determine if changes to the recreational use of the Little Sand Creek Watershed impact water quality.

Methods - Sand Creek:

The flow at the outfall of the Chestnut Drainage, which empties into Sand Creek, was evaluated for adequate stormwater collection on the same dates as collection of the Watershed samples. The stormwater flow was inadequate for collection in September, but samples were collected in October and November.

Stormwater samples were collected into a 1 liter amber glass bottle, stored at 4 degrees Celsius and transported to SVL Analytical Laboratory for analysis of semi-volatile organic carbon (SVOC) concentrations.

Results - Sand Creek:

Our previous sampling efforts in the springtime at this location revealed the presence of pentachlorophenol (PCP) in the stormwater. However, our efforts this fall did not result in the detection of PCP in any of the samples.

Interestingly, two other forms of SVOCs were detected in the stormwater collected in November. These included 4-Nitrophenol (4.84 μg/L) and bis(2-Ethylhexyl)phthalate (DEHP) (5.40 μg/L). 4-Nitrophenol has several uses including use as a pH indicator, and as a raw material for fungicides and insecticides, certain types of drugs and as a dye for leather. DEHP is present in hydraulic fluid and is as a plasticizer used in PVC.

Conclusion – Sand Creek

We believe the negative PCP results are the outcome of an extremely dry summer and subsequent lowering of the groundwater table. PCP and the other chemicals of concern located on the Joslyn property are present in the soils and leach into the groundwater. In the spring, the groundwater table rises and mixes easily with surface water, resulting in detection of PCP in the stormwater collected, in part, from this site.

Additional testing would be needed to determine if certain types of SVOCs are frequently detected in the stormwater at this location as well as their possible place of origin. Specifically, testing in the spring will help to confirm our hypothesis that PCP is more easily mobilized from the Joslyn Property when groundwater mixes with surface water run-off.