



Water Quality Monitoring Program

Nicholas and Crab Creek Watersheds Report 2016

I. Project Introduction

Crab Creek and Nicholas Creek are located on the southwest coast of Prince of Wales Island. The watersheds represent systems with historical significance to the traditional and customary gathering activities of both Tlingit and Haida cultures. While each of these watersheds are in a state of regeneration, the Craig Tribal Association (CTA) is striving to implement a water quality monitoring program to ensure Crab Creek and Nicholas Creek watershed health for future generations to come.

The overall objective of the monitoring project was to develop a baseline data set of basic water quality parameters, identifying all point-source and non-point-source pollutants entering Nicholas Creek and Crab Creek. By developing a baseline data set of basic water quality parameters, the CTA would be able to assess watershed health by monitoring water quality. Basic water quality parameters included temperature, turbidity, dissolved oxygen, pH, phosphates, and conductivity. Sampling events were to occur throughout the spring and summer season, with events taking place at three distinct sampling sites in both Nicholas Creek and Crab Creek Watersheds. Once water quality had been addressed, the CTA would assess findings and concerns, and make suggestions for possible mitigation strategies.

Each sampling site was identified using latitude, longitude, and elevation coordinates entered into a handheld GPS unit. Accordingly, each site was given an assigned site number. Proposed baseline sites have been selected for representativeness of baseline for the main channel of the stream. The CTA has begun to build a baseline dataset of basic water parameters by collecting samples at each watershed's sites shown in Figure 1.

Figure 1. Topography Map of Water Quality locations.



II. Results

At the beginning of the project period in April, CTA was unable to begin sampling due to YSI meter improperly calibrating. After receiving repaired YSI meter, the Environmental staff commenced water quality monitoring the beginning of July till the end of October.

Table 1 shows the 2013 averages of each measurement at each site on Nicholas and Crab Creeks. Table 2 shows the 2014 averages of each measurement at each site on Nicholas and Crab Creeks. Table 3 shows the 2015 averages of each measurement at each site on Nicholas and Crab Creeks. Table 4 shows the 2016 averages of each measurement at each site on Nicholas and Crab Creeks.

These averages do not include certain data values due to human error or instrument malfunction.

Table 1. 2013 Averages

	CC 1	CC 2	CC 3	NC 1	NC 2	NC 3
DO	77.03333	77.06667	71.6	74.25	65.15	92.95
pH	7.273333	7.23	6.96	6.575	6.695	7.3
Conductivity	0.220667	0.180333	0.145333	0.083	0.096	0.103
Turbidity	3.27	2.65	2.386667	1.035	0.955	0.28
Temp C	11.23333	11.26333	10.53333	12.795	12.67	11.665
Phosphate	0.066667	0.066667	0.066667	0	0	0

Table 2. 2014 Averages

	CC 1	CC 2	CC 3	NC 1	NC 2	NC 3
DO	91.8081	88.17944	89.24737	91.56842	87.41211	93.94846
pH	7.062381	6.978636	6.734737	6.701364	6.5225	6.645263
Conductivity	0.090778	0.089632	0.0755	0.030353	0.026368	0.031
Turbidity	1.199048	1.123	0.92	0.4	0.53	0.280632
Temp C	10.94524	10.47773	10.25368	12.57727	12.27091	12.69316
Phosphate	0.05	0.14	0.011111	0	0.018182	0
Nitrate	0.057895	0.067	0.0375	0.005	0.005	0.005556

Table 3. 2015 Averages

	CC 1	CC 2	CC 3	NC 1	NC 2	NC 3
DO	93.47826	88.27727	88.34542	95.17417	93.09792	98.63864
pH	7.374	7.331	7.103	7.119	7.119	7.278
Conductivity	0.10925	0.111818	0.093091	0.032727	0.033864	0.040091
Turbidity	1.289	1.4	1.275	0.964	0.555	0.332
H2O Temp °C	12.546	12.716	11.495	13.688	13.75	13.764

