Chatanika 2012 Final Project Summary

Summary

Limited water quality sampling has occurred in the Chatanika River since the late 1980s. The purpose of this study was to evaluate the current condition of the river with respect to Alaska Water Quality Standards (WQS) for selected parameters of concern.

Data indicate that the Chatanika River is meeting WQS for the observed parameters in the study area.

- Samples were collected at six sites from McMannus Creek downstream to the Chatanika at the Elliot Highway five times from June to August 2012.
- Samples were collected and analyzed for total suspended solids (TSS) and total arsenic. Turbidity and basic water quality parameters (dissolved oxygen, pH, conductivity and temperature) were measured in situ at each sampling site.
- All arsenic samples were non-detect.
- Total suspended solids ranged from 0-17.5 mg/L with a mean of 3.85 mg/L
- Turbidity ranged from 0.35-6.83 NTU with a mean of 2.42 NTU.
- Turbidity was correlated with TSS (r^2=0.62) and generally increased from upstream to downstream.

Background

The Chatanika River is located north of Fairbanks, Alaska between the Yukon and Tanana Rivers. It flows westwards from its headwaters in the Alaska Range to the Minto Flats, where it joins the Tolovana River. The upper and middle portions of the river are paralleled by the Steese Highway and the river sees multiple uses including recreational boating, fishing and gold mining.

The Chatanika River supports many fish including Arctic grayling (*Thymallis arcticuls*), northern pike (*Esox lucius*), burbot (*Lota lota*) and Chinook, coho, and chum salmon (*Onshorhynchus tshawytscha*, *O. kisutch*, *O. keta*) (Ott and Townsend 1995).

The Chatanika River is located in the Circle and Fairbanks mining districts and mining has occurred periodically since the early 1900s in many tributaries. The Chatanika River drainage saw an increase in mining activity after 1972, when the federal government deregulated the price of gold. Suspended solids from mining effluent increased in the river and were still elevated up to 100 miles from the mining sources (Townsend 1987). Increased sediment loads associated with mining decreased Arctic Grayling and other fish stock (Simmons 1984, Wuttig 2002). Multiple complaints by fisherman and recreational users to the Department of Environmental Conservation (DEC) prompted the three state agencies involved with placer mining, the DEC, Department of Natural Resources (DNR) and Department of Fish & Game (DF&G) to collaborate on mining guidelines for placer miners. The Chatanika drainage was one of three drainages identified as “special priority” in the 1986 State of Alaska Interagency Placer Mining

Guidelines and provided a basis for intensified efforts to work with miners on achieving compliance with applicable laws and regulations.

Water quality was assessed at several locations associated with mining activity in 1983, 1985 and 1986 (Townsend 1987 and references within). Data showed a reduction in turbidity and suspended solids in the Chatanika River as a result of state agency efforts and increased implementation of mining plans with best management practices. There was also an increase in fish harvest from 1983 to 1986.

The Chatanika River has been identified through a public nomination process (Alaska Clean Water Actions; a.k.a. ACWA) as historically receiving increased sediment inputs associated with placer mining. The water has been entered in the ACWA database but needed a current assessment of water quality. Historical data on sediment and metal concentrations (As, Zn, Pb etc) exists. This study was initiated to confirm (or refute) success of permit and regulatory programs in improving water quality conditions.

Methods

Water samples were collected at six road-accessible sites on the Chatanika River (table 1 and figure 1) bi-monthly during the 2012 open water season. A hand held YSI meter was used to measure basic water quality parameters (pH, dissolved oxygen (DO), conductivity, and temperature). A Hach 2100P turbidimeter was used to measure turbidity. Grab samples were collected for analysis of total suspended solids (TSS) and total arsenic. Full methods and analytical methods are in the Chatanika Quality Assurance Project Plan (available by request from DEC).

