



## Water Quality Monitoring Program

### Nicholas and Crab Creek Watersheds Report 2015

#### **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 sites shown in Figure 1.



This is a detailed topographic map of Prince of Wales Island, Alaska. The map shows the island's rugged terrain with numerous contour lines indicating elevation. Key geographical features include the Kaniak River flowing into Kaniak Bay on the eastern coast, and the Kaniak Peninsula on the southern coast. The map also shows several smaller islands and peninsulas, including the Kaniak Peninsula, the Kaniak Peninsula, and the Kaniak Peninsula. A red star marks a location near the center of the island, and another red star marks a location on the western coast. The map includes a north arrow in the upper left corner and a scale bar at the bottom left indicating distances up to 3 miles. Various place names and geographical features are labeled throughout the map.



## II. Results

Throughout the 2015 field season, the Environmental staff collected water quality samples beginning from April and commenced at the beginning of September, as required by the Quality Assurance Project Plan approved by the US Environmental Protection Agency. 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. 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

In 2015, the average dissolved oxygen level for Crab Creek was 90.03%, an increase of 15.03% from 2013 and an increase of 0.29% from 2014. In 2015, the average dissolved oxygen level for Nicholas Creek was 95.64%, an increase of 18.14% from 2013 and an increase of 4.0% from 2014.

The 2015, average water temperature for Crab Creek was 12.25 degrees Celsius, an increase of 1.25 degrees from 2013 and an increase of 1.69 degrees in 2014, almost a 2 degree increase since 2013 when



the project started. The Nicholas Creek average water temperature was 13.73 degrees C in 2015. In 2014, the average water temperature for Nicholas Creek was 12.5 degrees C. Water temperature increased 1.23 degrees C since 2014 and a total of 1.35 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 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 ft<sup>3</sup>/s. In 2014, average discharge rate was 439.9 ft<sup>3</sup>/s. The scientific community uses the Stanley Creek gauge as a representative for the west side of Prince of Wales Island. The 2015 data for the Stanley Creek gauge has not been released to date. The rates, over time, have been continually showing an increase in annual discharge. The Juneau Climate summary from the NOAA National Weather Service showed annual precipitation steadily increasing. Annual rainfall for 2014 was considered the wettest summer on record for Juneau Alaska with 24.25 inches of June, July, and August. It can be concluded that the increase in dissolved oxygen levels are related to the amount of precipitation of a given area. 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, etc.) are common additional sources of dissolved oxygen in the environment and, in many bodies of water, can, in fact, be the dominant factor in determining the dissolved oxygen content.

Surface water temperatures of Nicholas and Crab Creeks have shown to increase by 1-2 degrees Celsius since 2013. Many studies suggest increases in water temperature maybe directly related to Climate Change and its effects. More 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.

Currently, CTA Environmental staff will continue implementing the water quality monitoring program for fiscal year 2015 -2016. Sampling will continue in April and end August 2016. All future field data collected will be used to propose possible mitigation strategies and create recommendations for further monitoring efforts. The environmental staff would like to continue to build capacity by adding more parameters to the water quality program in the future, such as a rain gauge and total discharge meter.



## References

1. National Weather Service, National Ocean and Atmospheric Administration. 2013 Juneau Annual Climate Summary. Updated Jan 27, 2015.
2. National Weather Service, National Ocean and Atmospheric Administration. 2014 Juneau Annual Climate Summary. Updated Jan 27, 2015.
3. USGS. 2015. Staney Creek Gauge. [http://waterdata.usgs.gov/nwis/uv?site\\_no=15081497](http://waterdata.usgs.gov/nwis/uv?site_no=15081497). Updated October 5, 2015.
4. YSI Environmental 2003, 2005. Environmental Dissolved Oxygen Values Above 100% Air Saturation. [www.ysi.com](http://www.ysi.com)