Karuk Tribe of California

Department of Natural Resources
Post Office Box 282
Orleans, CA 95556
(530) 627-3446 Fax (530) 627-3448

Administrative Office
Post Office Box 1016
Happy Camp, CA 96039
(530) 493-5305 Fax (530) 493-5322

Karuk Tribal Health Clinic
Post Office Drawer 249
Orleans, CA 95556
(530) 627-3452 Fax (530) 627-3445

KARUK ABORIGINAL TERRITORIES
INDIAN CREEK AND ELK CREEK
WATER QUALITY MONITORING REPORT

For Fall 2000 Monitoring Period
Prepared April 20, 2001

PURPOSE

The purpose of this report is to document the existing background water quality of surface waters within the Karuk aboriginal territories. This report presents the third year of sampling of surface water within the Indian Creek and Elk Creek watersheds. It is intended that this information will be used to assist in identifying and quantifying contaminant sources and provide background data in the event of future contaminant introduction to the Indian or Elk Creek watersheds.

IMPLEMENTATION

The monitoring plan was initiated in 1998 and sampling is intended to take place in the late summer and fall of each subsequent year. Samples and discharge measurements are to be taken at or near the annual low flow and during the first flushing event of the year. This timing is intended to catch the periods of minimum dilution and first cleansing flows in the respective watersheds. Sampling locations are designated in Figures 1 and 2 of this report.

DATA COLLECTION

The first sampling for this period was conducted on August 31, 2000 by Scott Quinn of the Natural Resources Department of the Karuk Tribe of California. Samples and data were also collected on October 23, 2000 by Mr. Quinn.

The first round of sampling included grab samples and discharge measurements at Indian Creek Sites 1, 4, 5, and 8, and Elk Creek Sites 1, and 3. Elk Creek Site 1 is located at the Karuk Tribal Office and was taken from the tap for a baseline drinking water analysis. The surface water measurements were taken following standard EPA sampling procedures and done in coordination with the specifications of North Coast Laboratories in Arcata, CA.

Data collection for the second round of sampling occurred on October 23, 2000. Due to time constraints, discharge measurements were not recorded at each of the sites. Field notes indicate that

the Dissolved Oxygen (D.O.) meter was not operating properly at this time, and D.O. was not measured.

In order to make comparisons between baseline levels existing in the creeks and potential contamination sources within the watershed, it is important to sample during low flows and during the first major precipitation event. A rainfall summary for August 1 to October 31, 2000 can be found in Figure 3. This figure illustrates cumulative rainfall and daily totals at the Orleans gage as reported by the California Department of Water Resources Data Exchange Center. For the 2000 season, the first significant rainfall occurred between September 1 and September 3. The first sampling event occurred on August 31 and should represent an accurate low flow baseline concentration. According to these records 2,04 inches of rain fell between sampling events.

DATA ANALYSIS

The data for this season is tabulated in two appendices: Appendix A- Indian Creek Data and, Appendix B- Elk Creek Data. A surface water sample was collected at Elk Creek Site 3 in accordance with the monitoring plan. A separate sample was taken from the tap at the Tribal Administrative Office in Happy Camp, and was evaluated using California State Drinking Water Standards.

Two approaches to analyzing the data are presented here, spatial and sequential. Spatial analysis examines patterns as they relate to the location of the sample site in relation to the watershed as a whole. Spatial comparison is useful to identify point sources that show an increase in concentration, and often tapers off downstream. Samples to be compared spatially must be collected on or very near the same day. This is to attempt to assure that there are minimal changes in the sampling conditions and that the values being compared are actually taken under the same set of circumstances. Discharge measurements are critical in determining how the constituent concentrations at different sites relate to one another and where the various influences intersect the stream system.

Sequential sampling looks at the concentration at a site through time. These temporal relationships are not as clear since sampling only occurs twice in a year and seasonal conditions can vary greatly. For this report, 1998, 1999 and 2000 data sets will be compared.

INDIAN CREEK SAMPLING RESULTS

The Indian Creek Sampling results indicate several possible relations with regard to watershed position. Sample Site 8 represents the upper most sampling location, while Site 1 is furthest downstream as shown in Figure 1.