Table 1. Description of Chatanika River sampling sites

Site ID	Latitude	Longitude	Site Description
CR1	65.292107	-146.361061	McMannus Creek just above confluence with Faith Creek
CR2	65.294689	-146.25049	Chatanika River below confluence with Faith and McMannus Creeks
CR3	65.272439	-146.693741	Chatanika River at Cripple Creek campground
CR4	65.219536	-147.073799	Chatanika River above Long Creek
CR5	65.191317	-147.259365	Chatanika River at Upper Chatanika Recreation area
CR6	65.08463	-147.725254	Chatanika River at the Elliot Highway above the Lower Chatanika Recreation area

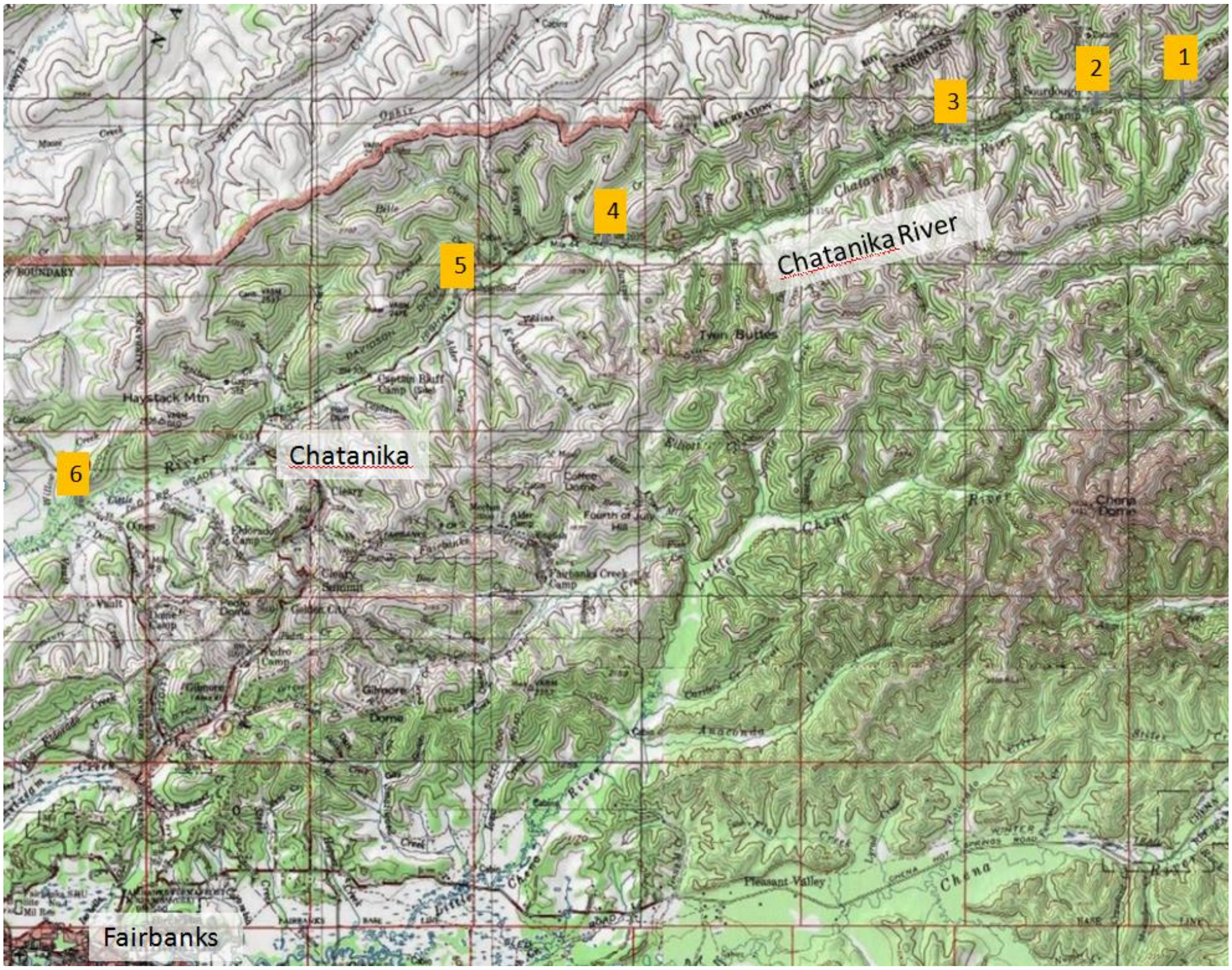

Figure 1. Map of Chatanika River sampling sites

Results and Discussion

The background natural turbidity of the Upper and Middle Chatanika River during normal flow is less than 1 NTU (Townsend 1987). During the late 1970s and early 1980s placer mining activities increased turbidity to above 100 NTU; but with coordinated efforts by the state natural resource agencies and the implementation of best management practices by miners, by the late 1980s turbidity had decreased to near background. Current data continues to show near background turbidity at all sites, with an average of 2.42 NTU (Table 2, Figure 3). This is within 5 NTU of background and meeting Alaska's Water Quality Standard for turbidity (DEC 2011).

Total suspended solids concentrations are similarly low, with an average concentration of 3.84 mg/L (Table 2, Figure 1). Turbidity was positively correlated with total suspended solids concentration with an r^2 of 0.62 (Figure 4).

Other basic water quality parameters were also generally within expected ranges and meeting water quality standards (DEC 2011). Conductivity was similar at all sites and increased slightly over the course of the summer (Table 2, Figure 5). Dissolved oxygen was similar among sites (Table 2, Figure 6). Slightly high and low DO values on June 6 and 21 respectively may be due to errors in calibration. pH values were also similar among sites and dates (Table 2, Figure 7).

Table 2. Results summary

Parameter	Units	n	Range	Average	Median
Total Suspended Solids	mg/L	29	0-17.50	3.84	2.04
Turbidity	NTU	29	0.4-6.8	2.4	1.9
pH	SU		4.51-8.17	6.93	6.87
Dissolved Oxygen	mg/L	29	8.8-17.3	12.1	11.9
Conductivity	umhos/cm	23	110-188	142.87	146
Temperature	Degrees C	29	4.5-13.69	9.25	9.82