Table 4. 2016 Averages

	CC 1	CC 2	CC 3	NC 1	NC 2	NC 3
DO	12.07	73.9	83.22	91.04	88.6	88.89
pH	7.82	7.72	7.33	7.33	7.16	7.08
Conductivity	0.06	0.08	0.07	0.02	0.025	0.032
Turbidity	1.85	1.03	0.8	1.14	1.06	0.85
Temp C	12.07	9.91	11.22	12.68	13.78	12.54
Phosphate	0	0	0	0	0	0

In 2016, the average dissolved oxygen level from Crab Creek was 88.34%, with an increase of 11.62% from 2013 and an increase of 5.12% from 2015. In 2016, the average dissolved oxygen for Nicholas Creek was 91.04% with an increase of 16.79% from 2013, and an increase of 1.76% from 2015.

The 2016 average water temperature for Crab Creek was 11.06 degrees Celsius, increase of 0.06 degrees from 2013 and an increase of 1.19 degrees in 2015. The Nicholas Creek average water temperature was 13.0 degrees C in 2016. In 2015, the average water temperature for Nicholas Creek was 13.73 degrees C. Water temperature increased 0.73 degrees C since 2015 and 0.63 degrees since 2013.

III. Conclusion

The Environmental department has continued to satisfy its goal in developing a baseline data set of basic water quality parameters, to establish an initial understanding of water quality at varying locations within Crab Creek and Nicholas Creek watersheds.

After analysis, it was concluded that many factors could have contributed to the increase in DO (dissolved oxygen) levels in Crab and Nicholas Creek. The amount of precipitation and flow levels could have been a factor. According to the United States Geological Survey, Stanley Creek average monthly discharge for 2013 was 203.67 ft³/s. In 2015, average discharge rate was 402.9ft³/s. The scientific community uses the Stanley Creek Gauge as a representative for the west side of Prince of Wales Island. The rates, over time, have been continually showing an increase in annual discharge. At this time, no information has been released on Stanley Creek 2016 averages, will follow up when available.

The Juneau Climate summary from the NOAA National Weather Service showed annual precipitation steadily increasing from 2013-2015. The annual rainfall in Juneau, AK for 2015 was 38.04 inches of July, August, September and October. Annual rainfall in Juneau, AK for 2016 was 24.48 inches through July, August, September and October. During these months the annual precipitation decreased by 13.56 inches through 2015-2016. It can be concluded that the decrease in dissolved oxygen levels could be related to the amount of precipitation of a given area, lack of precipitation throughout the summer months could be the cause of reduced DO levels in the creek. It would be beneficial to the program to install rainfall gauges as well as flow meters to calculate total discharge, on Nicholas Creek and Crab Creek. The data will help determine the local influence of precipitation on each of the watersheds.

Another possible factor to the levels of dissolved oxygen observed refers to the system itself.

Photosynthetically-active species (plants, algae, ect.) are common additional sources of dissolved oxygen in the environment and in many bodies of water, this could in fact be the dominant factor in determining the dissolved oxygen content. When the increased numbers of aquatic plants eventually die, they support increasing amounts of bacteria which use large amounts of DO.

Additional information is needed to fully conclude the increase in surface water temperatures in Nicholas and Crab Creeks are due to Climate Change or inadequate habitat to maintain or protect surface water temperatures.

At this time, CTA Environmental Department is waiting to hear back from Juneau USFS Tribal Liason regarding recommendations to either further monitoring efforts or possible mitigation strategies. CTA Environmental staff would like to continue to network with the water quality advisory committee on priority watersheds by continuing the water quality monitoring program; furthering baseline data set already established by including seasonal events not sampled for in the past season. As well as build capacity by adding more parameters to the water quality program in the future, such as a rain gauge.

References

1. National Weather Service, National Ocean and Atmospheric Administration. 2013 Juneau Annual Climate Summary.
2. National Weather Service, National Ocean and Atmospheric Administration. 2015 & 2016 Juneau Annual Climate Summary.
3. USGS. 2015. Staney Creek Gauge. http://waterdata.usgs.gov/nwis/uv?site_no=15081497. Updated 07/12/2016
4. YSI Environmental 2003, 2005. Environmental Dissolved Oxygen Values Above 100% Air Saturation. www.ysi.com