Discharge

The flow measurements at the Indian Creek sites are notably low. The Water Year 2000 (WY 2000) precipitation totals for Northern California are lower than normal and flows in most rivers and creeks reflect this. Lower flows likely influence the water quality data presented in this report. Temperatures will tend to be higher due to a lack of cold water inputs and deep pools. Concentrations of water quality parameters may appear higher when compared to other years due to the lack of dilution. Conversely, when significant and prolonged rainfall does not occur, transport of chemicals and minerals may be reduced. Sampling during the first flush derives its importance from the rapid movement of soils and chemicals accumulated in the watershed compared to the baseline levels found at the end of the dry season. Pollutants and minerals may be accumulating across the landscape and may not have had sufficient transport to the creek even by the time the first flush occurs. Flows in Indian Creek at the time of WY 2000 sampling ranged from 17.4 (Site IC-08) to 35.6 (Site IC-01) cfs, with only a slight increase from the first to second sampling events.

Water Temperature

Water Temperature measurements were collected at the time of sampling. The Karuk Tribal Office of Natural Resources has proposed a one day maximum acceptable level of 24 °C and a seven day consecutive maximum level of 16°C. During sampling in August of 2000 the water temperature at the Indian Creek sites ranged from 15 to 18 °C . While this data cannot verify a temperature that exceeds the 7 day maximum, it is likely that water temperatures were consistently high due to the lack of flow in the creeks.

Iron, Aluminum, and Manganese

Data from 1998 indicated high levels of aluminum (1400 ug/l), iron (6400 ug/l), and manganese (200 ug/l) at Site 5 (see appendix A). These concentrations exceeded the Maximum Contaminant Level (MCL) which are 100 ug/l, 300 ug/l, and 50 ug/l respectively. In 1999 the concentrations were reduced, but still exceeded the MCL for Iron.

The 2000 data suggest a trend of reduced concentrations of iron, aluminum and manganese. Aluminum was not detected above the method detection level during either sampling event. The highest detection for manganese was 1.2 ug/l measured at Site 5. The highest concentration of iron was also measured at Site 5 (39 mg/l). While iron and manganese did not exceed the MCL in any samples, an increase in concentration is visible at Site 5 in relation to the upstream Site 8. This suggests a source between the two sites or possibly along the South Fork of Indian Creek. Although concentrations of Iron and Manganese were detected in Indian Creek they are well below the MCLs and are significantly lower than the previous years. Iron concentrations for the study period are illustrated in Figure 4, note that a logarithmic scale is used because of the large variation in values.

Alkalinity
Alkalinity is the capacity of water to neutralize acid. The drop in alkalinity and pH at Site 5 is may be a reflection of the increase in cations (acids) appearing in the form of inorganic chemicals like iron, and manganese.

Hardness
Hardness in water can be represented as the sum of calcium and magnesium concentrations. Water with hardness values less than 75 mg/l CaCO3 are considered 'soft' and values greater than150 mg/l CaCO3 are considered 'hard'. Measurements of hardness for Indian Creek range from 74-85 mg/l CaCO3 which exceeds the MCL (60 mg/l CaCO3). However these concentrations are not alarming for surface waters and in general occur naturally as water contacts mineral or salt deposits within the watershed.

Mercury, Arsenic, Cyanide, Silver and Copper
The Fall 1998 report notes the observation of a high concentration of mercury (2.4 ug/l) from Site 8. No further detection of mercury was found indicating the observation may have been an isolated incident. During the 2000 sampling, mercury, arsenic, cyanide and silver were not detected at any of the sites above the detection levels. A low concentration of copper (7.9 mg/l) was detected at Site 1, which draws some attention since it was detected only one other time in the sample set (Site IC-05, 1998).

ELK CREEK

Sampling of Elk Creek for the Fall 2000 season occurred at two locations, Site 1 and Site 3. Site 3 is located just upstream of the confluence with the East Fork Elk Creek, and Site 1 was sampled from the tap at the Karuk Tribal Office in Happy Camp.

The Site 1 water sample is useful for the evaluation of the treatment process, as Elk Creek is the drinking water source for the town of Happy Camp. Data for Site 1 is located in Appendix B, and is listed with MCL's that reflect state drinking water standards.

None of constituents that were sampled from Elk Creek in 2000 exceed the Maximum Contaminant Level. High concentrations of iron (790 ug/l, 160 ug/l,) and aluminum (1100 ug/l, 240 ug/l) were detected at Site 2 and 3 respectively in 1999. In 1998, a high concentration of aluminum (240 ug/l) was detected at Site 3.