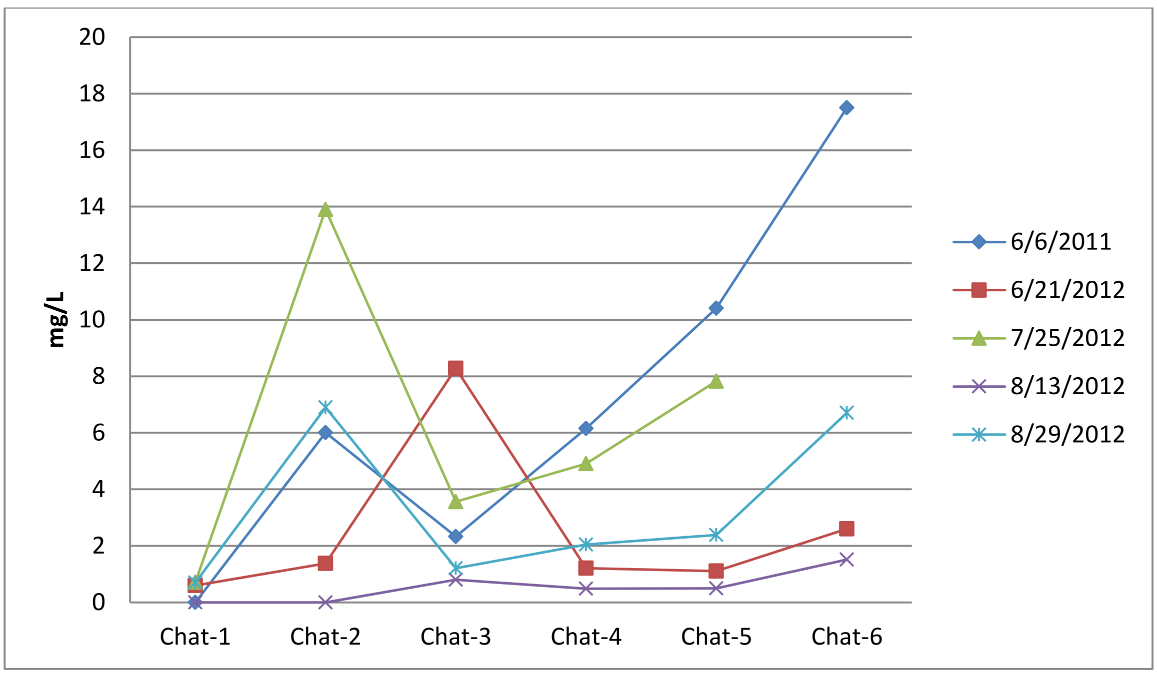

Figure 2. Total suspended solids concentrations by site and date

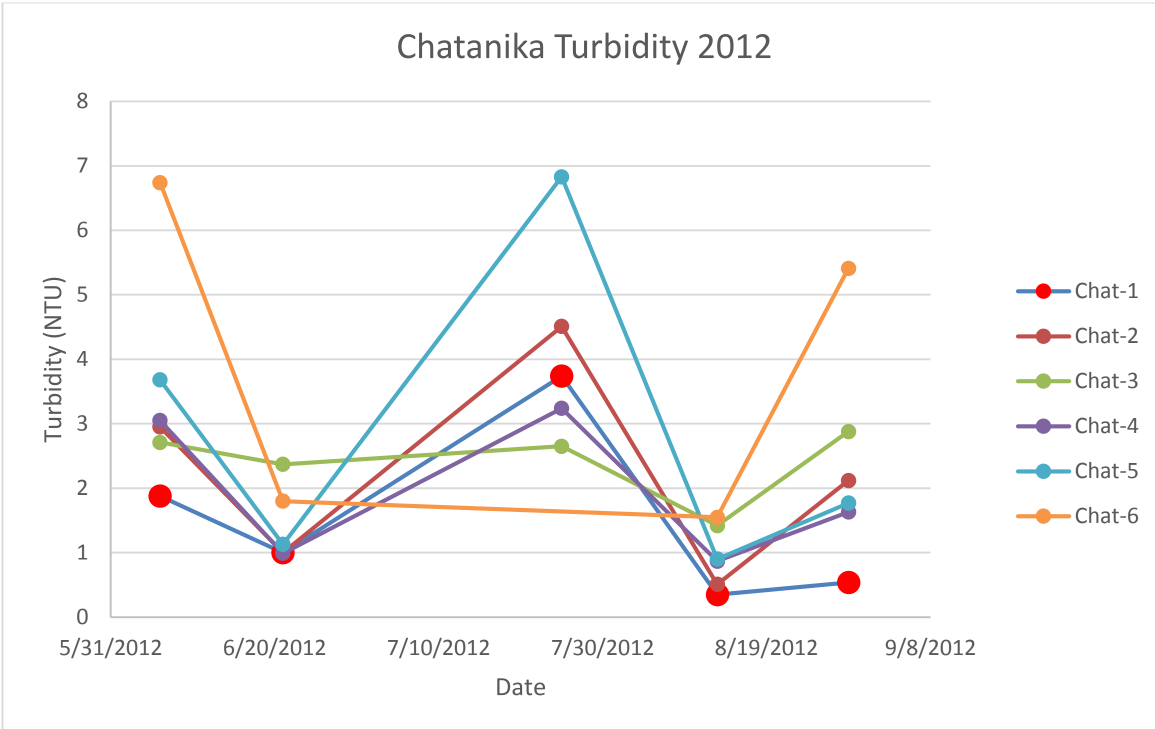

Figure 3. Turbidity by site and date

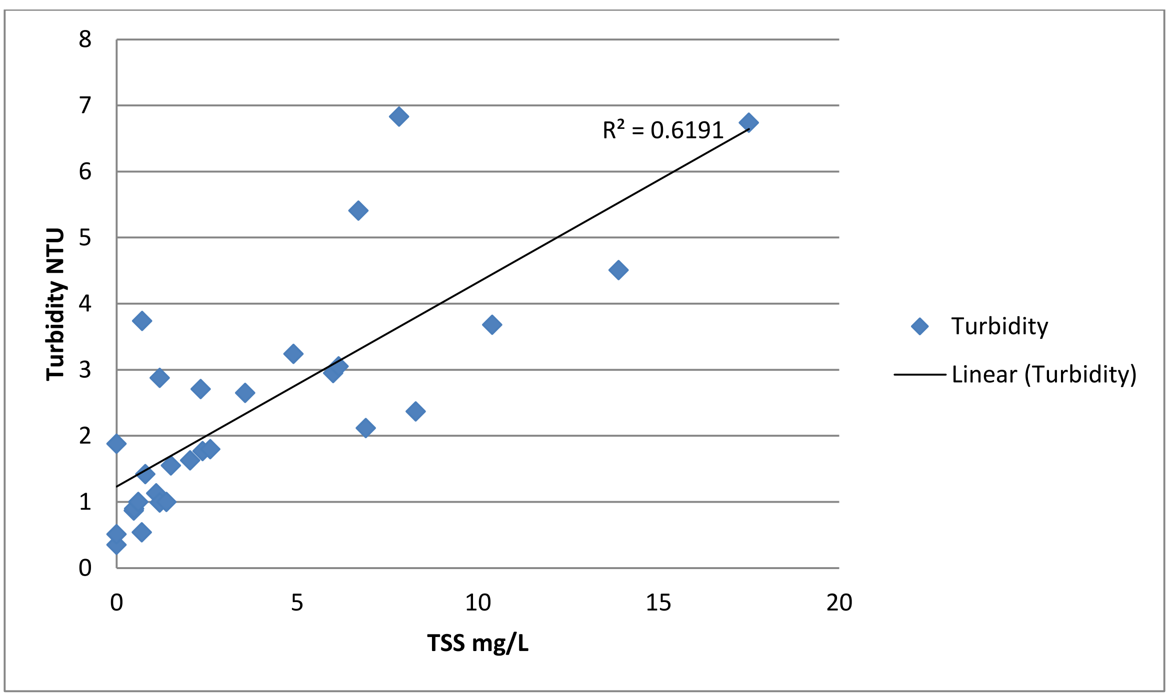

Figure 4. Correlation between TSS and turbidity

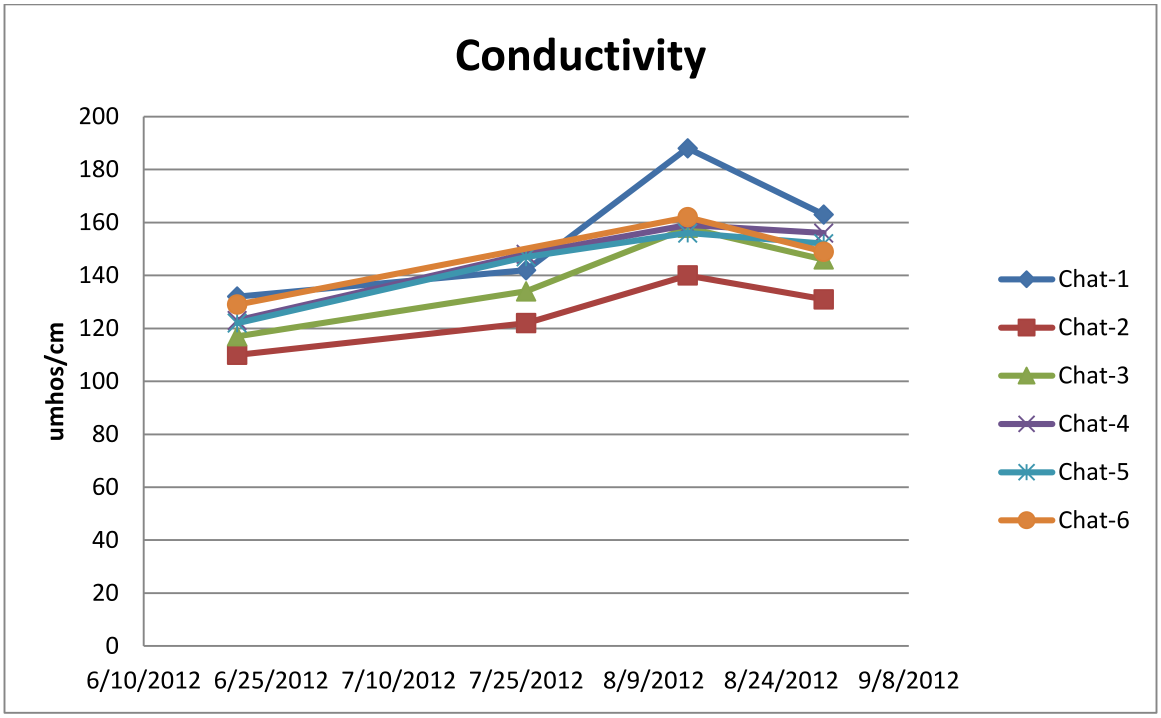