For the WY 2000 sampling, concentrations of aluminum and iron were below the methos detection

limits. Site 2 was not re-sampled in 2000 and is on a different tributary of Elk Creek therefore data from these two events cannot be compared.

The samples taken at the Tribal Office in Happy Camp can be looked at sequentially, but do not yield much information without more specific details about the drinking water treatment process. One can, however, speculate about the performance of treatment by comparing with data from Site 2 and Site 3 since they represent surface water prior to the addition of treatment chemicals.

Concentration of copper was not detected in the surface water (Site EC-03) but increases to 88 ug/l and 37 ug/l when sampled from the tap. These values are still well below the Drinking Water MCL of 1000 ug/l. The increase is most likely due to corrosion occurring in older pipes within the distribution system. Looking at the concentrations through time copper has decreased in tap water, but these samples only represent a snapshot. Lead, which is sometimes associated with corroding pipe systems, was not detected in any of the tap water samples.

No concentrations of arsenic were detected during either sampling event on Elk Creek.

SUMMARY

The Indian Creek Watershed Analysis (USFS, 1997) has identified two significant environmental pollution problems associated with mining operations, acid drainage and seepage of cyanide from mine tailings. The leachate stream from the abandoned Grey Eagle Mine enters Indian Creek just upstream of Site 5, and red/orange stained alluvium and bedrock is visible at this location. No cyanide or zinc was detected during the 2000 sampling events, and the decreases in iron, aluminum, manganese and nickel suggest that acidic leachate may not be polluting Indian Creek above Site 5. While this trend shows a great improvement in the quality of water in Indian Creek, it does not rule out the effects of pollution that may be occurring as a result of leachate or tail washings that are being discharged into adjacent watersheds.