Figure 5. Conductivity by site and date

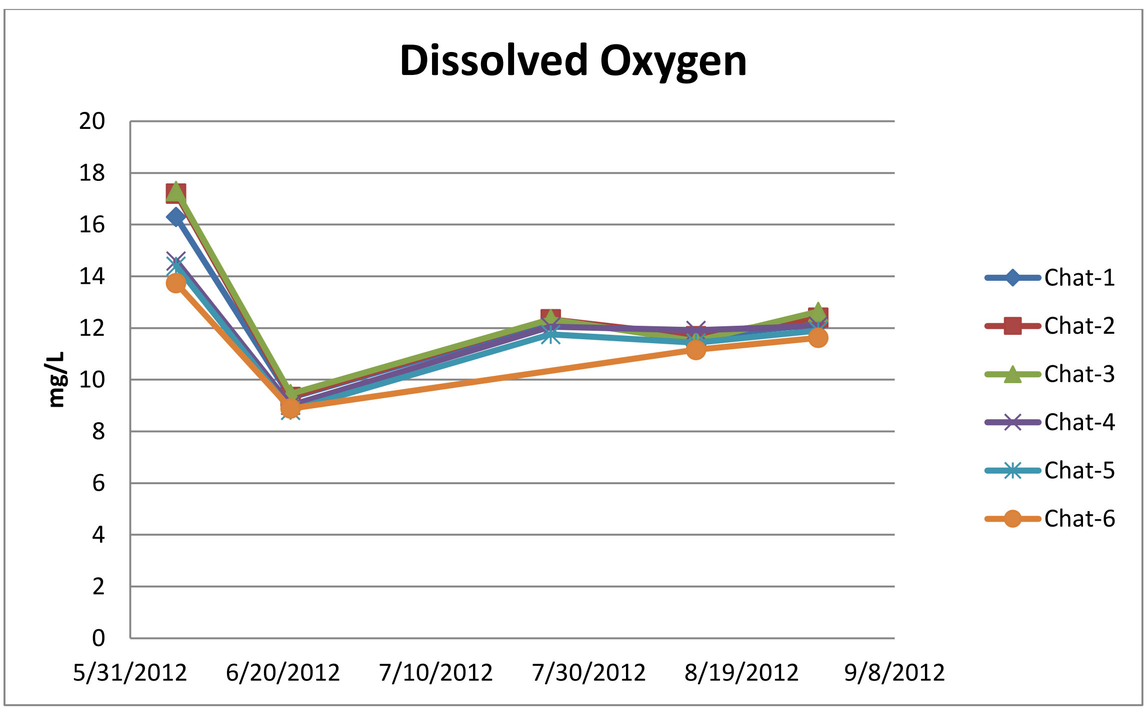

Figure 6. Dissolved oxygen by site and date

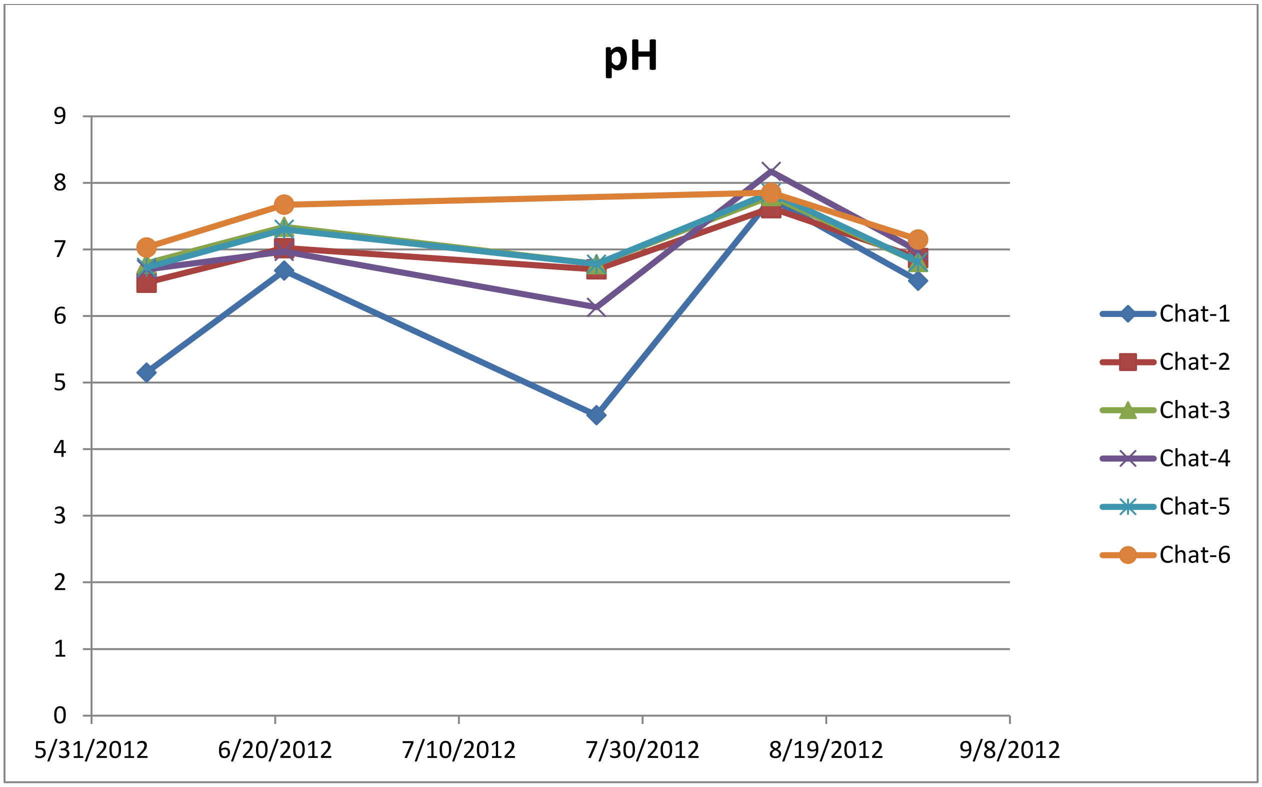

Figure 7. pH by site and date

References

Alaska Department of Environmental Conservation (DEC). 2011. 18 AAC 70 Water Quality Standards. Amended as of May 26, 2011.