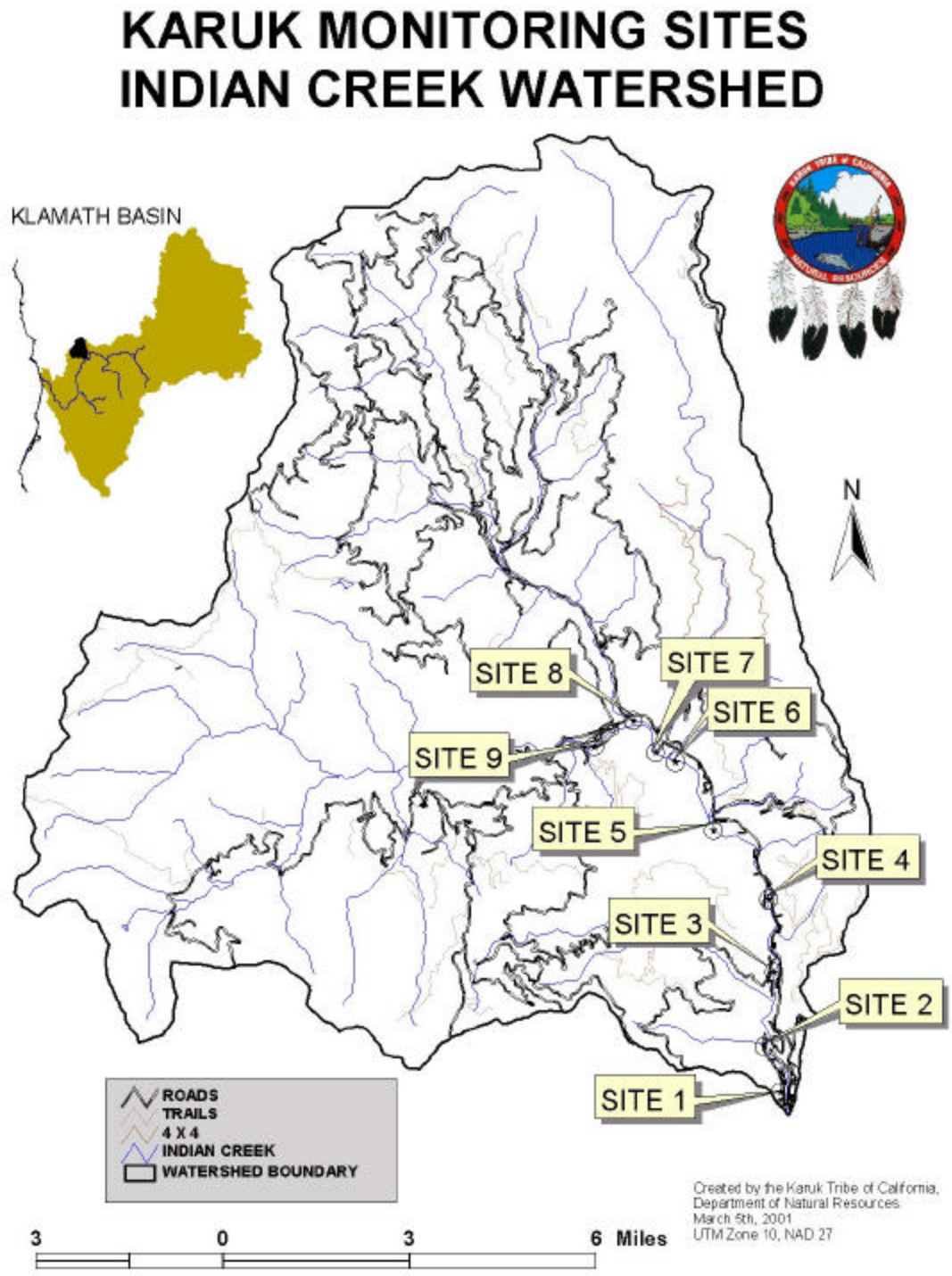

Figure 1. Water Quality Monitoring Sites on Indian Creek.

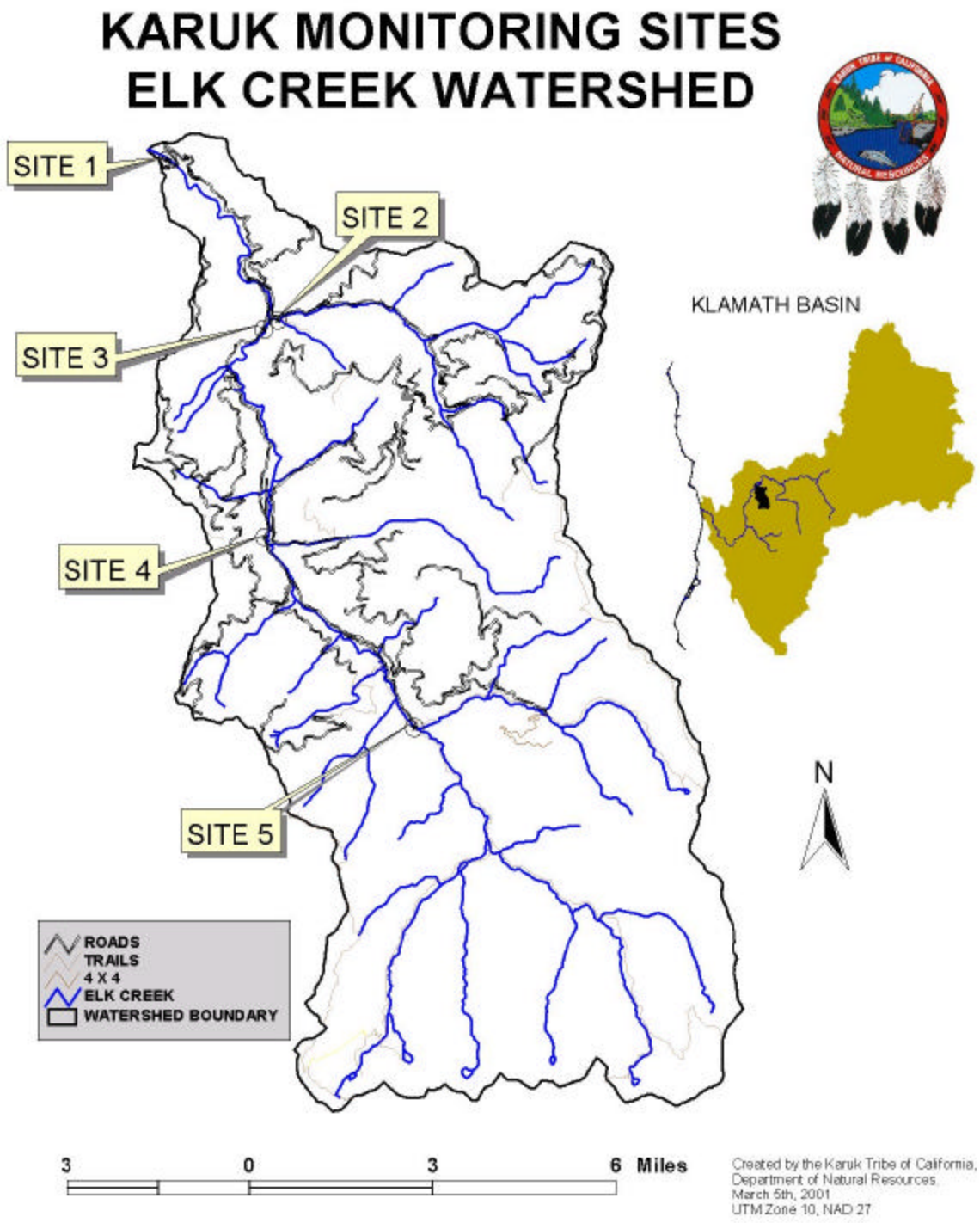

Figure 2. Water Quality Monitoring Sites on Elk Creek

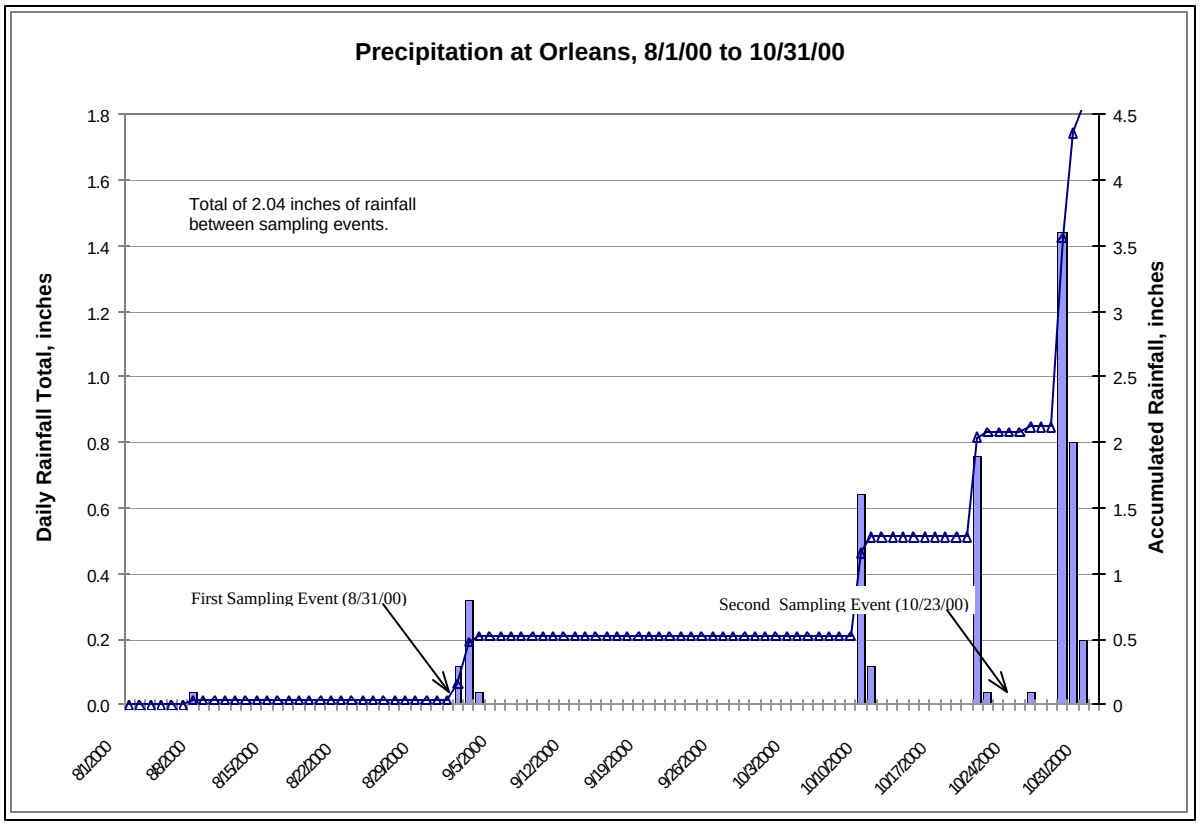

Figure 3. Precipitation at Orleans from August 1, to October 31, 2000.