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Townsend, A. 1987. Placer mining in the upper Chatanika River system 1980-1986. Alaska Department of Fish and Game, Division of Habitat. Technical Report No. 87-2.

Wuttig, K. 2002. Stock assessment of Arctic grayling in the headwaters of the Chatanika and Chena Rivers during 2002. Alaska Department of Fish and Game, Division of Sport Fish and Commercial Fisheries. Fishery Data Series No. 04-22.

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Data

Station ID	Activity Start Date	Arsenic (ug/L)	Conductivity (umho/cm)	Dissolved Oxygen (mg/L)	pH	Temperature (deg C)	Total Suspended Solids (mg/L)	Turbidity (NTU)
Chat-1	6/6/2012	Not Detected		16.3	5.15	4.5	Not Detected	1.88
Chat-2	6/6/2012	Not Detected		17.2	6.5	4.9	6	2.95
Chat-3	6/6/2012	Not Detected		17.3	6.79	5.43	2.33	2.71
Chat-4	6/6/2012	Not Detected		14.6	6.7	6.68	6.15	3.05
Chat-5	6/6/2012	Not Detected		14.4	6.73	7.53	10.4	3.68
Chat-6	6/6/2012	Not Detected		13.74	7.03	7.88	17.5	6.74
Chat-1	6/21/2012	Not Detected	132	9.3	6.68	9.82	0.6	1
Chat-2	6/21/2012	Not Detected	110	9.34	7.02	10.41	1.38	1
Chat-3	6/21/2012	Not Detected	117	9.45	7.34	11.33	8.28	2.37
Chat-4	6/21/2012	Not Detected	123	9.01	6.97	12.15	1.2	0.99
Chat-5	6/21/2012	Not Detected	122	8.82	7.3	13.14	1.1	1.13
Chat-6	6/21/2012	Not Detected	129	8.89	7.67	13.69	2.6	1.8
Chat-1	7/25/2012	Not Detected	142	12.25	4.51	8.6	0.707	3.74
Chat-2	7/25/2012	Not Detected	122	12.34	6.7	9.04	13.9	4.51
Chat-3	7/25/2012	Not Detected	134	12.34	6.78	9.89	3.56	2.65
Chat-4	7/25/2012	Not Detected	148	12.05	6.13	11.07	4.9	3.24
Chat-5	7/25/2012	Not Detected	147	11.75	6.78	11.73	7.82	6.83
Chat-1	8/13/2012	Not Detected	188	11.64	7.76	10.2	Not Detected	0.35
Chat-2	8/13/2012	Not Detected	140	11.69	7.62	10.84	Not Detected	0.51
Chat-3	8/13/2012	Not Detected	158	11.5	7.8	11.94	0.8	1.42
Chat-4	8/13/2012	Not Detected	159	11.91	8.17	11.35	0.478	0.87
Chat-5	8/13/2012	Not Detected	156	11.43	7.85	12.2	0.49	0.9
Chat-6	8/13/2012	Not Detected	162	11.16	7.85	12.81	1.51	1.55
Chat-1	8/29/2012	Not Detected	163	12.15	6.53	5.95	0.7	0.54
Chat-2	8/29/2012	Not Detected	131	12.4	6.87	6.15	6.9	2.12
Chat-3	8/29/2012	Not Detected	146	12.63	6.81	6.15	1.2	2.88
Chat-4	8/29/2012	Not Detected	156	12.08	6.98	7.1	2.04	1.63
Chat-5	8/29/2012	Not Detected	152	11.9	6.81	7.69	2.38	1.77
Chat-6	8/29/2012	Not Detected	149	11.62	7.15	8.1	6.7	5.41