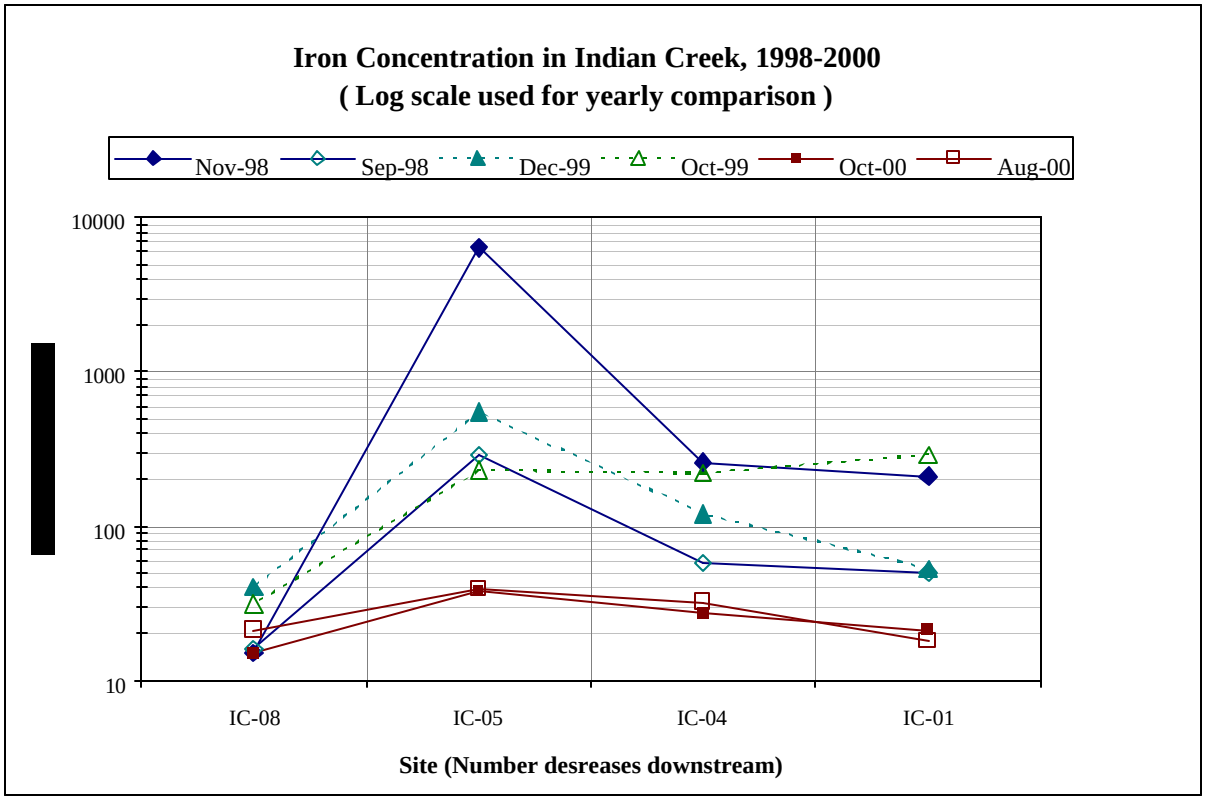

Figure 4. Iron Concentration in Indian Creek at four monitoring sites from November 1998 to August 2000. The laboratory detection limit for iron is 15 ug/L.

APPENDIX A
KARUK WATER QUALITY MONITORING REPORT
FOR FALL 2000

Indian Creek Water Quality Data

1. August 2000
2. October 2000

3. Summary of Data:
   - September / November 1998
   - October / December 1999
   - August / October 2000

APPENDIX B
KARUK WATER QUALITY MONITORING PLAN
FOR FALL 2000

Elk Creek Water Quality Data

1. August / October2000
2. Drinking Water Samples WY 2000

APPENDIX C
KARUK WATER QUALITY MONITORING PLAN
FOR FALL 2000

Field Water Quality Data Sheets for Laboratory Samples

1. Indian Creek and Elk Creek - August 2000
2. Indian Creek and Elk Creek - October 2000

APPENDIX D
KARUK WATER QUALITY MONITORING PLAN
FOR FALL 2000

Analytical Reports from Laboratory Analysis

1. Indian Creek and Elk Creek – August 2000
2. Indian Creek and Elk Creek - October 2000